Identifying and Valuing Agricultural Land

RESEARCH BRIEF

This Research Brief summarizes research conducted as part of the Columbia Basin Rural Development Institute's Regional Food Systems project. For other research products associated with this project, visit cbrdi.ca/food.

BACKGROUND AND RATIONALE

In the Columbia Basin-Boundary region, demand for locally-produced food exceeds the current supply. One of the most commonly-cited challenges associated with expansion of the local food supply is a shortage of available farmland, especially that which can be purchased at an affordable price. In response to this concern, this study investigated the availability of land in the region with characteristics amenable to agriculture. Our study contributes to the body of work on agricultural land utilization in the Basin-Boundary region. Three other notable sources address the question of land availability to some degree.

First, Statistics Canada's Census of Agriculture[1] provides historic information on farmed area, and allows for a comparison of current conditions to those from the past, giving a sense of the amount of land capable of agriculture that has been taken out of production for one reason or another.

For example, census tables show that in the Regional Districts of Kootenay Boundary, Central Kootenay, and East Kootenay, the total area being farmed decreased from 183,457 hectares in 2001 to 148,246 hectares in 2011, indicating that over 45,000 hectares of recently farmed land are no longer under production. Census of Agriculture data is collected via a survey of farm operators and, while geographically comprehensive, has the disadvantage of macro-scale reporting. Given the survey's focus on current agricultural activities, it is also of limited use for understanding the extent of underutilized agricultural lands.

Second, Agricultural Land Use Inventories[2] provide detailed assessments of agricultural land usage for the areas they cover. In our region, a comprehensive land use inventory has been completed for the Regional District of East Kootenay (RDEK), and an agricultural water demand model (which relies on a survey of properties with irrigation demand) was completed for the Kettle Valley in the Regional District of Kootenay Boundary (RDKB). As an example, results for the assessment of the Central Region in the RDEK found that 39,112 hectares (22%) of the Agricultural Land Reserve (ALR) have potential for farming and are not currently farmed. Agricultural Land Use Inventories act as a

snapshot in time and provide reliable information at the parcel scale. However, such inventories are expensive to implement and the survey area is limited to i) parcels in the ALR that are greater than one acre in size and accessible by road, ii) parcels with farm status for property tax assessment, and iii) parcels where photo interpretation indicates signs of agriculture. The inventory therefore does not consider properties that are not in the ALR and properties that are not currently farmed.

Third, a recent study on the potential for pocket agriculture in the West Kootenay region undertook an assessment of land availability in the area from Creston to Grand Forks to Nakusp[3]. Using a geospatial analysis primarily based on soil capability maps, the study found that only approximately 10% of the 200,000 hectares of capable lands (i.e., those with soil capability classifications 1-5) in the West Kootenay region are actually under cultivation for crops or pasture. This study has the advantage of assessing utilization of all properties—not just those actively farmed or in the ALR—but is limited in its determination of what qualifies land as capable for agriculture.

Our study attempts to address the limitations of the above three sources by employing two methods to assess utilization of agricultural land. The first combines soil capability data with property assessment data and applies specific suitability criteria to get a sense of agricultural land utilization in all Basin-Boundary municipalities and electoral areas. The second detects agricultural lands based on remotely sensed data collected from satellite and air photo sources, with additional suitability criteria also applied. The second analysis was intended as a pilot project and is therefore limited in geographic scope. Our study has the additional advantage of considering the value of underutilized lands—an important factor in determining feasibility for agricultural use.

OVERVIEW OF METHODS

1A - PROPERTY DATA ANALYSIS

For property tax purposes, BC Assessment collects data on every privately owned property in British Columbia (BC). Among the variables included in this dataset are the primary use of the property (including farming) and assessed value. The strengths of this dataset lie in its comprehensive coverage of the entire province and the regular reporting and updating of the information. In order to quantify the amount of land within each electoral area that is capable of supporting agriculture, but is not currently being farmed, we analyzed BC Assessment data for 2014[4] and the 1:50,000 Land Capability Classification for Agriculture in BC5 soils maps.

The Land Capability Classification for Agriculture in BC system ranks soils for their potential for agricultural use. Classes 1-4 are capable of sustained production of field crops, with class 1 being the best. The lower the rank, the more management practices are required to overcome limitations. Class 5 lands are capable of producing perennial forage crops and some fruit trees. All lands are rated for both 'unimproved' and 'improved' conditions. The 'improved' ratings were used for this calculation and reflect the land capability after existing limitations have been overcome by improvements such as drainage, irrigation, or fertilization.

Land that is available for agricultural expansion was defined as being private properties over two acres in size that are not currently classified as a farm by BC Assessment, have at least 50% of the property with class 5 soils or better, and an average slope of less than 20 degrees. To reflect economic feasibility considerations, properties less than two acres in size are excluded from these calculations. In addition, our analysis includes only privately owned properties.

1B - REMOTE SENSING ANALYSIS

Remote sensing in combination with geographic information system (GIS) technology is increasingly used by land managers to assist in agricultural decision making. Remote sensors collect data by detecting the solar energy that is reflected by the earth or emitted by the earth itself. Different substances have different reflectance patterns, which allows for differentiation of land cover types based on their spectral signature. For example, chlorophyll in healthy plant leaves absorbs visible light and plants re-emit that solar energy as near-infrared light. Conversely, unhealthy or sparse vegetation reflects visible light and absorbs near-infrared light. This allows for identification of land with higher productivity or agricultural potential.

Our remote sensing pilot project was conducted in partnership with the Selkirk Geospatial Research Centre and focused on two portions of the Basin-Boundary region—one with available high resolution aerial photography (the Creston Valley) and one without such data (the Columbia Valley). In the second case, the analysis relied solely on freely available Landsat satellite imagery[6]. Our protocol used the normalized difference vegetation index (NDVI) to estimate levels of vegetation greenness. After applying this initial estimate of productivity to all lands in the study area, additional criteria were applied to determine whether or not a piece of land could feasibly be farmed. These criteria are described in the results section below.

The Creston Valley analysis further classified lands as potential high-quality farmlands or orchards based on calculated correlations between slope, soil type, and actual land use as confirmed by BC Assessment property classification data. The Creston Valley analysis also benefitted from available high resolution aerial photography, which permitted a degree of error checking that could not be performed on the Columbia Valley analysis.

To generate an estimate of underutilized agricultural lands, existing agricultural lands were excluded from the dataset. The Columbia Valley analysis used results from the 2011 Agricultural Land Use Inventory to accomplish this task (i.e., any property classified as actively farmed was removed from the inventory of areas with potential for agricultural expansion). Given the lack of a current Agricultural Land Use Inventory for the Creston Valley, BC Assessment property classification information was used for that analysis. For detailed information on our remote sensing methodologies, please contact the RDI.

2 - LAND VALUE ANALYSIS

Our land value analysis used results from the property data analysis to understand the monetary value per acre of private land with potential for agricultural expansion. Average land values were determined using 2014 assessed values as estimated by BC Assessment. To ensure comparability of results, only the value of a property's land was included in the calculation and the value of any improvements (i.e., buildings) was excluded. BC Assessment reports that assessed values for acreages are estimated based on recent sale prices of similar properties and are therefore a reasonable approximation of market values. Our results are calculated and presented at the scale of the electoral area/municipality.

RESULTS AND DISCUSSION

AVAILABLE FARMLAND

Our results indicate that within the Basin-Boundary region, there are currently over 297,000 acres (120,000 hectares) of land on private properties over two acres in size that have soils capable of supporting agriculture, but are not currently being farmed. The 2011 Census of Agriculture reported that over 383,000 acres (115,000 hectares) of land were being actively farmed at that time. Our results therefore suggest that agricultural production in the region could increase by over three quarters if all quality soils were farmed.

The electoral area with the most available farmland is Area B in the RDEK, with almost 50,000 acres. However, about half of this area is class 5 soils, likely capable of producing only perennial forage crops. The area with the most high quality farmland available is in the Creston Valley, which includes the municipality of Creston and portions of Areas B and C of the Regional District of Central Kootenay, where 851 acres of class 1 soils are not currently being farmed. As a component of total agricultural land, the highest rates of availability were calculated for Areas B, H, and I of the RDCK, Areas A and C of the RDKB, and Area G of the RDEK (**Figure 1**). Detailed, area-specific results can be viewed on the Digital Basin online data portal.

RESEARCH BRIEF

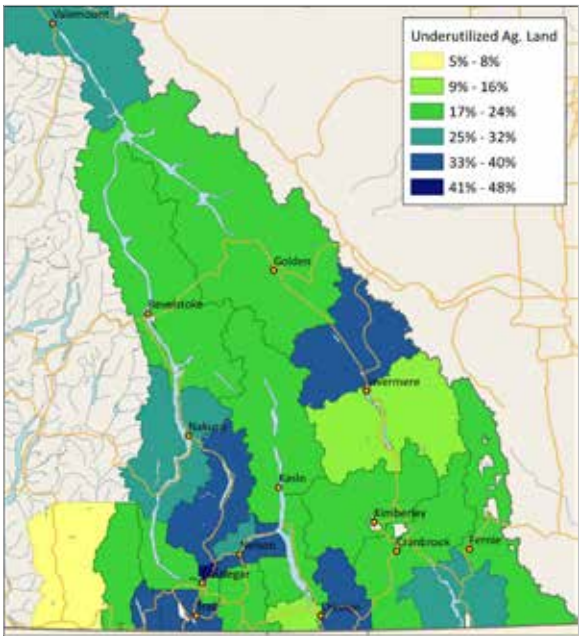

Figure 1: Unfarmed area with agricultural potential, expressed as a percentage of total agricultural land, by electoral area/municipality.

Figure 2: Sample classification results for potential farnlands (including orchards) in the Creston Valley. Black outlines indicate parcels with potential for agricultural expansion.

REMOTE SENSING PILOT

Both the Creston Valley and Columbia Valley analyses found considerable potential for expansion of agriculture based on land suitability. Results also demonstrate that a remote sensing approach to agricultural land classification has the potential to generate highly detailed agricultural capability information at fine scales without the extensive resource commitments required to undertake an Agricultural Land Use Inventory.

Of the 570 hectares surveyed in the Creston Valley, 251 hectares (44%) were identified as areas with potential for agricultural expansion (**Figure 2**). Based on soil type and slope data, 172 of these hectares were classified as potential high quality farmland and 79 were classified as potential orchards. Properties classified as potential farmlands have remotely sensed NDVI values greater than approximately 0.2; BC Assessment property use classification other than farm, commercial, industry or civic use; and greater than 2100 m2 of classified area for high quality farmlands or greater than 280 m2 of classified area for orchards. Use of high resolution aerial photography allowed for error checking and removal of improperly classified areas from the dataset.

In the Columbia Valley (Areas F and G of the RDEK), 15,248 hectares were identified as areas with potential for agricultural expansion (**Figure 3**). Of these, 27% are privately owned, 5% are owned by the Crown, and the remainder have undefined ownership. It should be noted that a considerable amount of classified lands lie in the Kootenay Valley, where little agriculture currently exists. Lands classified as having potential for agricultural expansion have remotely sensed NDVI values greater than 0.15; elevation less than 1200m; slope less than 25 degrees; soil type of class 5 or better; and no identification as parkland, wetland, water feature, built-up area, transportation corridor or forest.

Though high resolution aerial photography was not available to confirm the accuracy of results, comparison with Agricultural Land Use Inventory data suggests good agreement between our classification and ground observations. 83% of

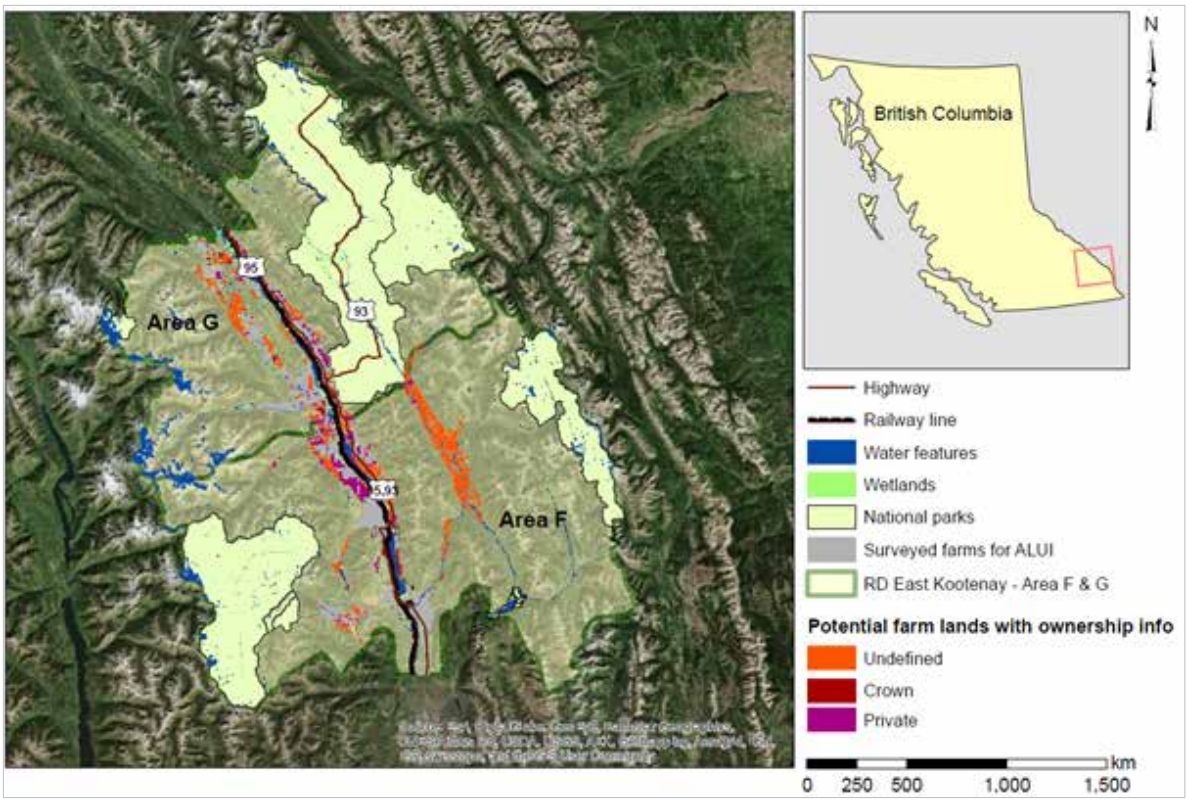

Figure 3: Classification results for potential farmlands in the Columbia Valley.

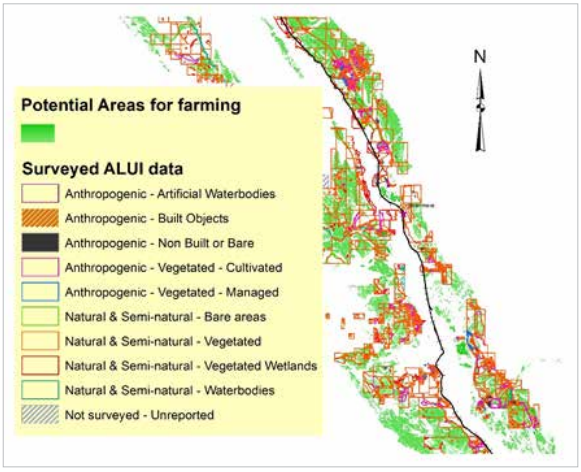

Figure 4: Agreement between Agricultural Land Use Inventory and areas classified as farmland through the remote sensing analysis in the Columbia Valley.

identified agricultural areas from the Agricultural Land Use Inventory were also identified as capable farmland through our analysis (Figure 4).

With refinement, the methodologies piloted by our remote sensing analysis could be applied elsewhere to develop a detailed understanding of agricultural land use. Additional testing and research could ground-truth a sample of results and use lessons from that process to ensure classification protocols generate accurate and actionable findings. This GIS-based approach has the potential to provide highly-useful information to the agricultural community, as it can be adapted to the local context by applying or adjusting any number of classification criteria (e.g., NDVI value, slope angle, land ownership).

VALUE OF UNDERUTILIZED FARMLAND

The results of our two assessments of agricultural land utilization support the findings from previous work that ample capable land exists to allow expansion of agricultural production in the Basin-Boundary region. That said, land access remains an important issue for the region's agricultural community. The results of our analysis of underutilized farmland values provide some context around the problem. The assessed value of farmland in the Basin-Boundary region ranges from $11,532 per acre to $73,540 per acre, averaging just over $22,000. Highest values were calculated

RESEARCH BRIEF

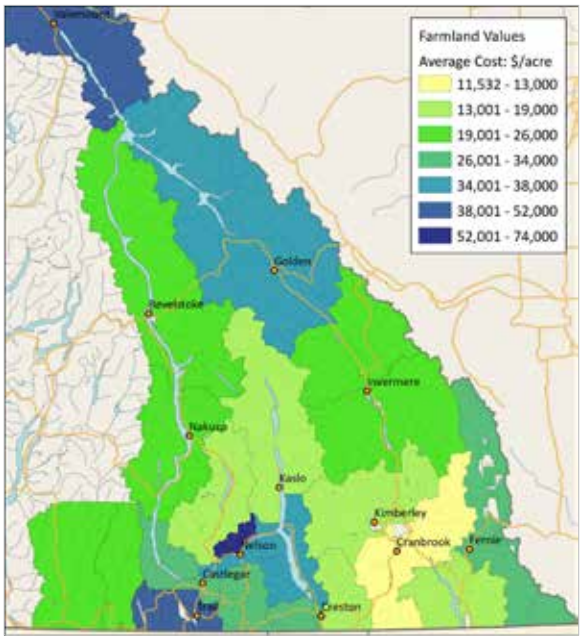

Figure 5: Average assessed value per acre of land with potential for agricultural expansion.

in the Town of Creston, Area F of the RDCK (rural Nelson), Areas A, B and C of the RDKB (rural Trail and Rossland), and Area H of the RDFFG (rural Valemount) (**Figure 5**). Detailed, area-specific results can be viewed on the Digital Basin.

Results suggest that land tends to be valued based on residential and recreational values rather than agricultural use or potential. The premium paid for location can be seen in Area F of the RDCK where the value of farmland is high due to the close proximity to Nelson and the desirable real estate on the North Shore of Kootenay Lake.

Combined with results from the property data analysis, this information can be used by farmland seekers to focus their search. Areas with more underutilized agricultural lands (especially those with substantial amounts of high quality available farmland) and lower average values for potential farmland could be seen as priority areas for agricultural expansion in the region. These areas include RDCK Area B, where the average value of an acre of agricultural land is $18,780 and there are over 4000 acres of Class 1 to 3 soils that are not currently farmed. RDCK Area H is another area of interest, where land values average $16,090 and there are over 5000 currently unfarmed acres of Class 1 to 3 soils.

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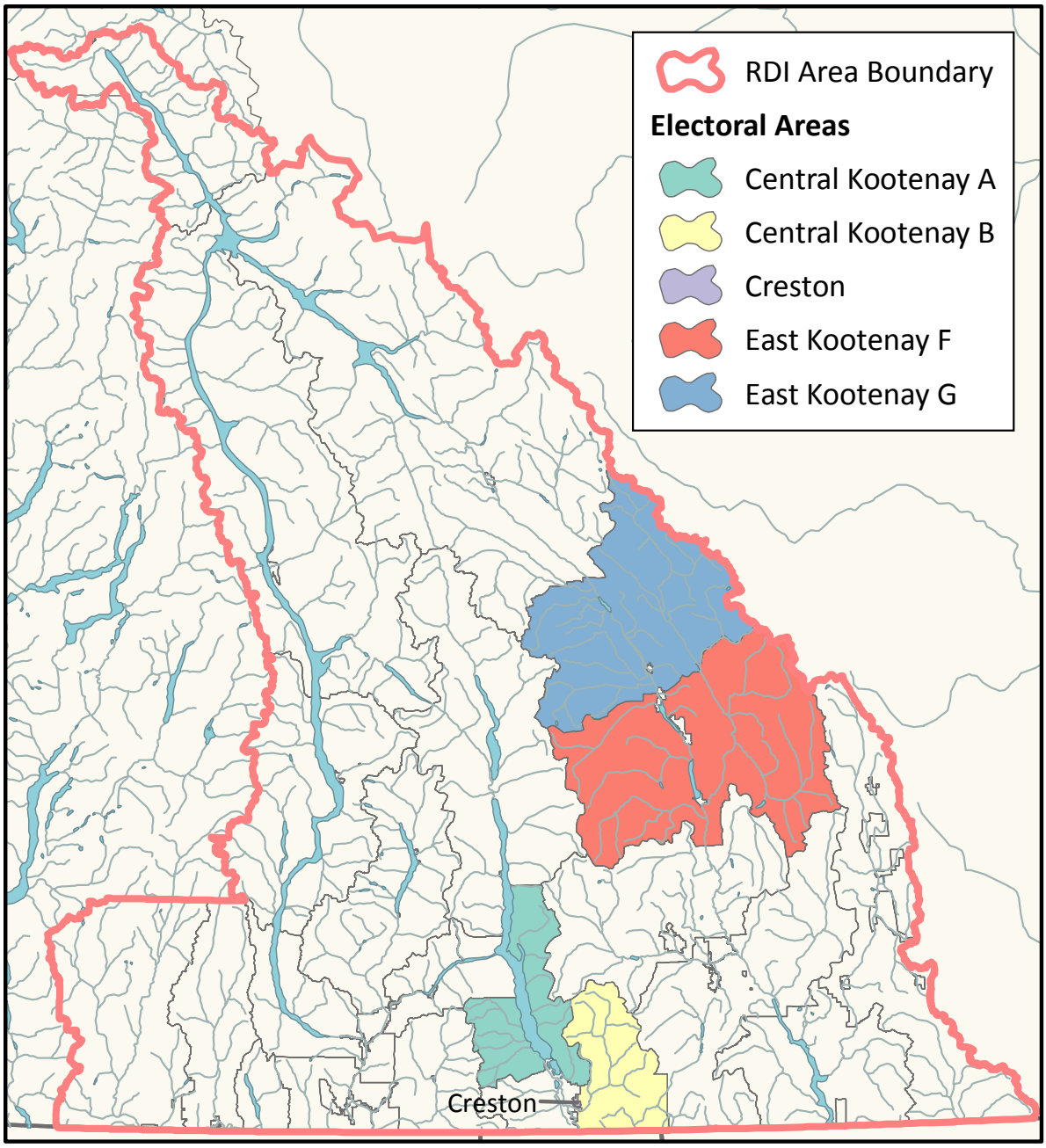

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