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Science transforming food systems for a better future

Using Case Studies to Develop an Agro-ecological Management Framework for South Africa

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What is Agro-ecology?

Agro-ecology can refer to the **science or the social movement or set of farm practices**.

- Agro-ecology is the application of **ecological principles to agricultural system**s and practices, acknowledging the importance of sustainable production towards achieving national food security.
- Using ecological principles in farming systems and **along the value chain**, can suggest new management approaches to promote healthy systems, incorporating long-term protection of natural resources, promoting economic development, and climate change adaptation and mitigation.
- Managing the use of agro-ecological practices can enhance the four dimensions of **food security – availability, access, stability, and utilization.**
- Contributing to reducing rural poverty, enhancing resilience, promoting local development, and improving communities' livelihoods.
- To regain equilibrium, ***a transition*** **is needed where the interacting ecological, economic, and social factors and processes are considered** by applying ecological scientific principles to management of sustainable agro-ecosystems.

ARC-DALRRD Agro-ecology Management Framework Project

funded under ARC-DALRRD SLA project # A20/LU5/NRE-ISCW

- Research Questions:

a) What process should be followed for a smooth transition from current farming systems to a sustainable agro-ecologically friendly farming system that will benefit all stakeholders?

b) How can agro-ecological farming principles be incorporated into a strategy framework to improve resilience and sustainability of RSA agricultural sector?

- A two-pronged approach is used:

1) Assess current status of agro-ecology principles in farming systems at selected pilot sites across South Africa.

2) Analysis of current relevant legislation relating to agricultural and environmental aspects of agro-ecology (see Kau *et al.* presentation).

FAO 10 Elements of Agro-ecology

- **Diversity;**
- **Synergies;**
- **Efficiency;**
- **Resilience;**
- **Recycling;**

Human & social values;
Culture & food traditions (context features);
Responsible governance;
Circular & solidarity economy (enabling environment)

- **Co-creation & sharing of knowledge** (common characteristics of agroecological systems, foundational practices and innovation approaches)

- FAO Criteria Tool: https://www.agroecology-pool.org/methodology/

Comparison of Agroecology Principles from HLPE and FAO

Three Groups:

- Environmental sustainability
- Social values & participation
- Economic Fairness

Table 1: HLPE principles of agroecology and alignment with FAO 10 elements

Principle	FAO's ten elements
Environmental sustainability	
1. **Recycling.** Preferentially use local renewable resources and close as far as possible resource cycles of nutrients and biomass.	Recycling
2. **Input reduction.** Reduce or eliminate dependency on purchased inputs and increase self-sufficiency.	Efficiency
3. **Soil health.** Secure and enhance soil health and functioning for improved plant growth, particularly by managing organic matter and enhancing soil biological activity.	Reflected in diversity, synergies, and resilience
4. **Animal health.** Ensure animal health and welfare.	Reflected in resilience
5. **Biodiversity.** Maintain and enhance diversity of species, functional diversity and genetic resources and thereby maintain overall agroecosystem biodiversity in time and space at field, farm, and landscape scales.	Part of diversity
6. **Synergy.** Enhance positive ecological interaction, synergy, integration, and complementarity among the elements of agroecosystems (animals, crops, trees, soil, and water).	Synergies
7. **Land and natural resource governance.** Strengthen institutional arrangements to improve, including the recognition and support of family farmers, smallholders, and peasant food producers as sustainable managers of natural and genetic resources.	Responsible governance
Social justice and participation	
8. **Co-creation of knowledge.** Enhance co-creation and horizontal sharing of knowledge including local and scientific innovation, especially through farmer-to-farmer exchange.	Co-creation and sharing of knowledge
9. **Social values and diets.** Build food systems based on the culture, identity, tradition, social and gender equity of local communities that provide healthy, diversified, seasonally and culturally appropriate diets.	Parts of human and social values, culture, and food traditions
10. **Participation.** Encourage social organization and greater participation in decision-making by food producers and consumers to support decentralized governance and local adaptive management of agricultural and food systems.	Part of human and social values
Economic fairness and participation	
11. **Economic diversification.** Diversify on-farm incomes by ensuring that small-scale farmers have greater financial independence and value addition opportunities while enabling them to respond to demand from consumers.	Part of diversity, circular and solidarity economy
12. **Fairness.** Support dignified and robust livelihoods for all actors engaged in food systems, especially small-scale food producers, based on fair trade, fair employment, and fair treatment of intellectual property rights.	Part of human and social values
13. **Connectivity.** Ensure proximity and confidence between producers and consumers through promotion of fair and short distribution networks and by re-embedding food systems into local economies.	Part of circular and solidarity economy

Source: Wezel et al. 2020:7, reordered and adapted to include overarching dimensions

Methods for Pilot Case Studies

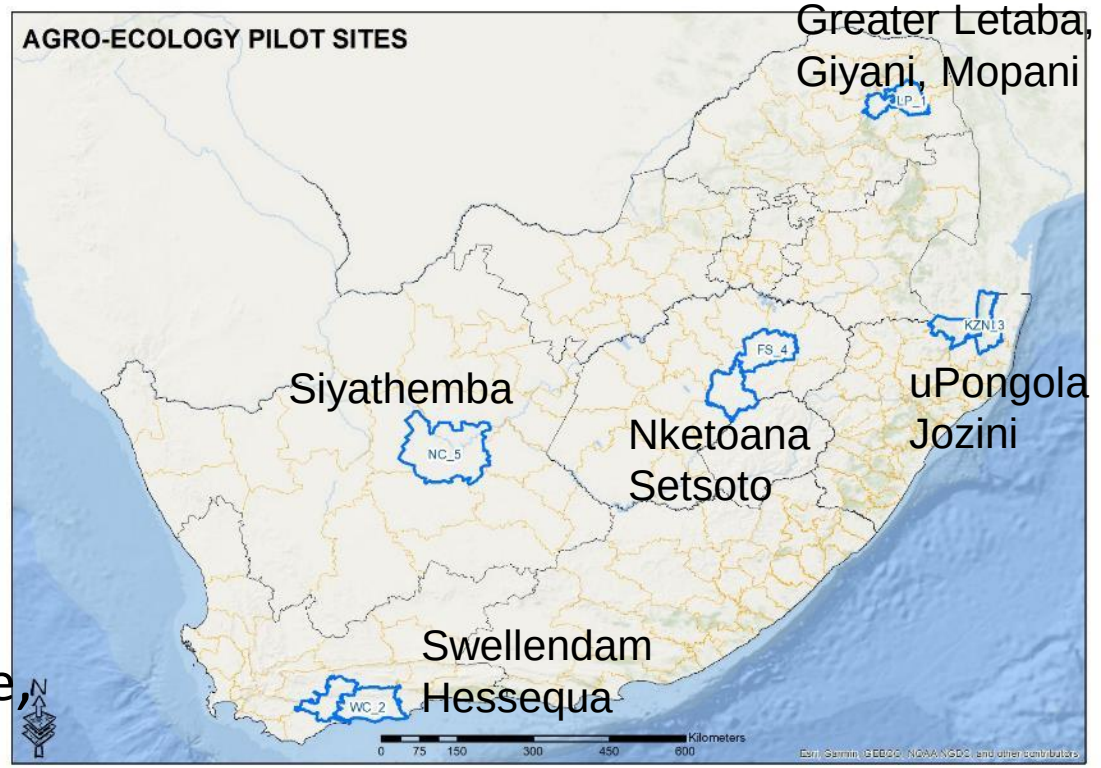
- Main purpose: to gather information from existing farmers & operational institutions
  - To evaluate status of agro-ecological farming systems
  - To use indicators to assess position along transition from traditional agriculture.
- Desktop study to collect data
  - natural resources, land capability, suitability & potential, land-use; conservation areas, biodiversity, social, economics, institutional, policy
  - different temporal & spatial scales, availability, accessibility, & compatibility of data from various sources.
- Site visits to engage stakeholders & collect information about status of agro-ecology
- Process to do selection has had many iterations:
  - Started from suggestions made in proposal & Discussed with DALRRD
  - Engagement with Stakeholder – CBO & NGOs - Review their suggestions
  - Considerations of main farming systems across South Africa
  - Consideration of natural resources across RSA
    - Köppen climate zones, Rivers, Annual Rainfall & season, Mean maximum & minimum temperatures, Generalized soil patterns
  - Discussion between ARC team & DALRRD team & Reference Group
- **To come to final selection of 5 areas in 5 different provinces**

Selected Sites

- Western Cape - Swellendam & Hessequa
  - winter rainfall, Suurbrak Overberg district
  - grains & fruits
- Limpopo - Greater Letaba, Giyani, Mopani district
  - semi-arid sub-tropical,
  - vegetables, grains, beef, collect wild plants & fruits
- KwaZulu Natal - uPhongola, Jozini, uMkhanyakude,
  - sub-tropical summer rainfall, humid
  - sugar cane, vegetables, citrus, nuts,
- Free State - Nketoana & Setsoto Local Municipalities (Lindley, Reitz, Senekal, Marquard, Clocolan)
  - semi-arid with cold winters and summer rainfall
  - grains, livestock, conservation agriculture
- Northern Cape – Siyathemba (Niekerkshoop, Prieska, Copperton, Marydale)

  Nama Karoo biome – low shrub-land

  wheat, lucerne, oats, maize, nuts, vegetables, grapes, small stock,



ARC & DALRRD teams funded under ARC-DALRRD SLA project #A20/LU5/NRE-ISCW

Multi-disciplinary & inter-disciplinary team of competent skilled persons

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- Dr Kobus Anderson: Agronomy, Water & Soils
- Ms Adri Laas: Stakeholder engagement
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  - Dr Althea Grundling, Dr Mokhele Moeletsi & Dr Michael van der Laan

DALRRD – Team

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Limpopo Pilot Site Visit - Greater Letaba, Giyani, Mopani district

Pop. #	Agric enterprise	Infra-structure	Institutions, NGOs	Commodity
1,150,722 median 23y 76% 0-39. Giy 256 300	Maize & veg Citrus & Sub-tropfruits Livestock - beef Game farming Wild collection Mopani worms & marula fruit	Road transport Letaba River + Nsami dam	PGS SAOSA, Greater Giyani LM Mopani DM	Organic millet
Climate	**Land uses or cover**	**Soils information**	**Mean Rainfall & Mean Temperatures**	**Elevation (masl)**
Dry Semi-arid Summer rainfall region, Subtropical with warm temperatures all year round	**Wild harvesting** agriculture & tourism (game farms, national parks & nature reserves) **Rural communities subsistence livelihoods** (maize, vegetables, tomatoes & rearing beef cattle), commercial: eucalyptus plantations, horticulture, & fruit	Dominant soils: deep, well-drained (with Oxisols, Lixisols, Cambisols, Luvisols) with clay content usually < 30%. Soils are red, massive, or weakly structured, with high base status.	500 mm per annum ranges **400 to 500 mm** (east side of Drakensberg) Foothills & Highveld: 600 to 1000 mm pa. Winter: 13°C Summer: 27°C	468 m On northern Klein Letaba River Ritavi river Nsami and Middle Letaba dams B82G&H

Meeting with the Water Sector in Greater Letaba Local Municipality

- Letaba Water-User Association boardroom on 22nd Nov 2023
- from Letaba Water-User Association & DWS.
- Not know much about Agroecology (as expected).
- Suggestions:
  - Revisit Ecological framework strategic plan – DFFE
  - Draft of National Water Amendment Bill (B – 2023)
  - Water allocations are per climatic zone & area (ha),
  - Water-user authorizations done via electronic applications
  - LWUA manages allocations according to water supply available

Meeting with Mopani farmers

- @ Giyani (near Gaza Beef) on 23rd November 2023
- Smallholder farmers from Farmers' Associations & Cooperatives,
- Local extension officers LDARD;
- Mopani Disaster Management Centre.

Discussions:

- Farming systems – Conservation Ag & Agro-Ecol & Organic Ag
- Noted their practices use chicken manure & min-tillage & compost
- ***Changed due to concern about soil & productivity***

Challenges due to pests & disease

- & need for chemical sprays

Farm visits in Greater Giyani Local Municipality

- Visited 2 farms to observe, assess & document key activities undertaken by farmers
- Farm #1
  - Vegetables, field crops and broilers
  - Co-op com prising 8 women
  - High chick mortality, need shade cloth
  - Lack market - no available packaging
- Farm #2
  - Specializing layer poultry farming;
  - Coop w silent members
  - Supply manure to local vegetable farmers
  - Lack market due to no branded packaging (1000+ eggs per day)

Meeting with farmers & extension practitioners in Greater Letaba

@ Ga-Kgapane community hall (Greater Letaba Local Municipality offices)

- Smallholder farmers, from Farmers' Associations & Cooperatives
- Local extension officers from Limpopo DARD
- Farmers: approx. 6/10 know about organic & 6/10 about CA
- Each farmer drew map of their farm

Challenges:

- *deteriorating irrigation systems;*
- pests & diseases;
- *unfavorable climatic conditions* (e.g., droughts & heatwaves),
- High costs of soil testing; lack of production inputs.
- Vegetables to market or retailers

Summary from Limpopo Site Visit

- **Key challenges**

  - Unsustainable harvesting of Mopani worms and wild fruits that are prominent in the area,
  - Birds intensifications on farms due to deforestation and burning of forest and bushes,
  - Water scarcity, deteriorating irrigation systems due to excessive heat,
  - Load-shedding negatively impacting to the poultry producers.
  - Low productivity due to unfavorable climatic conditions (e.g., droughts, floods and heatwaves)

- **Some of the practices used by farmers to farm with nature**

  - Use of chicken manure mixed with grass as their fertilizer,
  - They spray aloe and chilies mixtures to control pests
  - They crush the problematic insects, soak them in water and spray their crops as pest repellents
  - They soak some sacks of kraal manure into water and spray the effluent on their tomato fields to improve soil fertility and yields.

- **Planting Calendar and market**

  - Farmers indicated that due to changing climatic conditions (e.g., delays in rainfall onset),
  - Typical seasonal calendar changed for their various farm activities.

Farmers Perception: Comparison of Types of Farming Systems

Farm System	Fertilizer	Crops & Seeds	Land Preparation	Irrigation	Marketing
Organic	Livestock manure & organic allowed compounds	No GMOs	Conventional & minimal tillage	Vegetables; Rain-fed field crops	Local market
Regenerative Agriculture	Livestock manure & Top dress LAN	Not specified	Conventional & minimal tillage	Vegetables; Rain-fed orchards	Local market
Agro-ecology	Livestock manure & grass compost	Diverse range crops	*No-till or minimal tillage* & Conventional	Vegetables; Rain-fed field crops	Local market

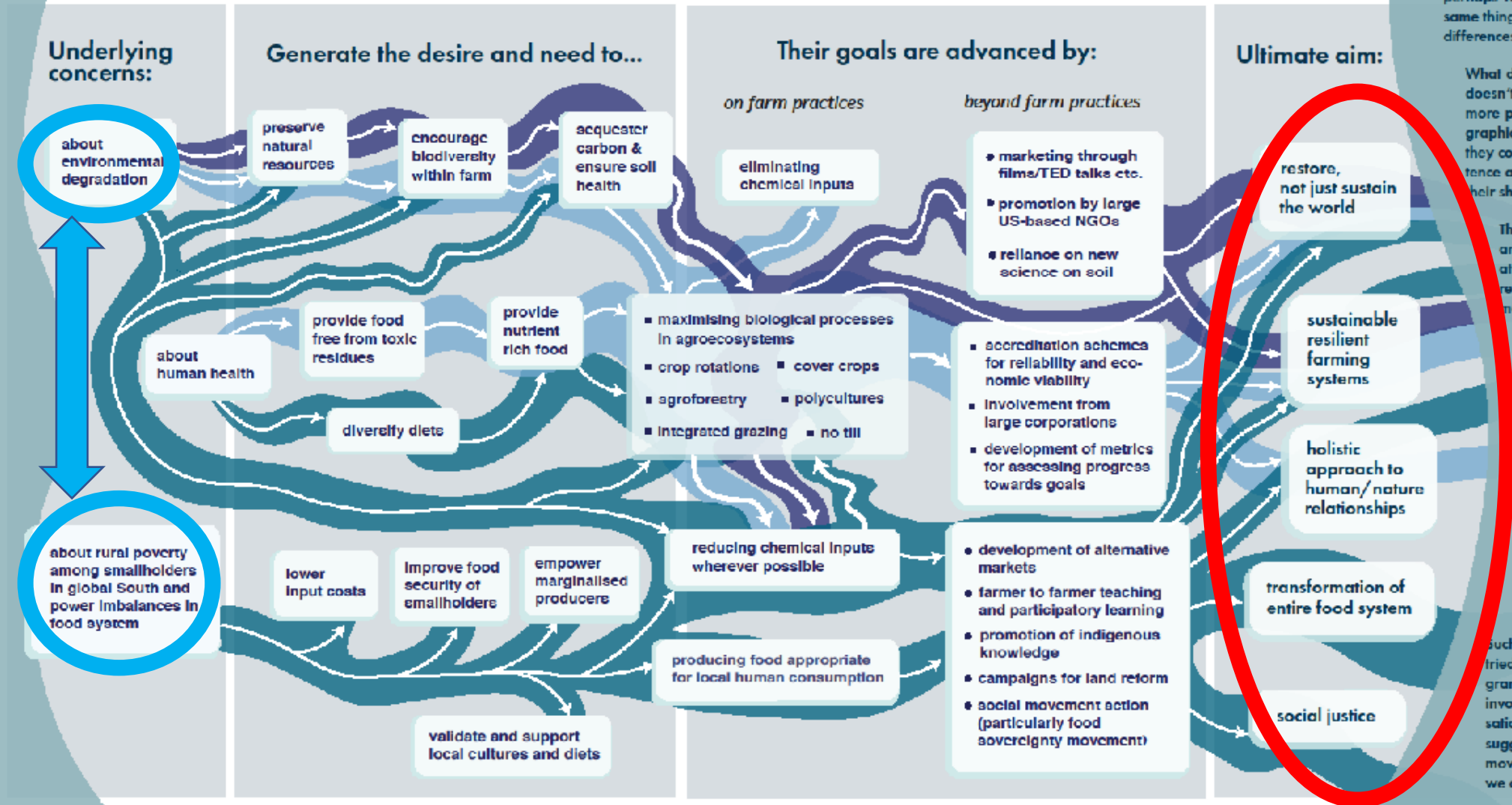
Way Forward

- Identify critical factors @ all sites
  - to gain insights about application of agro-ecological principles on-farm within various agro-ecosystems.
  - Constraints experienced by farmers, &
  - Impact on natural resources base.
- Inform the development of an Agro-ecological Management Framework for South Africa.
- Focus on major agro-ecological systems across South Africa to guide the development of a strategy for implementation.
- **Agro-ecology encompasses most of organic, regenerative and conservation agricultural principles**

Exploring the ebbs and flows of different agricultural movements

What distinguishes regenerative, organic, and agroecology?

Regenerative Organic Agroecology



Join the conversation

The regenerative, organic and agroecology movements share many concerns, and offer seemingly similar solutions. We, at TABLE, therefore began to ask ourselves if they are perhaps repeated attempts to articulate the same things, or whether there are substantive differences.

What does one movement offer, that another doesn't? And what makes one movement more prominent than another in certain geographical, economic or historical contexts? Do they compete for space, or does their co-existence allow them to collaborate and advance their shared goals on a larger scale?

This diagram emerged from such questions and conversations, and represents an initial attempt to understand how agroecology, regenerative agriculture and the organic movement relate to each other.

In producing this diagram we tried to articulate what distinguishes each movement. This, of course, risks making them seem more different or more in conflict than they really are.

Have we made too much of the organic movement's reliance on accreditation schemes? Have we overlooked the justice aspects of the regenerative movement? Have we overemphasised the agroecology movement's concern about rural poverty? Have we underplayed the radical/ reformist dynamics that exist within all three approaches, and the extent to which these overlap across the different movements?

Such problems will be familiar to anyone who has tried to distil complex issues into a simple diagram. We recognise that this work will inevitably involve omissions, simplifications or mis-categorisations. Therefore, we welcome contributions and suggestions from people identifying with these movements and/or working on these topics, as we continue to reflect on these issues.