

New Crops: The Trail From Development To Your Farm

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Introduction

Diversify. This was the mantra of agricultural policy administrators and politicians in the early 1990's. With the decisions to eliminate the crow rate subsidy on western grains, and to lower or eliminate other direct cropping subsidies there was a realization in federal and provincial governments that "old" crops like wheat and barley would have a reduced farm gate value. Economically sustainable cash crop farming would require "new" crops which provided greater farm gate value. But how would these new crops be developed and who would develop them? These questions are important because new crop development needs to happen and the manner in which these crops are developed needs to ensure that farmers benefit directly.

Why do we need new crops?

Farming is both a biological and economic activity. The duality of farming in this regard provides challenges for sustaining farming because tools for sustainability must serve both the biological and the economic needs of the farm. Instead of diversify it may have been better to adopt the mantra of diversity. Diversity is a biological requirement to achieve a sustainable farming system. Biologically simple systems are inherently susceptible to biological failure. Monoculture wheat, for example, does not continue to yield without the extensive use of pesticide and fertilizer inputs. At the same time, diversity within a farming enterprise can also provide economic sustainability. The more crops grown within a given enterprise (or region) for example, the more diverse the cash crop economy and the less susceptible that enterprise (or region) is to declines in market for any one given crop. Sustainable farming, therefore, requires diversity and diversity is fed by a supply of new crops. In this respect, new crop development is very important.

New crops?

In North America the only indigenous crops species grown to any great extent is sunflower. All of the other crops we grow have been brought to this continent at one time or another through history as "new" crops. Certainly in western Canada most common crops have been grown in the region for less than 100 years. We could say that wheat, barley, oats, flax, peas, canola, lentil, alfalfa, corn, soybean, forage grasses, and dry beans are all new crops. Certainly they have been introduced as new species to western Canadian agricultural systems, albeit some more recently than others. In addition to the introduction of new species, one might consider that new crops include new varieties (Table 1). In this respect, canola is perhaps a special case. A species greatly modified to be an acceptable food and feed crop. However, new wheat varieties, especially those that are superior from a milling perspective, are certainly also new crops. This would include also crops bred to deliver specialty oil qualities. There is another category of new crops as well. We might refer to these as old crops which have become new crops and these would include any crops produced organically or under identity preserved (IP) specifications (such as pesticide-free production). Organic crops are certainly new crops in the modern agricultural era and they bring new value and new opportunities to farming. The last category of new crops includes those coming in the next era of genetically modified crops (Plants with Novel

Traits - PNTs). Pending registrations for unconfined release of PNT's in Canada include primarily crops with very unique traits including crops which can produce pharmaceutical or neutraceutical proteins. These are certainly new crops, even if their growth platform is an old crop such as corn or canola.

Table 1. Categories of new crops for western Canada

Category	Examples in category
New species	wheat, barley, oats, flax, lentils, dry beans, borage, Coriander, alfalfa, <i>Brassica juncea</i> , soybean etc...
New varieties	AC superb wheat, Nexera canola
Old crops as new crops	organic wheat, organic forage seed, PFP malt barley, IP high milling quality wheat.
Plants with novel traits (PNT's)	Roundup Ready canola, drought tolerant wheat

New crop development approaches

The nature of new crop development is dependent on the type of new crop being considered for introduction. For example, traditional new crops (new species) have been introduced to western Canada by farmers directly and the development of these crops (the creation of functional agronomy packages) was a collaboration between farmers and public institution researchers, in particular Agriculture and Agri-Food Canada (AAFC). New variety development for these new crops was traditionally left to public institutions; breeders at universities and AAFC. The creation of new crops from old crops in the modern agricultural era (after the initiation of the green revolution) has been left to farmers with minor involvement from public institutions (universities, AAFC and provincial government agencies). The development of PNT's, especially those created through genetic modification (GM) technology, is of interest to the private sector, and governments in Canada have been eager to participate for the sake of encouraging the creation of a biotechnology industry in Canada. Among new crop development efforts, the private sector has remained primarily interested in PNT's because of the potential in the industry generally, and because GM technology allows for absolute property rights. These rights have been well supported in Canada as witnessed in the case of Schmeiser vs. Monsanto (Van Acker et al. 2004). The private sector is interested in variety development if there is an opportunity for property rights and rapid investment recovery. For example, the private sector has taken over canola variety breeding in Canada because farmers tend to purchase canola seed (more than 98% of canola seed in western Canada is purchased). They have been less keen to participate in wheat breeding where more than 70% of seed is farm-saved (Van Acker et al. 2003). In addition, the public sector (AAFC) is a formidable competitor in this sector having ownership of the most elite germplasm for spring wheat and a cadre of exceptional wheat breeders. Therefore, for much new crop development (new species, new varieties in many species, and new crops from old crops) there remains an essential requirement for the involvement of farmers and the public sector because the private sector is not interested.

How new crops are developed affects how they benefit farmers. The involvement of the public sector in variety breeding efforts for core crops in Canada such as wheat has been an indirect yet valuable subsidy to farmers. This subsidy has provided exceptional value when farmers have been allowed to farm-save seed. In this manner, farmers were able to exploit elite germplasm with minimum cost. The same cannot be said for canola varieties where the private sector has become very involved in variety breeding, almost to the exclusion of the public sector and seed costs in canola production have risen significantly. In Manitoba, for example, the cost of seed in canola production rose by almost 70% from 1993 to 1999, as variety development shifted from the public to the private sector (Manitoba Agriculture 2000). The public sector has not been very involved in cereal breeding efforts in Canada, because farmers are not apt to buy new cereal seed each year, AAFC is still an active breeder of these crops and there is not yet sufficient power in the seeds act or in plant breeder's rights to allow for absolute enforcement of property rights and to protect return on private investment. Interestingly, internal documents in AAFC reveal that there is a strong desire to end federal public breeding programs, at the same time AAFC (through CFIA) is undertaking a review of the seeds act with an aim to eliminate farmers rights to save seed. It seems that AAFC is intent on moving public breeding of cereals into the private realm and they are creating the conditions to allow this to happen. This would eliminate the subsidy value public breeding effort have brought to farmers in western Canada and it may limit new crop (variety) value for farmers in the same way we have seen this value limited in canola. Promoters of private sector initiatives would argue that there is a need to move all new crop development into the private sector because PNT development is expensive and will not occur if there is no absolute assurance of property rights. This may be true, but the strength of this argument relies on the strength of ones belief that PNT development must be the primary (or perhaps only worthwhile) new crop effort in Canadian agriculture. This cannot be true when new species development and new "old" crop developments (as well as the development of varieties in crop markets of no interest to private investors) still remain as vibrant and effect routes of new crop development for the benefit of farmers in western Canada.

What kinds of new crops are required?

Farmers are interested in sustaining their farms. Diversity is required for the economic and biological sustainability of farming. New crop development must serve economic and biological diversity inside the farm. All new crop development should be encouraged, including PNT development. However, if new crops deliver only a small net return at the farm gate then their true ability to sustain farming is limited in two respects. First, small net return is small net return and it doesn't help farmers to maintain adequate economic return. Secondly, small net return drives farmers to farm more acres. Larger farms tend to require simpler agricultural systems in order to manage the scale. Simpler systems are biologically less sustainable and more reliant upon external (purchased) inputs. In this respect, sustainable farming requires new crops (because it requires biological diversity) that deliver a significant return at the farm gate. To gain greater value at the farm gate farmers must have some ownership in the new crop development, either through the public sector, or directly perhaps through collaborative initiatives like the pulse growers' agreement with and funding of pulse crop breeding at the Crop Development Centre of the University of Saskatchewan.

Conclusion

Farming is a bio-economic activity and its sustainability relies on efforts which serve the dual nature of farming. There are many types of new crops ranging from PNT's derived using GM technology, to old crops made new through their production within an IP system such as organic. The existence of many new crop options is good news for sustainable farming but the nature of development (and ownership) of these new crops can either enhance or limit the new crops usefulness in sustaining farms. In Canada there are moves afoot to remove some involvement of the public sector in new crop development. This may threaten the usefulness of crops varieties as new crops to make farms more sustainable. Public sector and farmer involvement in new crop development is essential if there is to be a continued and useful supply of new crops to farmers in western Canada. In this respect farmers must maintain intense interest in and perhaps become directly involved in the development trail for new crops

References

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