



Exploring Agroecological Practices in Canada

Haben Asgedom Tedla¹, Ben Thomas² and Kirsten Hannam³

Research Scientists, Systems Agroecologists

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1. Saskatoon Research and Development Centre, Agriculture and Agri-Food Canada
2. Agassiz Research and Development Centre, Agriculture and Agri-Food Canada
3. Summerland Research and Development Centre, Agriculture and Agri-Food Canada,

Presentation outline

- **Background**
 - **Agroecology**
 - **Elements of Agroecology**
 - **Levels of Agroecology**
- **Agroecological Practices in Canada**
- **Agroecology as a Science in Canada**
- **Future research – Agroecology in Canada**
- **Questions and Answers**

Definition and focus

- The term agroecology was first used by Bensing in 1928

Definitions of Agroecology

- ❑ the study of the **interactions** between **plants, animals, humans** and the **environment** within agricultural systems.
- ❑ integration of research, education, action and changes that brings sustainability to all parts of the food system: **ecological, economic** and **social**.

Practice

Science

Movement

(Wezel *et al.*, 2009; Altieri 2012; Gliessman, 2018)

Background

Practices

Science

Future

Agroecology

the study of the interactions between plants, animals, humans and the environment within agricultural systems.

- Enhanced recycling of biomass (organic matter and nutrient cycling)
- Minimize losses of energy, water, nutrients and genetic resources
- Increase soil biological activities
- Diversified species and genetic resources overtime and space
- Enhance beneficial biological interactions and synergies
- Strengthen the resilience of agricultural systems

(Altieri, 2012; Dalgaard *et al.* 2003)

Background

Practices

Science

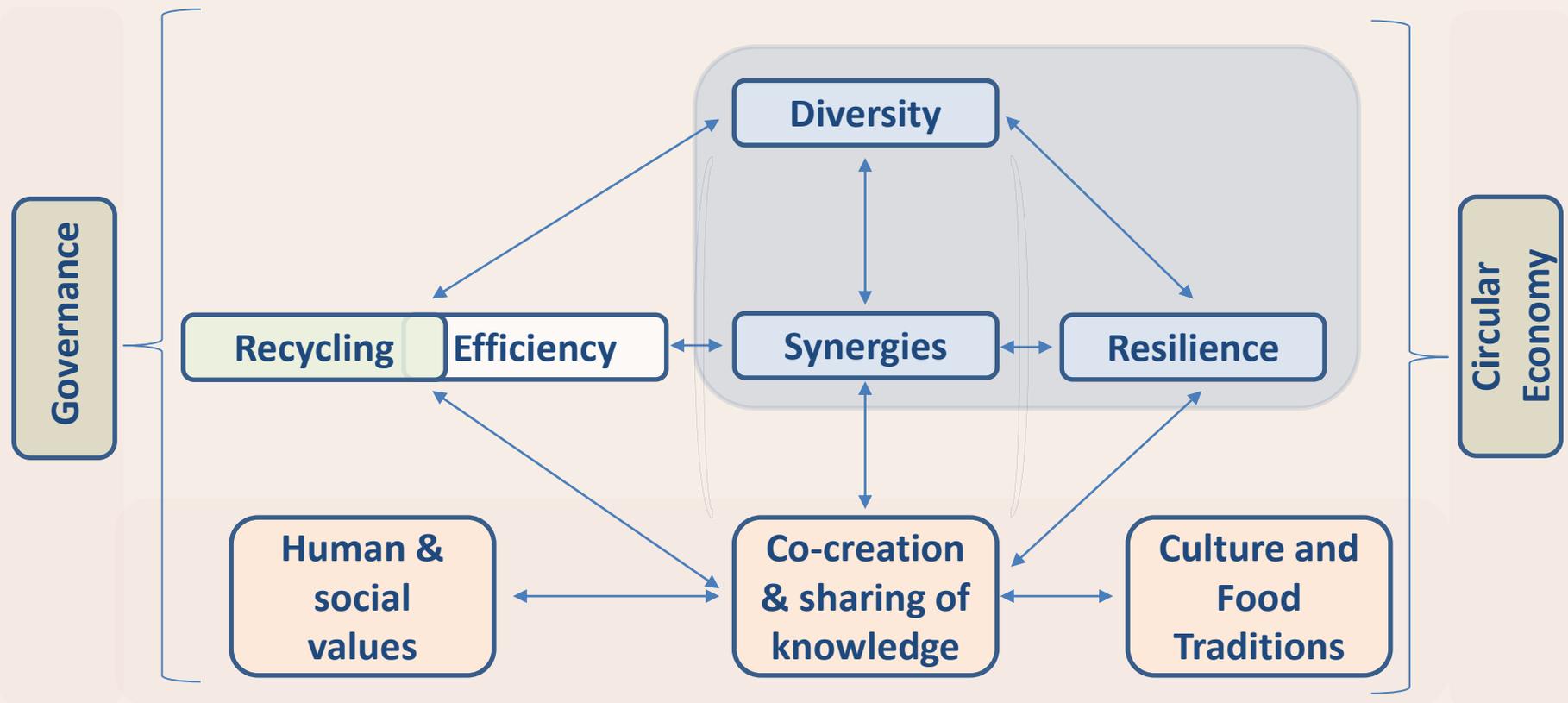
Future

Concerns

- Declining response for increasing application of inputs (Law of Diminishing Return)
- Resistance to pesticides and herbicides
- Low energy efficiency
- Increased greenhouse gas emissions
- Polluted water, soil and air
- Affected wildlife, biodiversity and human health
- Food insecurity
- Low resilience and adaptability

(Altieri, 2012)

Elements of Agroecology



(FAO, 2018)

Background

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Future

Levels of Agroecological Practices

- Level 1 Improve input use efficiencies
- Level 2 Substitute alternative practices and inputs (BNF, Cover crop)
- Level 3 Redesign whole agroecosystems (diversity, resilience)
- Level 4 Connections between growers and consumers
- Level 5 Integrated and fully developed food system

(FAO, 2018; Gliessman, 2014)

Background

Practices

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Agroecological Practices in Canada

☐ Level 1 Improve input use efficiencies

- Fertilizer / Irrigation use efficiencies
- Precision application of pesticides, nutrients
- Reduced energy usage

☐ Level 2 Substitute alternative practices and inputs (BNF, Cover crop)

- Inclusion of legumes and perennial crops
- Cover crops
- Intercropping
- No-till or reduced tillage
- Shelterbelt

(FAO, 2018)

Agroecological Practices in Canada

□ Level 3 Redesign whole agroecosystems (diversity, resilience)

- Complex crop rotations
- Diversified production for more resilient system against environmental stress
- Spatial and temporal diversification
- Agroforestry
- Integration of crop-livestock systems
- Regenerative / rotational grazing

□ Level 4 Connections between growers and consumers

- Community Support Agriculture
- Organic farming

(FAO, 2018)

Background

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Agroecology as a Science in Canada

University of British Columbia

University of Alberta

University of Manitoba

University of Saskatchewan

University of Guelph

Trent University

Fleming University

McGill University

Dalhousie University

(Dalhousie University, 2018)

Background

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Agroecology as a Science in Canada

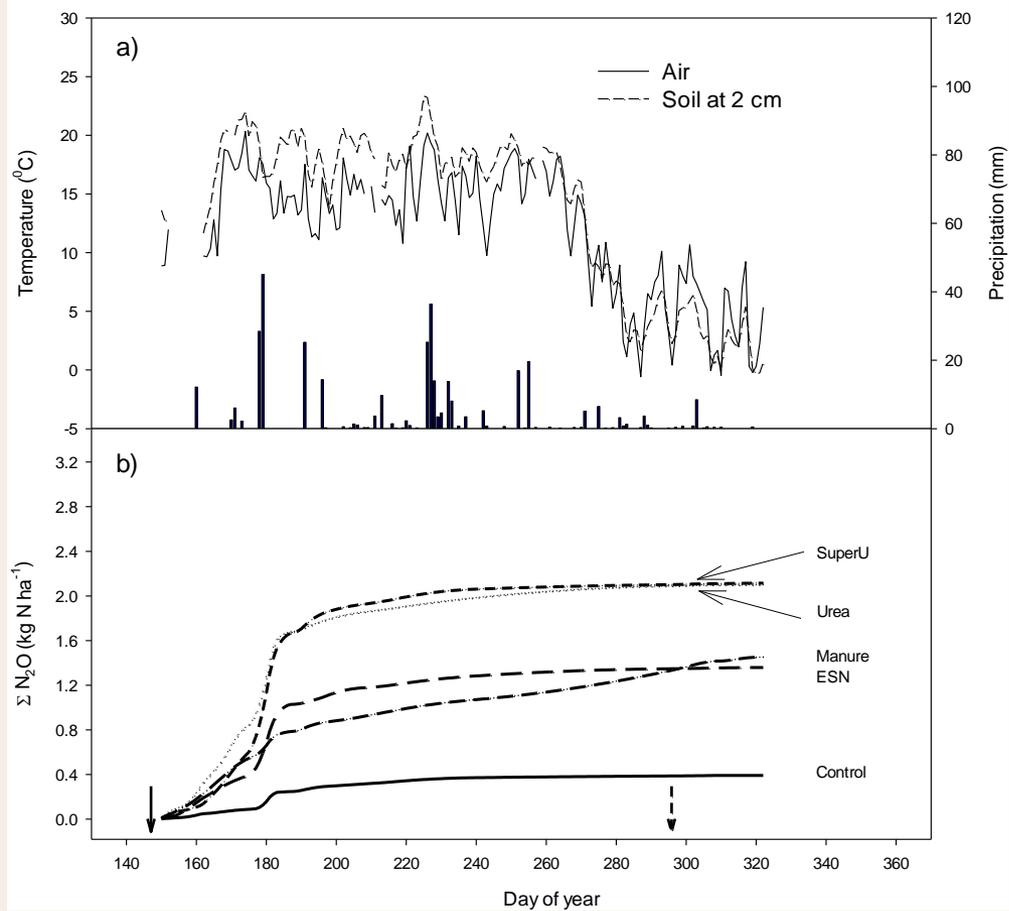
Sources



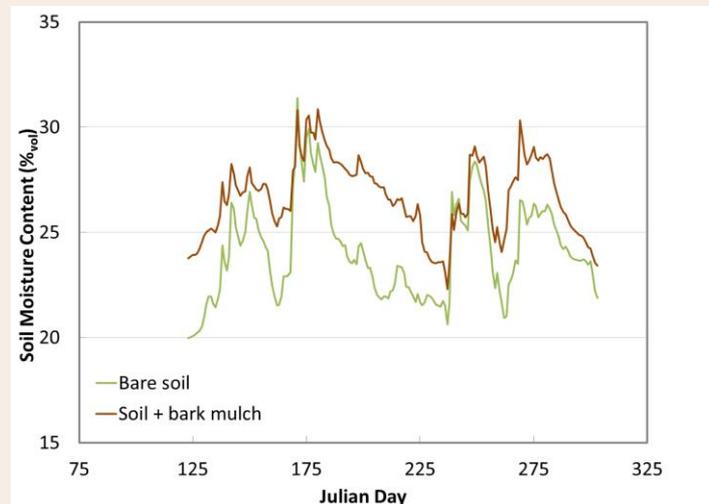
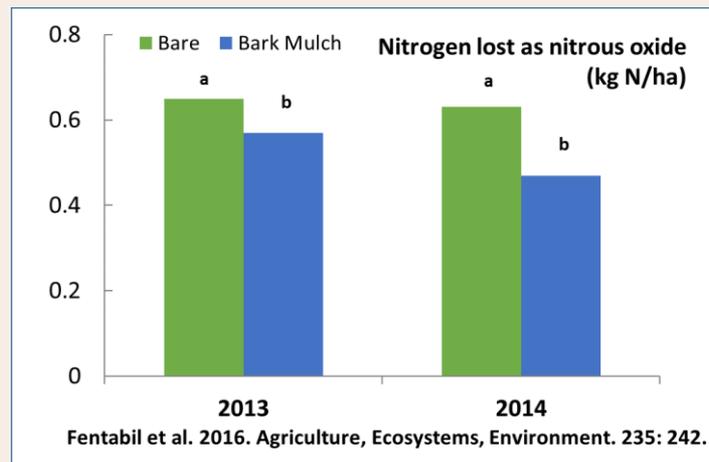
Placement methods



Asgedom H., Tenuta M., Flaten D., Gao X. and Kebreab (2014) Nitrous Oxide Emissions from Clay Soil Receiving Granular Urea Formulations and Dairy Manure. *Agron. J.* 106: 732-744.



Agroecology as a Science in Canada



Agroecology as a Science in Canada

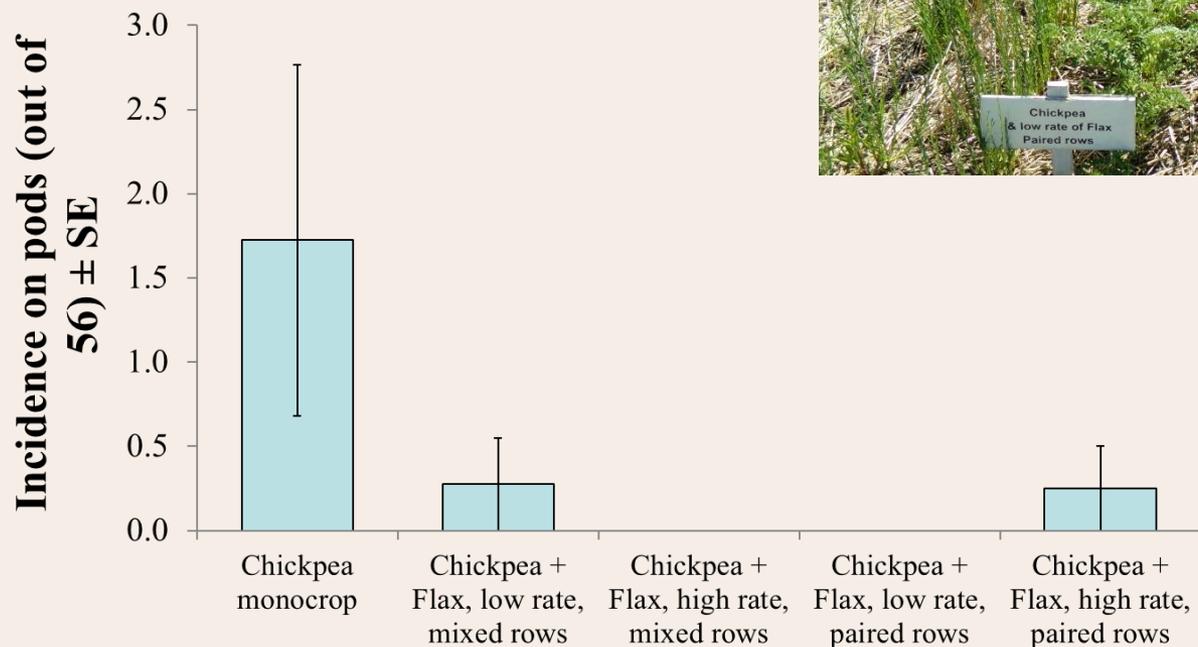
- Investigated soil health indicators in response to long-term tillage in the lower Fraser Valley, British Columbia
- No tillage for 21 years led to significantly greater:
 - Soil Active Carbon  24%
 - Wet Aggregate Stability  2 fold
 - Available Water Capacity  9%



Thomas, Hunt, Bittman, Hannam et al. 2019, Canadian Journal of Soil Science

Agroecology as a Science in Canada

Hubbard M., May W., Gan Y., and Shaw L. (2018) Chickpea/Flax to manage *Ascochyta* blight.



Agroecology as a Science in Canada

Optimizing systems productivity, resilience, and sustainability in major Canadian ecozones

- **Conventional rotation system (control)**
- **A pulse or oilseed intensified systems, with improved BMP's**
- **Multiple – commodity diversified with 'nutrient balance model'**
- **A free-style, market driven, profit maximization system**
- **High-risk, potentially high reward innovative system**
- **Green manure incorporated system**

(Gan *et al.*, 2017)

Agroecology as a practice / Movement in Canada

Food: Locally Embedded, Globally Engaged - FLEDGE

USC Canada

National or Regional Organic and CSA Networks

The Young Agrarians

Ecological Farmers of Ontario - EFAO

Just Food Farm

The Bauta Family Initiative on Canada

(USC-Canada, 2019)

Agroecology Practices / Movements in the International Arena

India – Sikkim State

Brazil – *Campesino a Campesino*

Europe – A European Association for Agroecology

Future – Agroecology in Canada

- ❖ Recognition of agroecological practices
- ❖ Research on effects of advanced agroecological practices on ecosystem processes - modeling
- ❖ More research on redesigning of agricultural systems for more resiliency
- ❖ Utilization of digital technologies to assess agroecology

THANK YOU

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Q&A

