Fact Sheet: Agroecology

and why we say YES!

biodiversity | food sovereignty | agroecology | social justice

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What is agroecology?

Agroecology is a holistic science as well as a bottom-up approach to practising and organising agriculture to create just, ecologically sustainable and viable food systems.

Agroecology is based on co-operation – from fostering functional diversity in agro-ecosystems, to building relationships of solidarity between producer collectives, producers and consumers, and between movements resisting the corporate control of food.

Agroecology promotes food sovereignty, which is the right of peoples to access and control the resources they need (including land, water, seeds, biodiversity, markets and technical support), to be able to make their own choices about the kind of food they eat, produce and buy.

Agroecological practices build healthy soils, conserve water and foster and protect diversity. International experts convened by the UN including the Special Rapporteur on the Right to Food have endorsed agroecology as a win-win opportunity to mitigate the impact agriculture has on climate change and help farmers adapt to climate change.

The positive benefits of agroecology are agriculture and rural development that:

- **mitigates climate change by increasing carbon in soils, conserving ecosystems, and avoiding fossil fuel use;**
- **builds food sovereignty and self-sustaining and independent farmers and communities;**
- **contributes to healthier livelihoods and better relationships between food producers and consumers;**
- **maintains and enhances natural ecosystems and resources;**
- **provides varied, nutritious, safe, affordable, and accessible food to communities;**
- **helps to conserve traditional knowledge, culture and seed;**
- **builds resistance to corporate control of land and the food system.**

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Developing and evolving definitions of agroecology

The meaning of agroecology has developed and changed over time. First used in 1928, the term emerged in scientific research linking the biological sciences with agronomy. The concept of "agro-ecosystems" – a domesticated ecosystem for the purpose of food production – was introduced in the 1970s and integrated into agroecology by the 1980s.[1] Agroecology was thus defined as "the science of applying an ecological conceptual framework and principles to the study, design and management of sustainable agro-ecosystems".[2]

A much broader understanding of agroecology has since developed that looks beyond specific agro-ecosystems to the food system as a whole. From this perspective agroecology is not only a science, but also the practice of sustainable agriculture, building on local indigenous knowledge and traditional farming practices; as well as a political agenda that advocates for a more sustainable approach to agriculture and its relationship with society based on the ecological, economic and social dimensions of food system change.[3]

This approach is strongly grounded in the social movements of Latin America and the global South, emerging from a critical appraisal of the impacts of the "modernisation" of agriculture and multinational capturing of the food system to the exclusion and detriment of local peoples, and the destruction of their environments.

Agroecology is promoted to foster sustainable agriculture but also rural development that strengthens the autonomy, economies and cultures of local peoples and traditional farmers.[4] It is this broad approach – including the science, practice and political dimensions – that resonates with Biowatch. The political dimensions of the agroecological movement are essential if we hope to transform the inequities in the global food system. As Eric Holt Gimenez[5] wryly notes: on their own, "technical solutions invite us to ignore the growing financial speculation and monopolization of food, turn a blind eye to massive land grabbing, and pretend free trade agreements benefit the poor".

Biowatch is among the organisations and international social movements that see agroecology as a means to realise the goal of food sovereignty. In 2007 civil society and social movement organisations representing millions of farmers met in Nyéléni in Mali to launch an international movement for food sovereignty.[7] This movement views agroecology as the embodiment of diverse peasant and indigenous production systems, developed over millennia. It argues that "agroecology is the only model capable of feeding the peoples of the world, but only through its protagonists – peasant farmers and indigenous peoples".[8] By valuing traditional farmers in this way their land, resources and knowledge are sustained, which in turn maintains the diversity of practices that ensure sustainability by being adapted to local social and natural environments.

Within the context of food sovereignty, agroecology is also seen as an alternative model for agriculture and rural development that "returns the social role of food – in contrast to the capitalist system which reduces food to a commodity".[9]

In February 2015 the food sovereignty movement again met in Nyéléni to focus on agroecology. At this international forum agroecology was framed as "a key form of resistance to an economic system that puts profit before life," and a way to "transform and repair our material reality in a food system and rural world that has been devastated by industrial food production".

The forum spoke out strongly against the appropriation of agroecology by international institutions and corporations to promote false versions of agroecology – such as Climate-Smart Agriculture – that reduce it to a narrow set of technologies that tweak industrial production without fundamentally challenging existing structures of power. Rather, agroecology is the "essential alternative" to the industrial model that enables small-holders to defend their dignity, "transforming how we produce and consume food into something better for humanity and our Mother Earth."[10]

What is food sovereignty?

Food sovereignty is the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems. It puts those who produce, distribute and consume food at the heart of food systems and policies rather than the demands of markets and corporations. It defends the interests and inclusion of the next generation.

Food sovereignty offers a strategy to resist and dismantle the current corporate trade and food regime, and directions for food, farming, pastoral and fisheries systems determined by local producers.

Food sovereignty prioritises local and national economies and markets and empowers peasant and family farmer-driven agriculture, artisanal fishing, pastoralist-led grazing, and food production, distribution and consumption based on environmental, social and economic sustainability.

Excerpt from the Declaration of Nyéléni, made in Mali in 2007 by 500 representatives from 80 countries.[6]

"Agroecology for food sovereignty!"

Principles of agroecology

There is no one "recipe" of techniques for implementing agroecology because each area is unique and has its own climate, ecology, geology, culture, social dynamics and resources. Instead, agroecology is characterised by principles which guide practice, resulting in diverse expressions of agroecology around the world.

Ecological principles of agroecology

Five core principles are associated with agroecology as the applied science of making agriculture more sustainable. [11] These can be summarised as:

1. **Balance and optimise nutrient flows within the system by enhancing the recycling of biomass.**
2. **Secure favourable soil conditions for plant growth by managing soil organic matter and raising the activity of soil organisms.**
3. **Minimise resource losses that arise from the flow of energy, water or air by designing relatively closed systems.**
4. **Promote the functional biodiversity** (increase of species that work together to make the system more healthy and productive) **of the system – at the level of the farm and in the landscape – within and between species, above and below ground, and in time and space.**
5. **Enhance the beneficial biological interactions and synergisms between system components that can provide key ecological processes and services within the system.**

In practice this means that the agro-ecosystem will be comprised of complex "polycultures" that mix crops, trees and other beneficial plants and animals; use successions of plants and crop rotations that increase diversity between seasons and over the years; and use cover crops and create micro-climates within the system to optimise soil fertility and increase synergies.[12]

Social principles of agroecology

In addition to the core ecological principles of agroecology, Biowatch supports several additional social and political principles that are emerging, especially through social movements, in support of the goal of food sovereignty and the values of indigenous communities.[13] These can be summarised as:[14]

6. **Recognise and dynamically conserve agricultural heritage systems.**
7. **Build on traditional knowledge and farming practice.**
8. **Improve practices that don't work through the application of science and research, based on participatory, farmer-led research agendas.**
9. **Recognise the critical role of women and youth and support their active and equal participation.**
10. **Ensure sovereignty over resources (including seeds, biodiversity, land and territories, waters, knowledge, culture and the commons) within customary systems for ensuring collective rights and the fair resolution of disputes.** The rights of communities to maintain their own spiritual and material relationships to their territories and commonages is emphasised. In South Africa, access to land and water resources remains a key underlying objective to advocate for agroecology within the food sovereignty movement.[15]
11. **Self-organise collectives and create solidarity between groups.**
12. **Localise markets to connect the producers and consumers of foods, based on shared ethics, risks and benefits.**
13. **Maintain and enhance the natural resource base for coming generations**
14. **Recognise the spiritual connection between nature, the cosmos and human beings, and rejects the commodification of life.**

PHOTO: MAX BASTARD

"Agroecology builds on local indigenous knowledge and traditional farming practices."

Agroecology for justice, sustainability and food sovereignty

Biowatch advocates for agroecology as a multi-faceted alternative to industrial agriculture, with the most potential to benefit the farmers with whom Biowatch works in northern KwaZulu-Natal, South Africa.

Agroecology has a completely different logic to the profit motive of industrial agriculture. The practices that result from the application of agroecological principles are synergistic and intrinsically avoid or mitigate many of the problems created by the industrial food system, while benefiting society and nurturing the planet.

Agroecology empowers small-holders to be more productive and alleviates poverty

Biowatch specifically works with small-holder farmers, both because of need, but also because small farms are optimal for agroecological production. When small-holder production is compared with large industrial monocultures, 20-60% more produce is harvested per unit area by small-holders, while being economically efficient because fewer inputs are bought.[18] Direct comparisons made in Argentina and Brazil found the value per unit area of small-holder production is on average 1.5 times (and up to 5 times) greater than that of large-scale producers.[19]

Comparisons between several countries show that gross domestic product (GDP) growth in agriculture is at least twice as effective in reducing poverty compared to other sectors, and the multiplier effects in the local economy are significantly higher when small-holders are the beneficiaries.[20]

In South Africa, state support reaches less than 10% of the 2.5 million households practicing traditional subsistence farming on only 14% of South Africa's 100 million hectares of farmland.[21,22] Although commercial agriculture uses the remaining farmland and 60% of the country's water, it contributes only 3% to the country's gross domestic product (GDP). The entire agricultural value chain contributes 12% to GDP and employs 822 000 people.[23,24,25]

Empowering women is most beneficial in alleviating poverty. Women produce as much as 80% of the food in sub-Saharan Africa yet they typically only receive 7% of extension services and less than 10% of the credit offered to small-scale farmers.[26,27] However, improving women's access to these resources has the potential to reduce the number of undernourished people globally by as much as 12-17%.[28]

Agroecology produces healthy and nutritious food where it is needed

In an agroecological system, not only is more produced per hectare, but a greater variety of products are produced, including building materials, medicines, fibres, fuels and foods. The food is healthy and nutritious because healthy soil provides more nutrients and no synthetic chemicals are used. Local markets make affordable and culturally responsive food accessible, thus contributing towards ensuring food security.

The first Green Revolution, and the New Green Revolution for Africa currently being promoted, perpetuate the myth that there is too

What is wrong with the industrial food system?

During the 1930-60s, a so-called "Green Revolution" successfully promoted the industrialisation of agriculture as a solution to hunger. This revolution introduced new technological packages including high yielding but resource intensive crop varieties, large-scale mechanisation and irrigation, and petro-chemical fertilisers and pesticides re-purposed from war time weapons production.[16] This intensive production linked to globalised distribution networks and markets has resulted in the currently dominant industrial food system.

Although these technologies boosted the production of cereal commodity crops in the short term, the industrial food system is failing us.[17] Not only do millions of people still go hungry but industrial agriculture is also the main contributor to climate change; poisons our environment and us; destroys soil fertility; depletes and eutrophies water resources; and acidifies and over-harvests the oceans. Vast natural areas have been converted to sterile monocultures. Millions of people have been driven from their lands – some through land-grabbing and others through rising debt incurred on increasingly expensive agri-business inputs and investment in larger infrastructure to maintain the economies of scale to stay competitive.

New technologies such as GMOs that allow corporate patents on life have not only created new ecological disasters such as "superweeds", but have further entrenched commodification of our natural resources and corporate control of the entire food system.

"The industrial food system is the main contributor to climate change."

little food for the burgeoning global population, and that increased production based on their technological fixes is the only way to alleviate hunger.[29]

While environmental degradation and climate change may affect long-term productivity, hunger is not currently the result of there being too little food. The number of calories farmers are producing per person is the highest it has ever been. Global cereal crop production increased by 174% between 1950 and 1990, compared to a population increase of 110%; and world food supplies were 20% higher per capita in 2000 than in 1961.[30] Despite this increase, basic food insecurity still affects one billion people worldwide.[31] At the same time, 400 million people were obese in 2008.[32] Obesity and other "lifestyle" diseases like diabetes are a symptom of inadequate access to nourishing food. Driven by profit, industrial agriculture has increased production in a limited number of cereal and oil crops. One third of people globally, including in developed countries, suffer from "hidden hunger" – malnutrition caused by insufficient micro-nutrients and vitamins in their diets.[33] Studies in California and India found that obesity is most prevalent in food insecure women in urban areas.[34] This is also the case in South Africa where prevalence of overweight and obese people is high compared to the rest of the region, with more than 29% of South African men and 56% of women being overweight or obese.[35] Diabetes has also become a major public health problem with high prevalence rates of 4-6% especially in urban areas.[36]

The real causes of hunger are: poverty (people are too poor to buy the food that is produced or don't have the resources to produce their own); and the inequitable distribution of food according to the dictates of the global free-market. Structural adjustment programmes have forced developing countries to remove state support for agriculture and social spending, while rich countries continue to subsidise their industrial farmers. Low priced imports devastate production in developing nations, with consequent dependence on imported foods.

Paid for with foreign currency earned from "cash crops", poor nations are vulnerable to volatile global food prices. For example, in 2008 the international maize price rose in response to the US demand for maize to make ethanol fuels. In Mexico, the centre of origin for maize, Mexicans made dependent on US maize imports through free trade agreements, could not afford their staple food, sparking the first food riots of the 2008 food crisis. Both of the 2011 and 2008 food crises occurred "during years of record global harvests, record food prices and record profits for the world's agribusiness monopolies".[37]

Agroecology ensures food sovereignty and livelihoods for many

Agroecology satisfies diverse local needs through optimal use of available resources, including a small-holders' most important resource – their labour – while avoiding the use of harmful outside inputs that create debt and dependency. Technologies like GMOs which commodify and own life have no place in agroecology, which thrives on co-operation and sharing. For example, traditional practices encourage collective responsibility and care for common resources such as land and water for everyone's benefit. For centuries farmers have exchanged seeds creating diverse and resilient gene pools but also relationships of reciprocity which provide insurance for difficult years.

In contrast industrial agriculture creates a market from which it can profit by making resources scarce and exclusive. Patents and intellectual property rights control seeds and inputs; without buying them one cannot use or share them. Multinational corporations own the inputs, and the retail and distribution networks. This is also true in South Africa. The maize and wheat seed markets are entirely owned by the US companies Monsanto and Du Pont-Pioneer. Ex-apartheid co-operatives (SENWES, NWK and AFGRI) now control 74% of the maize silo capacity and only four companies (Tiger Brands, Premier Foods, Pioneer Foods and Foodcorp) control bread and wheat milling as well as the maize and bread retail sector. Seventy percent of the food South Africans buy is purchased in supermarkets owned by five companies: Shoprite, Pick n Pay, Spar, Woolworths and Massmart.[38] The accelerated expansion of industrial commodity crops and timber plantations has created a global epidemic of land grabbing and megafarms, forcing small-holders off their lands. Even the commercial farming sector in South Africa has been affected by concentration – the number of commercial farms dropped dramatically from about 60 000 in 1996 to just under 40 000 by 2007 and 150 000 agricultural jobs were shed between 1993 and 2002.[39,40]

Agroecology conserves water

Agroecology conserves water through more plant cover and water harvesting techniques that slow run-off so water has time to seep into the soil. Healthy soils with high organic matter content absorb and hold moisture for long periods, and water that does flow on to rivers or groundwater is cleaner.

Industrial crops are often water intensive and require irrigation, and poor plant cover and impact from machinery damages soils leading to high losses through evaporation and water run-off. Run-off carries chemical pesticides, herbicides and fertilisers into rivers and groundwater. Salinisation and toxins affect the quality of ground-water on which 65% of South African are entirely dependent. Excess phosphorous and nitrogen from fertilisers lead to "eutrophication" – an over-supply of nutrients in rivers and oceans causing excessive growth in algae or phytoplankton that uses up the oxygen, killing fish and other aquatic animals. South Africa is the 30th driest country in the world, with water scarcity expected to increase with climate change. Despite this, inefficient agricultural irrigation consumes 60% of fresh water resources.[41]

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Agroecology builds healthy soils

Soil fertility depends on complex dynamics between its structure, nutrients and living organisms. The addition of organic matter to create favourable conditions for beneficial soil organisms is a core principle of agroecology because soil health is the foundation for healthy plants and water retention. For every one percent of organic matter added to a cubic metre of soil it can hold an additional 49 litres of plant available water.[42]

South Africa is not well suited to crop production; only 17% of farmland is arable and 1.3% is currently irrigated.[43] South African soils are highly susceptible to wind erosion, especially in the heavily-tilled maize growing areas of the North West and Free State. By 2011 as much as 5% of South Africa's land was classified as degraded – equal in area to a third of the land currently used for cultivation and tree plantations.[44] Irrigation reduces soil fertility by building up salts in the soil. This salinisation has affected 260 000 ha of irrigated land in South Africa. Five million hectares have been acidified through excessive use of chemical fertilisers.[45] Every year South Africa uses two million tons of fertilisers.[46] Tilling of soils destroys soil carbon, immediately reducing fertility. When heavy machinery is used soil can compact below the plough level as well as forming a hard pan of soil on the surface. This prevents water infiltration and causes the topsoil to wash away.

Agroecology is resilient in diversity

Agroecological systems are diverse in domesticated and wild species of plants and animals to enhance beneficial ecological interactions between them (for example pest predation) and to provide us with many useful products in addition to food. Not only is there a mix of many types of plants and animals, but also many varieties within each species – one variety may be better adapted to a particular pest, weather condition, or cultural ritual than another. As a result agro-ecological systems tend to be more resilient to natural and economic stresses.

At least 7 000 plant species have been cultivated or collected by humans for food over time, but today 95% of our calorie or protein intake is from just 30 crops[47] and sugar, soya and palm oil have become new staples in the globalised diet. Not only were there many types of crops but also incredible diversity within each crop. For example, the centre of origin of potatoes in the Andes some communities grow as many as 178 different types.[48] Southern Africa is the centre of origin for Finger millet, Pearl millet, Sorghum and Melon.[49] Modernisation of diets, replacement with modern varieties and land clearing for mono-crops threaten diversity, with an estimated 75% loss of crop diversity to date.[50]

Maintaining the diversity of wild plants is also important – two thousand plant species are used for medicinal purposes in South Africa, and an estimated 42% of the natural food basket of rural households in Southern Africa consists of indigenous fruits.[51,52]

Agroecology promotes zero waste

Agroecology produces food for local consumption – not only is it fresh, but very little perishes between the farm and the consumer and packaging is not really needed. This also avoids energy consumption for refrigeration and transport. The small amounts of waste that are produced are biodegradable and can be returned to replenish nutrient cycles on the farm.

Industrial agriculture produces a variety of wastes from farm to plate: waste in the production of energy and packaging, and food lost in global transport, processing, and wasteful consumer habits especially in developed countries. While millions cannot access food, it is estimated that 32% of the total food produced globally is wasted.[53]

Agroecology is healthy and non-toxic

Agroecology avoids the need for toxic and petrochemical pesticides and fertilisers by building soil with organic matter and creating the conditions that foster a dynamic balance between species so that pests and diseases are kept in check.

Chemical pesticides and herbicides poison us and the environment. Their many impacts include run-off into water systems where they affect the reproduction of aquatic organisms, the death of non-target species especially pollinators, impacts on micro-organisms, and pest or weed resistance to the chemicals making these even more difficult to control. People and many other animals suffer neurological and thyroid problems, endocrine disruption, birth defects and cancers. In 2004 some of the most toxic, which have dispersed and accumulated to remote areas of the globe, were banned through the Stockholm Convention on Persistent Organic Pollutants.[54] Multinationals continued to promote their less toxic brands, but even several of these were classified as probably carcinogenic to humans by the World Health Organisation in 2015, including Monsanto's blockbuster herbicide Glyphosate,[55] which they had claimed has no long-term effects.

Agroecology cools the planet

Agroecology responds to the greatest crisis of our time: climate change. The diversity in an agroecological food system, as well as the ecological practices used, provide greater resilience and adaptability to varying weather patterns, and consequent floods, droughts and pest outbreaks. Agroecology also helps to mitigate and reverse climate change. By focusing on local food production for local

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consumption the energy and resources needed for refrigeration, packaging and transport are greatly reduced. Prevailing industrial agriculture uses 10 times more energy than ecological agriculture, consuming an average 10 energy calories for every food calorie produced.[56]

GRAIN calculates that when all impacts are considered from farm to plate to landfill, the industrial food system is the greatest cause of anthropogenic climate change, accounting for around half of all emissions.[57] This includes: land use change and deforestation (15-18%); on farm emissions (11-15%); processing, transport, packing and retail emissions (15-20%); and waste emissions (2-4%).

Agroecology's biggest mitigation potential relates to the practice of conserving and building soils. Ecological farming conserves and fits into the natural environment and uses very little mechanisation so that there is less soil disturbance. Chemical fertilisers are avoided, thereby avoiding the enormous energy consumed in breaking apart nitrogen atoms to obtain ammonia – the first step in most fertiliser production – and the nitrous oxide emissions that off-gas in the field.[58] Instead, organic waste is returned to the soil as compost avoiding the methane produced if this waste was land-filled. Methane and nitrous oxide have a much greater impact on the climate than carbon dioxide. There is over three times more carbon stored in soils than the carbon dioxide in the atmosphere.[59] This carbon is lost when soils are tilled. Scientists estimate that tilling and the destruction of soil life have caused a 30%-75% loss of soil carbon globally.[60] A portion of this goes into the atmosphere as carbon dioxide, contributing to climate change. This process can be reversed through agro-ecological farming practices; GRAIN calculates that 25% of the excess carbon causing climate change could be returned to soils,[61] providing one of the cheapest and most beneficial ways to reduce climate emissions.

Onwards to food sovereignty

Biowatch advocates for agroecology as a proven way to farm with nature that is empowering to farmers and promotes food sovereignty – local community control over our food and the way it is produced. However, powerful profit-driven corporations have structured global agriculture to commodify food and make farmers dependent on their toxic inputs. This industrial agriculture is laying waste to the soil, water and biodiversity we depend on and is altering the climate.

In South Africa, while continuing to support agribusiness, government has allowed an agroecology strategy for the country to languish as a 7th Draft. Biowatch is disappointed at this missed opportunity and calls for political commitment to transition South African agriculture to agroecology, with the aim of food sovereignty; to bring meaningful rural development to the 2.5 million small-holder farmers in South Africa; and to feed the nation without destroying the natural resources on which we depend.

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"Biowatch calls for political commitment to develop an agroecology policy and strategy for South Africa that will genuinely promote agroecology within the context of food sovereignty"

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