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## Producer-Funded R&D for Prairie Agriculture

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### Issue

The amount of R&D funded by prairie agricultural producer associations is generally quite small, even though the expected returns are comparatively large and matching government grants are relatively plentiful.

There has been a sizeable increase in producer-funded R&D for some commodities in recent years, but overall producer-funded R&D for prairie agriculture remains inefficiently low from the perspective of both producers and society as a whole. The value of the producer levy, which for most commodities is refundable upon request, is typically around 0.5 percent of industry receipts, and the fraction of association revenues devoted to R&D is typically in the thirty to forty percent range. Producer refunds of levy payments typically range from five to ten percent. Associations that fund R&D range in size from comparatively small (e.g., the Saskatchewan Alfalfa Seed Producers Development Commission's annual levy revenue is in the \$100,000 range) to comparatively large (e.g., the Western Grains Research Foundation's annual levy revenue is in the \$5 million range).

### Policy Implications and Conclusions

Producer underinvestment in R&D can occur with respect to the level that maximizes: (1) aggregate returns for producers; and (2) aggregate social return. The first type of underinvestment is primarily due to free-riding incentives facing individual producers and differences in key producer variables, such as financial strength, level of education

and operating time horizon. The second type of underinvestment is primarily due to weak intellectual property rights (IPR), which give rise to R&D spillovers. The focus of this research is on the first type of underinvestment.

Producer associations vary in their capacity to reduce the incentive for individual producers to free ride. Most importantly, "strong" associations utilize mandatory, non-refundable levies whereas "weaker" organizations utilize mandatory levies, which are refundable. Provincial legislation, which governs the activities of producer associations, typically makes it quite difficult for association directors to "strengthen" the organization by converting from refundable to non-refundable levies, or, even more simply, to raise the producer levy. Legislative reform and realigning the incentives facing producers is necessary if policy makers are serious about significantly increasing producer involvement in R&D. Canadian policy makers should thoroughly examine the Australian Grains Research and Development Corporation (AGRDC), which, through increased coordination and legislative simplification, increased producer-funded R&D from \$67 million in 1984/85 to \$541 million in 2005/2006. The GRDC's success is largely attributable to large economies of scale, which was achieved through the creation of a national agency, a business investment approach to R&D, a mandatory levy, and a commitment by the Australian government to match dollar-for-dollar all producer contributions to a maximum of 0.5 percent of industry receipts.

Finally, when attempting to increase producer involvement in the R&D process, it is important for policy makers to understand that the efficient level of R&D investment by producers varies widely across sectors. Such variation is due to differences in value-added opportunities, rates of industry growth, and private sector R&D participation rates. Studies that estimate rates of return to producer investment in R&D should be undertaken to ensure that funding targets are appropriate for the sector in question.

## Discussion

Prairie commodity producers have benefited significantly from on-going public sector R&D, which lowers production costs, increases product quality, and creates new products. Producers have also participated directly in the R&D process by allocating a fraction of their farms' surplus to their association, and then requesting association directors to apply for matching government grants and manage research contracts and partnerships. A number of studies have demonstrated that the return to both public sector R&D and producer-funded R&D has been comparatively large for many of the grains, oilseeds, and pulse crops, which are produced on the Canadian prairies. For example, estimates from a recent study suggest that, in the long-term, Saskatchewan pulse growers receive approximately \$15.60 for every R&D dollar they contribute through a producer check-off.

Producer underinvestment in R&D is becoming more problematic due to a gradual shift from public to private sector R&D in agri-food markets. Indeed, with the on-going strengthening of intellectual property rights, development of food supply chains, and globalization of agri-food markets, private sector R&D is increasingly becoming a source of new innovation for agriculture. Producers are, at best, only secondary beneficiaries from private sector R&D, and so it is becoming increasingly important for producers to participate more fully in the R&D process. Policy makers and association managers face many constraints when attempting to induce producers to contribute more of their farms' surplus to collective R&D. These constraints help explain why producers in general tend to underinvest in R&D, and why the underinvestment problem is particularly worrisome in some sectors (e.g., canola) but less so in others (e.g.,

pulses).

To get a sense of the scale of producer-funded R&D in prairie agriculture, consider the case of the Saskatchewan Canola Development Commission, which averaged 36,500 members for the period 2000-2004. This commission collected an annual aggregate levy equal to about \$1.25 million, which averages to about \$34 per registered canola producer. Using an estimated market price of canola equal to \$400, the \$.50 per tonne levy represents a producer contribution of about 0.15 percent of gross producer receipts. Of the \$1.25 million in aggregate levy revenue, the Canola Development Commission invested about \$405,000 in R&D. This value translates to roughly \$12 per registered canola producer per year. For other agricultural commodities, average annual R&D expenditures per producer per year over the period 2000-2004 are equal to \$177 for alfalfa, \$11 for flax, \$712 for pork, \$88.50 for pulse crops, and \$86 for sheep. Relative to expenditures on farm inputs such as fuel, fertilizer, and feed, these values are quite small.

Although data are not available on total (public and private) R&D expenditures for prairie commodities, producer-funded R&D likely constitutes only a small percentage of total spending. The time trend in producer-funded R&D, as measured by the average year-to-year percentage change in expenditures over the period 1999 to 2004, varies widely across industries. For example, the year-to-year change in R&D expenditures for canola is essentially flat, averaging just one percent over the 1999 to 2004 period. Average expenditures appear to be falling rapidly for flax (average change of -9.0 percent) and rising rapidly for pulse crops (average change of 30.5 percent). Producer-funded R&D must also compete with other uses of association revenue, such as commodity promotion. For canola and flax, an average of thirty-nine and thirty-eight percent of the association's total levy income, respectively, was spent on R&D. This fraction is somewhat higher for the case of pulse crops (forty-seven percent) and alfalfa (sixty-three percent). Understanding the incentives facing association managers who allocate association revenue to R&D, commodity promotion, and other activities is important when designing policies for increasing the level of producer-funded R&D.

Why do producers invest in R&D at a level below that which maximizes aggregate producer return? The primary reason is that individual producers have a strong incentive to free ride. Free-riding occurs in all situations involving public goods and collective action (if individual members who choose not to contribute cannot be prevented from enjoying the benefits of collective action, then each member is expected to contribute at a sub-optimally low level). Free-riding undermines the effectiveness of all collective action involving public goods, and the theory of public good provision postulates that this problem becomes worse with larger and more diverse organizations. Moreover, R&D involves up-front costs and a flow of benefits that typically begin only after considerable delay. Producers with a relatively short time horizon, have a particularly strong incentive to under-invest in R&D, especially when R&D benefits flow over a relatively long period of time.

The rules governing levy collection are an important determinant of free-riding incentives. In the extreme case, if the check-off scheme specified a purely voluntarily donation to an R&D fund at the time of commodity sale, free-riding would be most severe and individual contributions would be minimal. Most associations use a system of mandatory refundable levies, within which producers must specifically request a refund to have their levy contributions returned. Such a system certainly reduces free-riding, but the refundable nature of the levy severely limits the ability of association managers to raise the levy to a level that will maximize the collective return on investment for producers (the current rate of refunds is generally between five and ten percent). Some producer associations, such as the pulse growers in Saskatchewan, use a mandatory, non-refundable levy scheme. With non-refundable levies, free-riding at the producer level is reduced, but is generally not eliminated, because producers can still explicitly and implicitly pressure association decision makers to set the levy at an efficiently low level. The non-refundable nature of pulse crop levies helps to explain partially why pulse growers systematically contribute higher amounts to R&D than producers in comparable sectors like canola.

There are other reasons why producer-funded R&D is relatively high and growing for pulse crops but relatively low and stable for traditional prairie crops,

such as wheat, barley, and canola. Farm groups typically rely on public institutions to carry out R&D, and so if public R&D has displaced private R&D, then opportunities for producer involvement in the R&D process will be limited. Canola is currently dominated by private sector R&D whereas the public sector remains a dominant player in the R&D market for prairie pulse crops. Pulse crops are also currently enjoying a strong growth phase, and thus there are likely to be a greater number of innovation opportunities and R&D niches for pulses than the more traditional crops. Availability of other sources of R&D is also an important determinant of the efficient level of R&D intensity for a producer association. Canola growers may feel that the public and private sectors are doing a reasonable job with R&D, and producers are capturing a reasonable fraction of the R&D surplus. This may not be the case with the pulse growers.

Producer associations that operate on the Canadian prairies are highly regulated and subject to laws that vary widely from province to province. Regulations are usually such that changing the size of the levy or the rules governing the levy mechanism (e.g., refundable versus non-refundable) is complicated and requires strong producer consensus. For example, in Saskatchewan the Agri-Food Council is the umbrella organization for many of the producer associations that operate in that province via the 2004 Agri-Food Act. Associations are set up either as a development commission (sixty percent producer support required) or a development board (eighty percent producer support required). Development boards use non-refundable levies whereas development commissions use refundable levies.

To get a sense of why it is difficult for a Saskatchewan producer association to change its levy collection mechanism, consider the following from the Saskatchewan Agri-Food Council (<http://www.agr.gov.sk.ca/agrifood/regulations.htm>):

When a board/commission wants to amend either its regulations or orders, it must prove to The Agri-Food Council (Council) that the recommended changes are not only beneficial, but also necessary and supported by producers. In order to amend regulations,

the board must first prove to the Council that the recommended changes are beneficial for the agency (including its producers). Upon convincing the Council that the recommended changes are beneficial and necessary to the agency, the Council will vote to either pass them or not. If accepted, the Council then forwards the recommended changes to the provincial government bodies that debates the changes and either recommends further changes, approves the changes or disallows the changes requested. If accepted by the provincial government bodies, the changes are then forwarded to the Executive Council and the Lieutenant Governor in Council for their approval/denial. If approved, the amendments are considered changed on the date of signing by the Lieutenant Governor.

The Australian system for facilitating producer-funded R&D looked similar to the system described above until it was revamped in the mid-1980s. The current Australian Grains Research and Development Corporation (AGRDC) is now a remarkably effective national agency that collects mandatory, non-refundable levies for the purpose of R&D, and has secured guaranteed matching contributions from the Australian government, up to a maximum of 0.5 percent of gross industry receipts. The AGRDC views R&D investment in a standard business framework, and does a good job communicating R&D opportunities and results to its producer members. Because the agency is national in scope, it is able to achieve significant economies of scale, something that Canadian producer associations are largely incapable of achieving. Additionally, the legislative rules governing the AGRDC's operation are relatively straightforward, unlike producer associations that operate on the Canadian prairies.