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Data Article

Summary of the underlying dataset to assist in tracking resilience of rural agricultural communities

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ABSTRACT

A list of indicators that can be used to track resilience of agricultural communities is presented in this brief. The provided data set covers a unique overview of policy-relevant indicators based on data on climate change impacts, vulnerability, adaptation, agriculture and rural development. This data is grouped into six critical sectors that are crucial for policy-makers to track resilience. The data is transferable and can be adjusted to different communities as the listed definitions can be modified to account for the specific local conditions. The indicators were used to identify a set of resilience indicators for rural agricultural communities in Ontario Canada (for details see “An Indicator Set to Track Resilience to Climate Change in Agriculture: A policy-maker’s perspective” [1]).

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Specifications table

Subject area	Agriculture, rural development, climate change
More specific subject area	Climate change resilience
Type of data	Table
How data was acquired	Literature review, authors and stakeholders’ inputs

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Data format	Filtered and Analyzed
Experimental factors	For data collected from the literature and for additional data identified by the authors, definitions were developed by the authors to cover resilience of rural agricultural communities
Experimental features	The data provide a comprehensive set to describe key features of resilience for rural agriculture communities.
Data source location	Global
Data accessibility	Data is with this article
Related research article	Bizikova L., Waldick R., Larkin P. and Mitchell S. (in press) An Indicator Set to Track Resilience to Climate Change in Agriculture: A policy-maker's perspective. Land-use Policy [1]

Value of the data

- The data provide a comprehensive baseline for rural agricultural regions to create their own indicator system to monitor resilience.
- The data cover critical sectors that are crucial for building resilient agricultural communities such a rural infrastructure, demographics and others.
- The data can serve as a basis to design indicator sets that are adjusted to specific local situation by using the information on how the data were defined to address local needs.

1. Data

This brief provides a list of indicators to monitor rural regions with considerable agricultural activity. The data includes 72 indicators covering several themes that are critical for rural, agricultural regions (Table 1). The data is based on the information available on the literature on climate change impacts, vulnerability and adaptation as well as additions by authors to cover critical aspects of rural agricultural communities. The data table includes definitions were developed by the authors. These definitions can be adjusted to a specific community needs and, so the data are transferable in terms tracking resilience.

2. Experimental design, materials and methods

Database of potential indicators to track resilience to climate change was developed using peer-reviewed and grey literature with additional indicators developed by the authors to address the potential information needs of themes relevant for the study area. Most of the indicators were based on issues/challenges listed in peer-reviewed and ‘grey’ literature published by major international and national agencies, such the European Environmental Agency (EEA), the U.S. Environmental Protection Agency (US EPA), Food and Agriculture Organization of the United Nations (FAO), Agriculture and Agri-food Canada (AAFC). The list of literature is presented in the references. In total, 72 potential indicators were selected listed in Table 1.

The 72 indicators were further assessed and modified based on stakeholders’ inputs to create a final indicator system for the study area in Ontario (Canada) presented in [1].

Table 1

Summary of indicators to measure resilience of the agricultural system in the studied area.

Themes and sub-themes developed for the study area		Indicators are selected from the literature		Definitions developed by the authors to reflect on resilience of rural agricultural communities ^a
Themes	Sub-theme	Indicator title	Similar indicator ideas listed in the literature ^b	
Farmland production activities	Farm Size	Farm size	[2,3]	Relative shares of small, medium, large farms using locally relevant estimation of different farm sizes
	Plant production	Agricultural productivity (yield) in the studies area	[3,4]	Yearly agricultural output compared with long-term average (5 or 10 years average)
		Vegetated cover by agricultural production	[2,3]	Number of days in year agricultural land is covered in vegetation
		Agricultural pesticide use	[5] with focus on water contamination	Use of pesticides in the agricultural area (kg of active ingredients per hectare)
		Agriculture fertilizer use	[5,6]	Fertilizer use in the agriculture area (kg per hectare)
	Mix of crop type	Feed production	[7–9]	Feed production (kg per hectare)
		Crop structure	[5,9]	Proportion of crops of total hectares to indicate perennial and annual crops
		Types of crops	[9,10]	Proportion of total hectares of transgenic, organic, root, and vegetable (non-organic and non-transgenic)
	Animal production	Livestock dentistry	[7]	Number of animals per hectare) and by type of the breed
		Veterinary drug use	Suggested by the authors	Veterinary drug use in milligrams of active ingredient per animal
	Manure management	Extent of manure management strategies	[5,7]	Proportion of the total area under variety manure management strategies
		Nutrient use	[3,5]	Nutrient inputs in kilogram per hectare
		Manure storage type	[5,7]	Amount of manure (kg) per different types of storage
	Agricultural infrastructure	Water irrigation costs	Suggested by the authors	Irrigated water application rates and/or per season
		Barn quality	[2,5–7,11,12]	Proportion of barns with air conditioning
		Greenhouses usage	[5,6,11]	Amount of production from greenhouses
		Proportion farm infrastructure in high flood risk zone	[5,6,11]	Proportion farm infrastructure in high flood risk zone based on 1:100 years floodplain map
	Management strategies	Conservation management	Suggested by the authors	Proportion or hectares of farmland under conservation practices such as use of no-till and rotational grazing
		Portion of land with tile drainage	Suggested by the authors	Portion of land with tile drainage
Environmental Services	Land cover	Watershed buffer zone	[4,11]	Proportion or total hectares shoreline permanently vegetated using thresholds for 120 m for certain wetlands

Table 1 (continued)

Themes and sub-themes developed for the study area		Indicators are selected from the literature		Definitions developed by the authors to reflect on resilience of rural agri-cultural communities ^a
Themes	Sub-theme	Indicator title	Similar indicator ideas listed in the literature ^b	
Climate Change	Biodiversity	Undisturbed land cover	Suggested by the authors [3,4]	Portion undisturbed land cover compared to cover under different managed cover
		Rate of deforestation		Portion of total land deforested
		Areas with woodlots and wetlands	Suggested by the authors	Proportion woodlots or wetlands from the total area
		Land fragmentation	[4,5]	Land fragmentation to indicate unsuitable habitat for local wildlife
	Wildfires and pests	Municipal zoning and buffer zones	[12] focused on riparian buffer zones	Municipal zoning classifications
		Species diversity	[12,13]	Species biodiversity based on critical species monitoring, mapping
	Climate change and weather variability	Species range shifts (e.g., hanta-virus, invasive)	[3,6]	Incidence of reported pests and disease
		Wildfire risks	[6]	Forestry Wildfire Risk Index developed by the government
		Changes in growing season and changes in seeding date	[10]	Seeding date – number of days away from average start of season, also taking into account changes in seeding by crops
		Changes in the late spring frost	[12,13]	Changes in the spring frost date also taking into account different crops needs (for example below 0 °C for soy and –2 °C for corn)
		Heat extremes	[6,14,15]	Details on locally-relevant dates were added: average frost days between May 1 and June 20
		Heat spell duration	[6,13]	Heat Spell Duration Index: Extreme – changes in annual length, by month; changes in annual length of impact (drought) by month; frequency (multi-year trend); ratio of water withdrawals to availability (UNH Water Stress Index); for the regional context three or more days > 32 °C
		Air pollution	[16]	Max number of consecutive days when daily max temp is greater than 5 °C above the normal max temp, by month
	Cold weather	Extreme cold and wind chill	[4,17] [12,13]	Air quality represented by the number of days with smog levels over national standards
				Temperature or wind chill expected to reach -35°C for at least two hours; Cold weather extremes are defined as days when minimal temperature is –20 °C or less
	Storms	Rain-related impacts	[4,14]	Freezing rain (in terms of hail, freezing rain and ice) in number of hours and intensity
	Droughts	Other extreme weather	[4]	Occurrence of local tornadoes
		Phenological risk by crop	[3]	Changes in annual length, by month. Crop-specific for different phenological stages.

Demographics and Markets	Flooding and excess water	Water excess/deficit	[5,6]	Streamflow/discharge rates
		Drought severity	[5,6]	Changes in annual length, by month thresholds by crops and compared to available moisture is 20% less than crop water requirement.
		Drought frequency	[5,6]	Provincial policy defines current thresholds for drought severity. Threshold is changing in terms of timing or seasonality (it is becoming an issue in other seasons)
		Consecutive wet days (wet spell duration)	[5,18]	Consecutive wet days by season (over ≤ 1 mm) – including microburst and excessive rainfall over short period
		Short duration intense	[5,6]	Microburst or short duration rainfall using locally relevant thresholds
	Erosion risk	Water retaining capacity	[14]	Water retaining capacity using local land cover and soil data
		Accidental/non- accidental deaths	[5]	Excess accidental and non-accidental deaths related to extreme weather (including occupational injury)
		Water borne disease incidence	[5]	Water borne disease incidence – number and severity of incidents per year
		Summer peak flow	[5,6]	Summer peak flow
		Late season precipitation	[3,5,6]	Late season precipitation defined by local conditions
	Population and economic characteristics	Crop use in floodplain	[2,19,20]	Crop choices in floodplain
		Erosion risk	[5]	Land use on clay soils
		Living alone	[18]	Proportion population living alone
		Age of farmers	[2,7,18]	Portion of farmers over 65 years; proportion of agricultural producers relative to total rural population
		Number of farmers	[2,18]	Number of farmers with predominantly source of income from farming
	Population characteristics	Rural population	[2,18,19]	Proportion agricultural producers relative to total rural population
		Income trends	[7,18,19,21]	Trends in income level – average income and share of households with low income
		Self-rated health/well-being	[18,19]	Self-rated mental and physical health index based on the census data, which are available for small communities and from the Canadian Health Survey
		Percentage of farms with off-farm income	[2,7,21]	Trends in off-farm income using farm census data
		Gross domestic product in rural areas	[18,19,21]	Monetary value of all finished goods and services for bounded region
		Occurrence of chronic diseases	[7,18,19]	Population health status groups according to the proportion with chronic disease
		Level of debt per farm type	[19]	Average and median debt levels
		Medium and average farm size with insurance coverage	[2,7]	Percentage of farms of certain size with insurance
		Housing in need of major repairs	[2,7]	Using data from Statistics Canada on housing that needs major repairs
Rural Infra-structure	Infrastructure vulnerability	Index of rural cohesiveness	[19]	Sense of belonging index based on the census data, which are available for small communities
		Proportion infrastructure in high flood risk zone	[11]	Proportion infrastructure in high flood risk zone using 1:100 years flood reference rate

Table 1 (continued)

Themes and sub-themes developed for the study area		Indicators are selected from the literature		Definitions developed by the authors to reflect on resilience of rural agri-cultural communities ^a
Themes	Sub-theme	Indicator title	Similar indicator ideas listed in the literature ^b	
		Proportion of population on private/small/municipal drinking water systems	[11,19] population without water access	Working with the definition of private and small drinking water systems under regulation; using government drinking water guidelines – not suitable for ingestion
		Water quality based on water regulations' standards	[4,6]	Drinking water quality disaggregated by municipal, other regulated, private ownership
		Frequency of water contamination	[4,7]	Frequency of water contamination – using methodologies development by water protection agencies
		Frequency of water shortage measure	[5,6]	Measured per year or season, and at the discharge measurements (m ³ /s)
		Road density in floodplain	[11] focused on major roads	Road density in the floodplain (in kilometers and types of roads)
		Access to telecommunication infrastructure	[2,22]	Proportion of population with access to wifi and availability of local radio/TV signal
		Age and condition of infrastructure)	[2]	Age and condition of infrastructure – using age and quality categories
		Access/location/density of health emergency systems	[22]	Number and percentage of communities with lower than average rural provincial access to services
		Unmapped/unregulated flooding control structures	[11]	Unmapped, unregulated flooding control structures on private lands

^a For additional detail see [1].
^b In this column, we list literature sources that already mention similar type of indicators and/or indicated similar challenges that may need monitoring even though the cited literature may not list the specific indicator.

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Transparency document. Supplementary material

Transparency document associated with this article can be found in the online version at <https://doi.org/10.1016/j.dib.2019.01.024>.

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