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**Shweta Singh**

Assistant Professor, School of  
Agriculture, RNB Global and  
University, Bikaner, Rajasthan,  
India

**Raveena**

Assistant Professor, School of  
Agriculture, RNB Global and  
University, Bikaner, Rajasthan,  
India

**Sarita**

Assistant Professor, School of  
Agriculture, RNB Global and  
University, Bikaner, Rajasthan,  
India

## Agroecology and supportability of agriculture: A review

**Shweta Singh, Raveena and Sarita**

### Abstract

Agroecology is the process to improve and long-term manage soil fertility and agricultural productivity. It provides a strategy to increase the diversification of agricultural ecosystems. So, it benefits from the effects of incorporating plant and animal biodiversity, recycling nutrients. All of these elements form the foundation of sustainable agriculture and aim to improve food systems and social sustainability. It supports the production of both large quantities and diversity of good quality foods, foods and medicinal plants, as well as for household and market use by economically at-risk populations and nutrition. Sustainable agricultural practices must address biodiversity conservation, ecological functioning, social tolerance, self-reliance, equity, and improved quality of life and economic productivity of crops and pets. The purpose of this review is to provide an overview to identify the ideal condition for the best agricultural practices as well as the impacts and future prospects of agroecology for supportability agriculture.

**Keywords:** Agroecology, sustainability, agriculture, productivity

### Introduction

Agroecology is a green revolution, starting in the 1950s, until the current era of innovation based on digital devices, global agriculture is characterized by technology transfer from above typical down. In this pervasive model, technology is developed in the controlled environment of universities and research stations, transferred to agricultural advisors and then to farmers, consumers and regulators use it (Chambers 1997; Oliver 2016) <sup>[5, 15]</sup>. Technology is seen as a commodity delivered to farmers, who have little control over its development and management (Cuéllar-Padilla M. and Calle-Collado A. 2011) <sup>[7]</sup>. Homogenized, standardized and mass-produced to operate most, not only physical technologies, such as seeds, pesticides and machines, but also their processes and sequences, with the aim of making farmer activities regular, thereby promoting predictable and manageable change in rural areas (Padel, 2001) <sup>[16]</sup>.

The term "agroecology" was first introduced in two scientific publications by Bensing (Tilman *et al.*, 2011) <sup>[20]</sup> and more recently by (Gliessman, 2007; Bensing, 1928) <sup>[12]</sup> and (Bensing, 1930) <sup>[3]</sup>. It is the science that uses ecological theory to study, design, manage and evaluate sustainable, productive and resource-efficient agricultural systems. Based on the natural social sciences, agroecology provides a framework for assessing the four key factors (Gliessman, 2007) <sup>[12]</sup> and their importance thus being recognized by agricultural and government research agencies.

Agro-ecology gives a system for evaluating four key frameworks properties of agribusiness: efficiency, flexibility, maintainability and value. The approach of agro-ecology that includes the progressed utilize of the most recent plant and soil science, as moreover the social science makes a difference in creating to "vigorous, profitable and reasonable" nourishment frameworks, pointed towards naturally wealthy, biologically and ecologically sound, and locally delicate rural hones. Development specialists claim that the approach of agro-ecology is both, a science that "studies agrarian frameworks from a biological and socio-economic view" and a development, like natural cultivating (Warner, 2007) <sup>[21]</sup>. In hone, agro-ecology can be borrowed from perm culture (Clapp and Cohen 2009) <sup>[9]</sup> to make closed frameworks, or possess rediscovering onwards strategies that mirror or work with, instead of look for to overwhelm and overcome, environment.

### Agroecology is characterized as

- A logical investigate approach including the all-encompassing think about of agroeco-

**Corresponding Author:**

**Shweta Singh**

Assistant Professor, School of  
Agriculture, RNB Global and  
University, Bikaner, Rajasthan,  
India

system and nourishment framework.

- A set of central and hones that enter upgrades the versatility and maintainability of nourishment and cultivating framework whereas protecting social judgment.
- A socio- political development which centre on the down to earth application of agroecology looks for other ways of considering farming, handling, conveyance and utilization of nourishment and its connections with society and nature.

It is an emerging ecological concept and principle for the design and management of agricultural functions and provides a methodological framework for properly performing this task. As a science, ecological agronomy identifies, classifies, and studies agricultural systems from an ecosystem perspective, acknowledging the close relationship these systems have with the economic and social environment around. Reduced productivity can be compensated or restored using agroecological methods that contribute to productivity improvement. Through the application of basic agro-ecological farming, farmers in the states of Bihar, Uttar Pradesh and Karnataka have achieved world records for rice and potato production (Altieri, 1987) <sup>[1]</sup>. About 500 million smallholder farmers support agro-ecological farming systems worldwide. It can improve the food system, bring income to farmers and healthy food for consumers, while mitigating climate change. The need for sustainable agriculture to meet growing food needs has been recognized by India and several other developing countries.

Agroecology “as a science”, “as a set of practices” and “as a movement”. As a result, the scope of agro-ecological research has extended from the land and fields to food systems and diets, the latter closely linked to the food sovereignty movements (Wezel and Jauneau 2011) <sup>[23]</sup>.

#### Its build on the following characteristics

- Agroecology encourages principles rather than rules or formulas for transition.
- It is the result of the common application of their basic principles and values to the design of an alternative food and agriculture system.
- This principle applies everywhere and leads to the use of different methods of practice in different contexts in different places.
- All principles should be explained in the context of increased integration with the natural world as well as justice and dignity towards humans, non-human beings and processes.

#### Agroecology: Agriculture Prospects

Agroecology is the application of ecological concepts and principles in agriculture. It promotes farming methods:

- Mitigate climate change by reducing emissions, recycling resources and prioritizing local supply chains.
- Working with wildlife – managing the impact of agriculture on wildlife and harnessing nature to do the hard work for us, such as pollinating crops and controlling pests.
- Put farmers and communities in control – they empower people-led approaches and adapt farming techniques to local areas – and economic conditions, specific environment and society of that area.

#### Agroecology: Agrobiodiversity outlook

Globally, the erosion of agricultural biodiversity is the main subject of debate, as it is the main.

#### Consequence

- Unsustainable use of resources.
- The deterioration of management practices.
- Monoculture of very versatile varieties.
- Market forces.

#### Principal of Agroecology

A few distinctive sets of agroecological standards can be found within the logical writing – Altieri and Nicolls (2005) <sup>[2]</sup>, Dumont *et al.*, (2013) <sup>[10]</sup>, Nicholls *et al.*, (2016) <sup>[14]</sup> – summarized in Migliorini and Wezel *et al.*, (2018) <sup>[22]</sup> and more as of late CIDSE (2018) <sup>[6]</sup>, FAO (2018d) <sup>[11]</sup> and INKOTA (2019) <sup>[13]</sup>.

Nowadays, it is related with a set of standards for the administration of horticulture and the environment of agro-food frameworks as well as broader political, social, and financial standards. These mentioned standards have only as of late showed up within the writing, stemming from the work of social developments that utilize agroecology as the centre establishment of their work.

A few of these standards bargain more particularly with the advancement of environmental forms and administrations, counting viewpoints of arrive, water, discuss and biodiversity (Nicholls *et al.*, 2016) <sup>[14]</sup>.

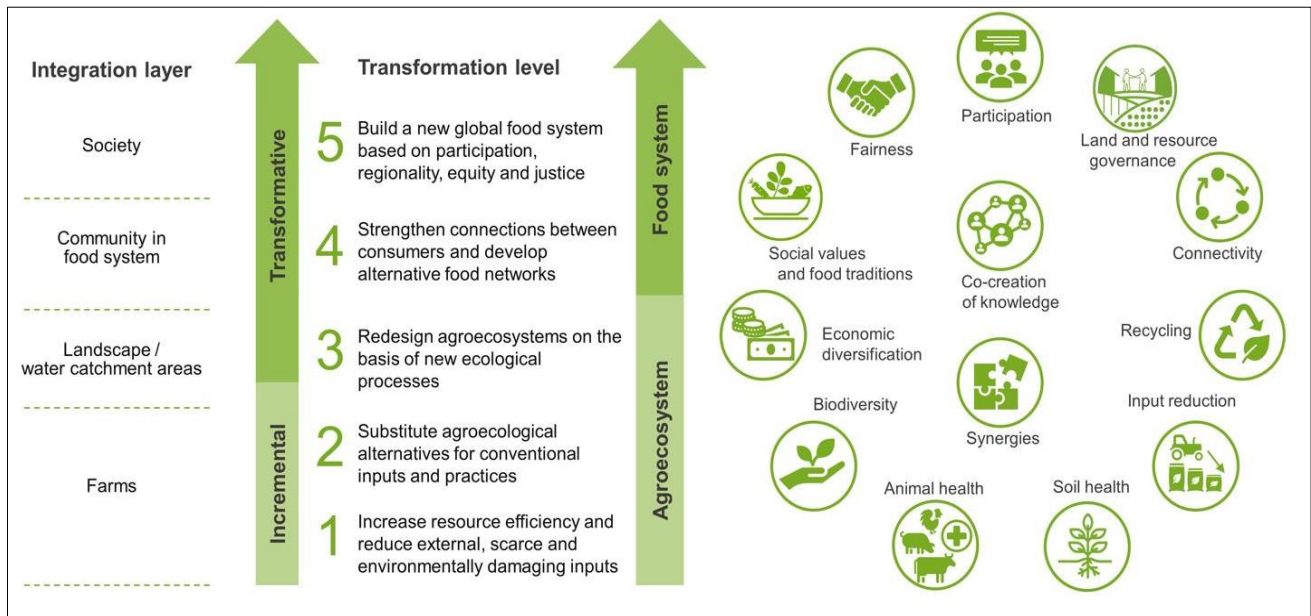
#### These incorporate the taking after

(i) biomass reusing; (ii) improving biodiversity capacities; (iii) give positive soil conditions for plant development; (iv) minimize misfortunes; (v) broadening of species and hereditary assets in agro-ecosystems; and (vi) improve useful natural intelligent and synergies. The standards of Nicholls *et al.*, (2016) <sup>[14]</sup> construct on five standards created by Reijntjes *et al.*, (1992) on maintainable farming and moo outside input. CIDSE (2018) <sup>[6]</sup> too has moreover collaborated with different gracious society organizations to create a set of standards on agroecology.

#### They bunch diverse standards into four categories

natural, socio-cultural, financial and political. A few of these standards address the necessities and dreams of numerous respectful society organizations and their endeavours in supporting smallholder ranchers and family cultivating and maintainable employments within the locale. Southern nations with reasonable showcase and generation conditions. So also, the INKOTA (2019) <sup>[13]</sup> has recognized 10 peer variables to best abuse the potential of agroecology, highlighting components related to human rights, cooperation, business control and a voice in decision-making.

On this premise, a set of synthesizing standards has been created through a three-step iterative prepare that incorporates their choice (from the writing), their express introduction (in understanding with a characterized concept) definition of what constitutes a principle and their combination (to attain the littlest set of non-repeating standards, capturing what is unequivocally expressed within the archive). FAO (2018d) <sup>[11]</sup> to begin with portrayed the 10 components of agroecology as differing qualities, information co-creation, synergies, effectiveness, reusing, flexibility, human esteem and society, social conventions and nourishment, mindful administration and the circular economy and solidarity (for more data). For more subtle elements, see Barrios *et al.*, (2020) <sup>[4]</sup>.



**Fig 1:** Transition levels towards maintainable nourishment frameworks and related solidified standards of agroecology.

**Table 1:** Consolidated set of 13 agroecological principles, their scale of application and correspondence to FAO elements of agroecology

Principle	Correspondence to FAO elements
It is agricultural production will ensure reduced economic and environmental costs. This way products can be reused with minimal impact on the environment.	Recycling
It practices promote he utilize of inventive thoughts that can be actualized within the agriculture sector.	Efficiency
Secure and improve soil wellbeing and working for progressed plant development, especially by overseeing natural matter and improving soil natural action	Synergies and resilience
Guarantee animal wellbeing and welfare.	Reflected in resilience
Maintain and upgrade differing qualities of species, useful differing qualities and hereditary assets and subsequently keep up in general agroecosystem biodiversity in time and space at field, cultivate and scene scales.	Part of diversity
Improve positive biological interaction, collaboration, integration and complementarity among the components of agroecosystems (creatures, crops, trees, soil and water).	Synergies
Differentiate on-farm livelihoods by guaranteeing that small-scale ranchers have more prominent budgetary autonomy and esteem expansion openings whereas empowering them to reply to request from buyers.	Parts of diversity as well as circular and solidarity economy
Upgrade co-creation and flat sharing of information counting nearby and logical development, particularly through farmer-to-farmer trade.	Co-creation and sharing of knowledge
Construct nourishment frameworks based on the culture, character, convention, social and sexual orientation value of nearby communities that give solid, differentiated, regularly and socially fitting diets	Human and social values Culture and food traditions
Support dignified and vigorous employments for all performing artists locked in in nourishment frameworks, particularly small-scale nourishment makers, based on reasonable exchange, reasonable work and reasonable treatment of mental property rights.	Part of human and social values
Guarantee nearness and certainty between makers and buyers through advancement of reasonable and brief conveyance systems and by re-embedding nourishment frameworks into nearby economies.	Part of circular and solidarity economy
Reinforce organization courses of action to move forward, counting the acknowledgment and bolster of family agriculturists, smallholders and labour nourishment makers as feasible directors of normal and hereditary assets.	Responsible governance
Energize social association and more prominent support in decision-making by nourishment makers and buyers to back decentralized administration and nearby versatile administration of agrarian and nourishment frameworks.	Part of human and social values

**Agroecology principal for the conversion**

Agroecology uses well-established ecological principles to design and manage diverse agro-ecosystems in which external inputs are replaced by natural processes such as Natural soil fertility, allelopathy and biological control.

It does not promote technical formulations but rather the above principles, which, when applied in a particular area, will have different forms of technology depending on the prevailing socio-economic and physiological circumstances of farmers. Each practice is linked to one or more principles, thus contributing to its expression in the functioning of agro-ecosystems. The practices adopted will promote ecological

interactions that determine the key operational processes of agro-ecosystems (nutrient cycling, pest regulation, yield, etc.) One of the major challenges of transformative alter in agribusiness is the trouble in planning separated pathways to convert agrarian and nourishment frameworks that meet nearby and national desires (Caron *et al.*, 2018) [8]. In expansion to the five levels portrayed over, FAO's agro-ecological system recognizes 10 components as potential beginning focuses for transformative alter towards feasible nourishment and farming frameworks, as well as their part in feasible agribusiness, supporting part of visual narrating and affiliation investigation (Barrios *et al.*, 2020) [4].

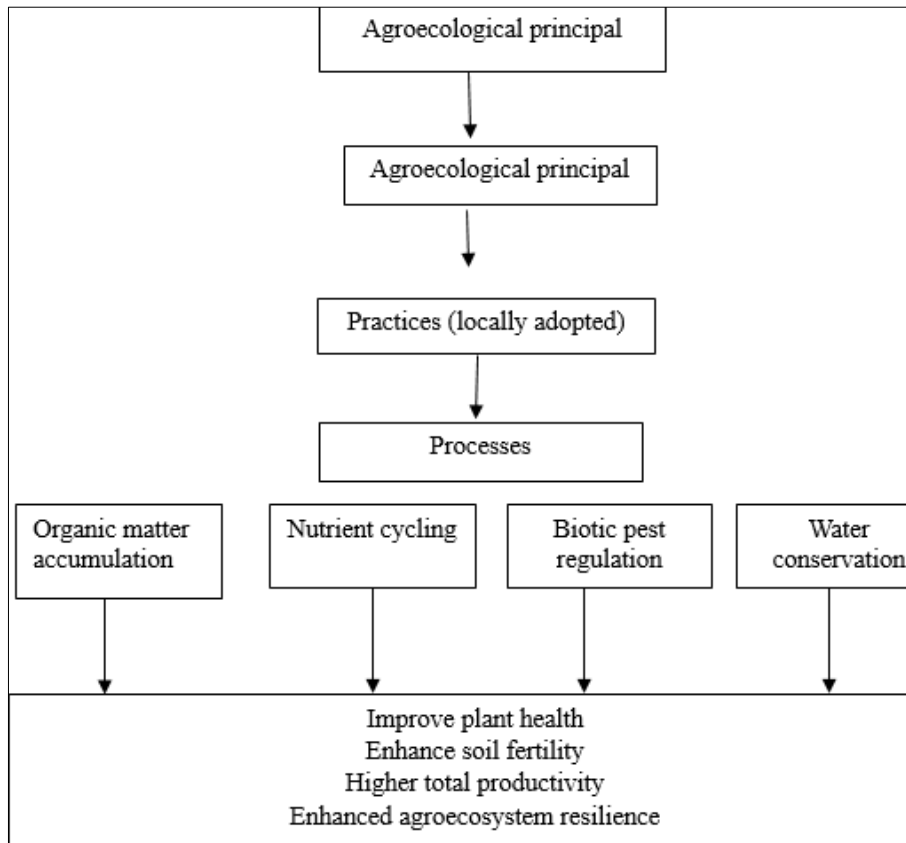


Fig 2: Agroecology principal for the conversion of farming systems.

**Four fundamental entry points are distinguished within the figure clockwise and brief stories are utilized to depict coherent moves. To begin with, the Differing qualities section point**

Enhancement is required to address the challenges of climate alter as well as sustenance, as changes in rural utilize and administration of plant and creature differences can have a critical effect on the versatility of rural frameworks to climate alter. Moment, the circular economy and solidarity: Changing nourishment utilization designs can have an enormous effect on markets of distinctive sizes. The developing customer request for more different, nutritious and secure nourishment will back cleaner generation, shorter esteem chains, differentiated markets and green occupations. Third, the beginning point for co-creation and information sharing: The advancement of instructive programs at all levels to

bolster the agro-ecological move is principal to raising mindfulness and empowering progressed joins between information and activity. It includes creating all-encompassing or frameworks considering aptitudes to handle the expanding complexity of an interconnected world where industry or sectoral approaches have been less fruitful. Fourth, the passage points for capable administration: Straightforward, responsible and comprehensive administration instruments are required to form an enabling environment for makers to convert their frameworks around agro-ecological concepts, standards and hones. By advancing a showcase framework that bolsters little and medium-sized nourishment businesses, capable administration moreover bolsters neighbourhood and territorial nourishment frameworks.

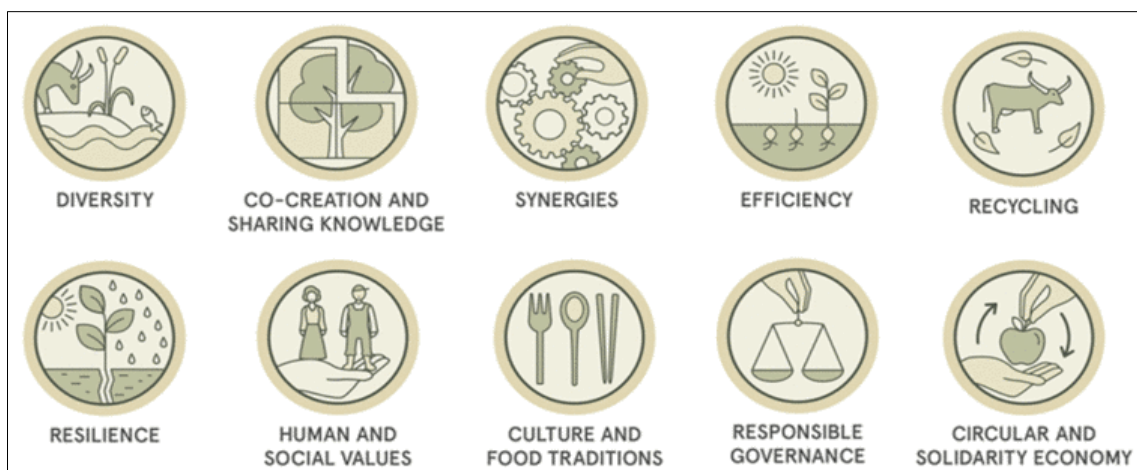
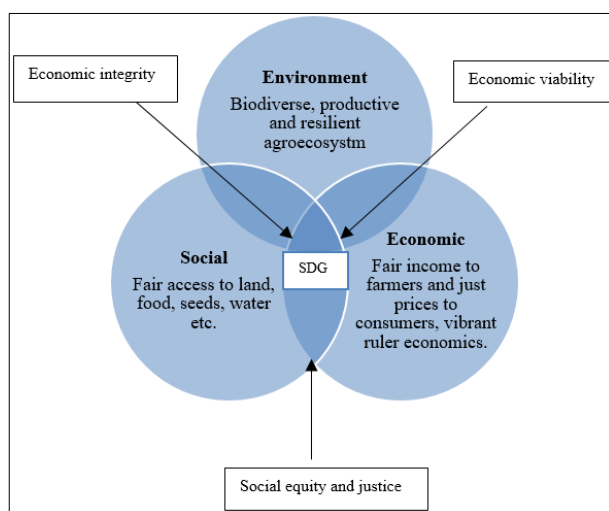


Fig 3: Four key passage focuses in FAO's 10 components of agroecology system to construct transformative alter pathways towards maintainable nourishment and rural frameworks (FAO 2018d) <sup>[11]</sup>

## Agroecology and its contribution to the sustainable development goals

Agroecology is connected to all the SDGs (Millennium Founded, 2018) and can contribute straightforwardly and in a roundabout way to the headway of each by giving specialized and social methodologies to reshape the world's nourishment frameworks. Logical prove has appeared that agroecology can increment trim yields and creature generation and hence add up to cultivate yield, increment the soundness of generation through enhancement, improve the versatility of ranches to climate alter, progress diets and salary, preserve biodiversity and the common asset base, and decrease agriculturist reliance on outside inputs, all of which are fundamental fixings for making strides the vocations of smallholder agriculturists (Rosset and Altieri, 2017) <sup>[18]</sup>. The agroecological transdisciplinary approach is well prepared for such a systemic approach, because it coordinating points of view from biology, agrarian sciences, nourishment, open wellbeing and political financial matters (Méndez, Bacon & Cohen, 2013) <sup>[19]</sup>.



**Fig 4:** The role of agroecology in supporting the multiple dimensions of the sustainable development goals (SDG)

## Conclusion

Agroecological standards have advanced in later a long time to incorporate the social and social viewpoints of the total nourishment framework, in expansion to those related to agrarian hones at the areas, ranches and scenes. These standards are important both for changing agrarian and nourishment frameworks to realize worldwide nourishment and nourishment security and for upgrading the versatility of horticulture in adjusting to climate alter. Another address is the suggestions of expanding the number of these agroecological standards in future investigate.

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