UNIVERSITY OF ALBERTA
Alberta Land Institute

CONNECTING RESEARCH AND POLICY FOR BETTER LAND MANAGEMENT

ECONOMIC EVALUTION OF FARMLAND CONVERSION AND FRAGMENTATION IN ALBERTA

Summary of Findings

Nov. 2017

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SUMMARY OF FINDINGS

Alberta's land base supports a wide variety of land uses and economic activity. The province is generally designated into a green zone, which is mostly held as crown land and used for forestry and recreation, and a white zone, which is mostly held as private land and used for agriculture, resource extraction, residences, and industry. While agriculture is the most obvious and largest land use in the white zone, the provinces urban areas are growing rapidly. The Calgary and Edmonton metropolitan areas had the highest rate of population growth of all Canadian cities between 2006 and 2011 and between 2011 and 2016 (Statistics Canada, 2017). Extensive patterns of urban growth have pushed the city edges into nearby farming areas at the same time as more rural residences have been carved out of agricultural fields. Energy/utility corridors and wellheads have also taken over significant areas of former agricultural land.

The Calgary and Edmonton metropolitan areas had the highest rate of population growth of all Canadian cities

This conversion and fragmentation of agricultural land has to concerns about rural landscape preservation, loss of food production capacity, high service costs, and conflicts between farmers and new rural residents. There have been policy responses by both provincial and municipal governments. In 2009 the Alberta provincial government enacted the Alberta Land Stewardship Act (ALSA) as the legal basis for regional land-use planning in the province. Part 3 of ALSA supports the use of conservation easements, conservation directives and market-based instruments for conserving the environment, natural scenic values, and agricultural land. Subsequent revisions of ALSA clarify that that the government must respect private property rights of individuals and that individuals can claim compensation if they believe that they have been the subject of a "compensable taking" in implementation of a regional plan. The Modernized *Municipal Government Act* of 2016 establishes Growth Management Boards for the Calgary and Edmonton metropolitan areas, and makes them responsible for developing "a growth plan for the region to help ensure the preservation of agricultural lands and wise use of the environment." Clearly, it is important that all officials responsible for decisions about land use understand the magnitude and causes of the problem.

HIGHLIGHTS

In that context, the following research results deserve special attention.

1) Analysis of satellite imagery shows that between 1984 and 2013 the amount of land in urban uses in the Edmonton-Calgary corridor increased from 3,127 km2 to 4,763 km2, an increase of 52% (Stan and Sanchez-Azofeifa, 2017). During that time the Calgary urban area expanded from 242 km2 to 754 km2 (Stan and Sanchez-Azofeifa, 2017).

2) Around Calgary, Edmonton and Red Deer, expansion of urban areas was higher in the 1984-1992 period than in either the 1992-2001 or 2001-2013 periods (Stan and Sanchez-Azofeifa, 2017).

3) Measured by distance between patches, both farmland and natural areas in the Edmonton-Calgary Corridor became significantly more fragmented between 1984 and 2013 (Stan and Sanchez-Azofeifa, 2017).

4) Across the White Zone of Alberta, the largest change in land cover between 2000 and 2012 was the conversion of grasslands and forests into croplands and pasture, possibly due to the rise of crop prices relative to cattle prices during the period. The area in developed uses (residential, industrial), increased by approximately 1,000 km2 (3000 to 4000 km2) over this period, mostly land that was converted from cropland and pasture. Over half of the land conversion into developed uses (625 km2) occurred in the Edmonton-Calgary Corridor (Haarsma and Qiu, 2015).

5) Conversion of land from agriculture to developed uses in the Edmonton-Calgary Corridor between 2000 and 2012 was positively related to population growth, price of agricultural land, road density and degree of fragmentation and negatively related to land suitability. Everything else equal, best quality lands were less likely to be converted than lower quality lands (Qiu et al, 2015).

6) Nonetheless, most of the land converted into developed uses between 2000 and 2012 was of the highest levels of land suitability, with 35% of the highest suitability and 34% of the second highest suitability found in Alberta (Haarsma and Qiu, 2015). Edmonton, in particular, is located in an area of very high quality agricultural land, making it difficult for the urban areas to grow without encroachment into high quality agricultural land.

7) Measured by the density of patch edges, there was a small reduction in farmland fragmentation between 2000 and 2012 in the Edmonton-Calgary Corridor, with an increase in fragmentation around Edmonton, Calgary and Red Deer (Qiu et al, 2015).

8) Data on farmland prices were provided by Farm Credit Canada for land transfers occurring between 1998 and 2014. A hedonic price analysis of those data showed that farmland prices were positively influenced by the presence of irrigation, dairy infrastructure, greenhouse infrastructure, good quality housing, high soil quality, high net farm income, proximity to Edmonton or Calgary, and proximity to highway 2 (Bentley, 2016).

9) A survey of 320 urban and rural residents in the Alberta Capital Region revealed considerable concern about the rapid expansion of the urban areas and the consequence loss of natural and agricultural land in the area. Survey respondents indicated that it was most important to maintain agricultural land for production of food for the local market, followed by air quality, water purification, scenic beauty, and production of food for the global market (Wang, 2016).

10) Responding to a choice experiment in which they were asked their willingness to pay for farmland conservation, about 80% of the 320 survey respondents indicated that they were willing to make a small one-time contribution toward farmland conservation in the Alberta Capital Region. Over 50% of respondents were willing to make a $300 contribution. Respondents were willing to contribute the most to conserve land used for vegetable production, followed by rolling grasslands used for livestock grazing, and by crop and hay land (Wang and Swallow, 2016). These results can be used to prioritize areas for conservation and the authors illustrate farms that would be considered highest priority for conservation depending upon the way that benefits and costs are weighed in decision making. To maximize net social benefits, such a program would target some of the lower priced lands within the region over very high-priced lands adjacent to the existing urban areas (Wang and Swallow, 2016).

LISTING OF PUBLICATIONS

Haarsma, D. & F. Qiu. 2017. Assessing neighbor and population growth influences on agricultural land conversion. *Applied Spatial Analysis and Policy*. 10(1): 21-41.

Qiu, F, L. Laliberte, B. Swallow, and S. Jeffrey. 2015. Impacts of fragmentation and neighbor influence on farmland conversion. *Land Use Policy* 48: 482-294.

Stan, K.D. and A. Sanchez-Azofeifa. 2015. Historical land cover change in Alberta and the effects of government intervention on future landscape alteration. 35th European Association of Remote Sensing Laboratories Symposium Proceedings. Stockholm, Sweden. June. 126-131. http://www.earsel.org/symposia/2015-symposium-Stockholm/proceedings.php

Stan, K.D. and A. Sanchez-Azofeifa. 2017. The Edmonton-Calgary corridor: simulating future land cover change under potential government intervention. *Land Use Policy* 63: 356-368.

Wang, H., F. Qiu and X. Ruan. 2016. Loss or gain: A spatial regression analysis of switching land conversion between agriculture and natural land. *Agriculture, Ecosystems and Environment* 221: 222-234.

Wang, H. and F. Qiu. 2017. Investigation of the Dynamics of Agricultural Land at the Urban Fringe: A Comparison of Two Peri-Urban Areas in Canada. *The Canadian Geographer*. Accepted.

Wang, H., Swallow, B. (2016). Optimizing expenditures for agricultural land conservation: spatially-explicit estimation of benefits, budgets, costs and targets. *Land Use Policy* 272-283.