AGROECOLOGY

Environmental, social and economic justice

A Biowatch Research Paper

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ACRONYMS

DAFF	South African Department of Agriculture, Forestry and Fisheries
DEA	South African Department of Environmental Affairs
DWA	South African Department of Water Affairs
DOC	South African Department of Communications
FAO	Food and Agriculture Organization of the United Nations
GMO/s	Genetically Modified Organism/s
WHO	World Health Organization
UN	United Nations
UN DESA	United Nations Department of Economic and Social Affairs
Stats SA	Statistics South Africa

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WHAT IS AGROECOLOGY?

Historical development and definitions of agroecology

Agroecology has several definitions that have arisen in the context and geography of its use. Initially the term agroecology was used in scientific study, but more recently it has also come to mean the practice of sustainable agriculture (often based on local indigenous knowledge), as well as being associated with a growing movement of people globally advocating for a different and sustainable "way to consider agriculture and its relationship with society" (Wezel *et al.* 2009:4). To better understand these varied definitions and interpretations we need to delve into the history of its use.

Wezel *et al.* (2009) describe the early use of the term agroecology. A Russian-born agronomist, BM Bensin, was the first to use the term in 1928 in relation to applying ecological methods to crop research. A German ecologist and zoologist, Tischler, published the first book with Agroecology (Agrarökologie) as the title, and he wrote several articles on agroecological research relating to soil biology, pest management and plant and insect interactions through the 1950s and 60s. Several other researchers published studies connecting ecological processes to agriculture, but without explicitly using the term agroecology. Thus, with its roots in the biological sciences and agronomy, agroecology was initially defined as "applying the science of ecology to agriculture" (Wezel *et al.* 2009). Through the 1960s and 70s interest in the application of ecological science to agriculture grew as a counter response to the Green Revolution, which aimed to intensify agriculture through the introduction of new high-yielding crop varieties, irrigation, and synthetic chemical fertilisers and pesticides – with consequent toxic impacts on human and environmental health.[1] In the 1970s the ecologist Odum introduced the concept of Agro-ecosystems – a domesticated ecosystem for the purpose of food production (Wezel *et al.* 2009). This concept strengthened in the 1980s and 90s, especially through protagonists such as Miguel Altieri and Stephen Gliessman;[2] and agroecology came to be defined as "the science of applying an ecological conceptual framework and principles to the study, design and management of sustainable agro-ecosystems" (Altieri 2005).

The definition of agroecology as a science thus has a strong foundation, and continues to be a key way in which agroecology is understood. The Merriam-Webster Dictionary defines agroecology as: "an ecological approach to agriculture that views agricultural areas as ecosystems and is concerned with the ecological impact of agricultural practices".

In the 2000s the understanding of agroecology broadened even further to look beyond specific agro-ecosystems to the food system as a whole. From this perspective, agroecology connects the producers and consumers of food, and takes on a political agenda encompassing the ecological, economic and social dimensions of food system change.

1. Rachel Carson published her influential book *Silent Spring* in 1962, documenting and warning of the long-term impacts of pesticides in the environment. Many scientific studies have since confirmed the toxic impacts of pesticides on soil health, water life, and non-target species including humans.

2. Miguel Altieri is a Professor of Agroecology at the University of California, Berkeley and Stephen Gliessman is a Professor of Agroecology at the University of California, Santa Cruz.

This food system approach is strongly grounded in the social movements of Latin America and the Global South, and emerged 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 their environments. In Latin America this approach has developed into a vibrant movement advocating agroecology as the foundation to foster sustainable agriculture and rural development that strengthens the sovereignty, autonomy, economies and cultures of local peoples and traditional farmers (Cohn *et al*. 2006; Wezel *et al.* 2009; WhyHunger 2015). Altieri *et al.* (2011:6) note that agroecology is compatible with the struggle and vision of rural movements because, rather than questioning peasant rationale, it uses local resources and skills to optimise the design of traditional farming systems.

Biowatch is among the organisations and international social movements that see agroecology as a means to realise the goal of food sovereignty. This includes La Via Campesina, comprised of 164 organisations in 73 countries that brings together 200 million peasant and small-holder farmers. La Via Campesina is a key member of the international movement for food sovereignty launched in Nyéléni, Mali, in 2007. The food sovereignty movement sees agroecology as an embodiment of traditional farming in all its diversity; although the term may be modern, agroecology is based on ages-old peasant and indigenous farming practice. A 2014 issue of the *Nyéléni Newsletter*, the voice of the movement, describes agroecology as "a multidimensional approach, founded on knowledge, know-how and peasants' ways of life, grounded in their respective natural, social and cultural environment." The movement 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". 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" (*Nyéléni Newsletter* 2014). 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" (Nyéléni 2015). The forum spoke out strongly against the

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. It 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. Food sovereignty promotes transparent trade that guarantees just income to all peoples and the rights of consumers to control their food and nutrition. It ensures that the rights to use and manage our lands, territories, waters, seeds, livestock and biodiversity are in the hands of those of us who produce food. Food sovereignty implies new social relations free of oppression and inequality between men and women, peoples, racial groups, social classes and generations.

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

appropriation of agroecology by international institutions and corporations to promote false versions of agroecology (such as climate-smart agriculture[3]) 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."

It is this broad approach to agroecology – bringing together science, practice and collective action – that resonates with Biowatch. The political and social dimensions of the agroecological movement are essential if we hope to transform the inequities in the global food system. As Eric Holt Gimenez (2014)[4] wryly notes: on their own, "technical solutions invite us to ignore the growing financial speculation and monopolisation of food, turn a blind eye to massive land grabbing, and pretend free trade agreements benefit the poor".

How does agroecology differ from other sustainable and organic production systems?

Agroecology is one of several types of agricultural systems aimed at sustainable and ecologically-based production. These include permaculture and organic, biodynamic, biological, natural and traditional farming. Agroecology emphasises the dynamic interactions in an agro-ecosystem, and thus Altieri (2005) criticises organic practice that simply swops the chemical fertilisers and pesticides for organic inputs, as narrowly treating the symptoms of ill health, without addressing the imbalances in the complexity of inter-relationships that are the root cause.

Agroecology may also differ from these other forms of organic-based production in that it is underpinned by a call for land and agrarian reform, and socio-economic justice. In the Global South agroecology is growing as a potential engine for genuine community-based rural development.

3. Using the language and even some of the methods of ecological agriculture, climate-smart agriculture provides a veneer of sustainability for interventions that continue to promote industrial agribusiness products and technologies. See Biowatch *Fact Sheet: Climate-Smart Agriculture* available at http://www.biowatch.org.za/docs/fs/2015/Biowatch_Fact_Sheet_CSA_web.pdf

4. Holt Gimenez is an agroecologist, political economist, lecturer and author who is a prominent critic of the global industrial food system. Food First is a non-profit think-tank focused on eliminating the injustices that cause hunger.

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AGROECOLOGICAL PRINCIPLES

Several principles characterise the agroecological approach. Parmentier (2014:78-81) provides an overview of these, noting that the core principles associated with agroecology as a science have been added to as the discourse on agroecology broadened to include the social and political dimensions.

Core ecological principles of agroecology

Five core principles are associated with agroecology as the applied science of making agriculture more sustainable. These can be summarised as:[5]

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 of the system (species that work together to make the system more healthy and productive), including within and between species, above and below ground, and in time and space (on farms and in the wider landscape).

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 comprise complex "polycultures" that mix crops, trees and other beneficial plants and animals in the system; makes use of successions of plants and crop rotations that increase diversity between seasons and over the years; uses cover crops and creates micro-climates within the system to optimise soil fertility and increase synergies (Altieri 2005).

Agroecological principles are universal, but the farming practices that fulfil these will vary to suit the particular context (climate, geology and culture) and available resources at each farm.

5. Adapted from Altieri 2005; De Schutter 2010; Parmentier 2014.

Emerging social principles of agroecology

Biowatch supports several additional social and political principles that are emerging internationally, especially through social movements that strengthen local autonomy in support of the goal of food sovereignty and the values of indigenous communities.[6]

These can be summarised as:[7]

1. Recognise and dynamically conserve agricultural heritage systems.

2. Build on traditional knowledge and farming practice.

3. Improve practices that don't work, through the application of science and research, based on participatory, farmer-led research agendas.

4. Recognise the critical role of women and youth and support their active and equal participation.

5. 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 right 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 for agroecology within the food sovereignty movement[8].

6. Self-organise collectives and create solidarity between groups.

7. Localise markets to connect the producers and consumers of foods, based on shared ethics, risks and benefits.

8. Maintain and enhance the natural resource base for coming generations.

9. Recognise the spiritual connection between nature, the cosmos and human beings and completely reject the commodification of life.

6. See Parmentier 2014: Annex 2 and 3.

7. Adapted from Parmentier 2014; Rosset and Martinez-Torres [no date]; WhyHunger 2015.

8. See for example, the Civil Society Statement on the Draft Agroecology Strategy for South Africa (Draft 7) (2013). Available at http://www.spp.org.za/civil-society-statement-on-the-draft-agroecology-strategy-for-south-africa-draft-7/

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SUPPORT FOR AGROECOLOGY

The view of agroecology as a transformative force is not just the view of peasant farmers. Agroecology has also been endorsed by several international experts and agencies as the most viable approach to agriculture in order to feed the world's growing population in the face of increasing climate change and resource scarcity.

In 2004 the World Bank initiated an inter-governmental process called the International Assessment of Agricultural Science and Technology for Development (IAASTD). Co-sponsored by several UN agencies and the World Health Organization (WHO), the process involved 110 governments, NGO representation, and 400 world experts. Various current and future scenarios were explored in the process to assess the role of agricultural science and technology in reducing hunger and poverty; improving rural livelihoods; bettering health; and facilitating environmentally, socially and economically sustainable development. The assessment explored these in the context of key challenges: loss of biodiversity and ecosystem services, climate change and water availability. It was the first agricultural science assessment to recognise that agriculture is multifunctional, and to include traditional knowledge systems. The final global assessment was presented at a closing plenary in Johannesburg in 2008. Fifty-eight countries endorsed the final report titled "*Agriculture at a Cross-roads*".[9] It emphasises, amongst others, the role of women in agriculture and the importance of traditional knowledge and community innovation especially when concurrently looking at production, profitability, ecosystem services and the food system. The report endorses agroecology as one of the ways to achieve environmental sustainability, together with improving resource efficiency; improving the understanding of soil-plant-water dynamics; increasing farm diversification; enhancing biodiversity conservation; promoting the sustainable management of livestock, forests and fisheries; improving understanding of the agroecological functioning of mosaics of crop production areas and natural habitats; countering the effects of agriculture on climate change; and mitigating the negative impacts of climate change on agriculture (McIntyre 2009:6).

The small-scale and family farming sector put forward a common agenda at Rio+20, the 2012 UN conference on sustainable development. The UN Food and Agricultural Organization (FAO) endorsed their views, and published these in a synthesis report. In the report, agroecology is identified as one of four central messages:

> "Agroecology, practiced by small-scale farmers, has demonstrated empirically its potential to achieve sustainability aims. It is not based on agronomic and technological fixes but rather on the ecological processes that underlie food production, involving in-depth knowledge of the interactions between what is produced, the soils and associated biodiversity" (Maass Wolfenson 2013:2).

The most current and well-substantiated support for agroecology has come from the former UN Special Rapporteur on the Right to Food Olivier De Schutter[10] who has highlighted the importance of agroecology in transforming the food system so as to realise the right of all to have sufficient and nutritious food. Following the 2008 food crisis

9. Although South Africa hosted the closing plenary and participated in the process, the South African government didn't sign on in support of the report. Australia, Canada and the United States participated in the process and also chose to not fully endorse the report – their disagreements on various points are noted in the final text.

10. De Schutter was the UN Special Rapporteur on the Right to Food from 2008 to 2014. In May 2014 the UN Human Rights Council appointed Ms Hilal Elver as the new UN Special Rapporteur on the Right to Food.

and the publication of the IAASTD reports, De Schutter convened a seminar on agroecology, and then published a dedicated report (2010) identifying agroecology as the best mode of agricultural development to invest in. He argues that agroecology is proven to quickly realise the right to food in vulnerable parts of society, while addressing the concurrent food, ecological and energy-climate crises.

Our **RIGHT TO FOOD** requires that food is:

- ***Available***:
  There must be sufficient food on the market to meet need.

- ***Accessible***:
  Food must be physically accessible to all people, including children, the elderly and people with disabilities. Food must also be affordable, and not be so costly that people cannot afford other basic needs such as school fees, medical care or housing.

- ***Adequate***:
  Food must satisfy dietary needs taking into account our age, sex, occupation, health and living conditions. It must also be safe to eat, free of adverse substances and culturally acceptable.

Extract from the 2010 report submitted by the Special Rapporteur on the Right to Food, Olivier De Schutter, to the United Nations Human Rights Council (16th session, agenda item 3).

De Schutter warns against pouring money into agriculture that is only focused on increased production; rather investment should benefit the poorest farmers, and facilitate the transition to a low-carbon and resource-conserving agriculture. He argues that investment should be made for the public good including affirming and prioritising women, farmer knowledge development and sharing, better extension services, and connecting farmers to fair markets.

In his final report in January 2014, after six years in office, De Schutter cites climate change as "one major reason why a shift to agroecological modes of production is urgently called for" (p8), as it improves the resiliency and sustainability of food systems. In addition, he notes that agroecology must be supported for its health and social benefits, especially in contributing to sustainable rural development and helping the poorest of the poor. In this regard he also emphasises the rights of peasants and small-farmers over their land and resources, and that they should not be forced or co-opted into the dominant agricultural system.

BRAZIL: AGROECOLOGY IN PRACTICE AND POLICY

There are many examples of agroecological practice worldwide that include traditional farming communities, as well as projects to revive and build on traditional farming by applying new agroecological knowledge. Many examples from Africa have been compiled by the Alliance for Food Sovereignty in Africa (see http://afsafrica.org/case-studies/) and international examples are described in the publication "*Nourishing the world sustainably: scaling up agroecology*" (Altieri *et al*. 2012). As an example of what can be achieved we highlight developments in Brazil, which encompass deepening and expanding practice, as well as innovative changes to the policy environment to enable agroecology.

Since the 1970s Brazilian family farmers and civil society organisations, including La Via Campesina and the Landless Workers Movement (MST), have mobilised around an alternative vision for rural development to counter the destructive industrial agricultural regime that included land concentration and the expulsion of the poor from their lands in the country.[11] In the 1980s, as the military dictatorship weakened and Brazilians were freer to organise, an alternative vision to the Green Revolution began to take shape. Agroecological theory entered the debates and provided a good fit. In 2002 the first National Agroecology Encounter was held, bringing together rural social movements, civil society and professionals to share concrete agroecological innovations. Following on from this the National Agroecology Alliance (ANA) was formed bringing together social practices based on agroecology with agroecological theory for Brazilian agrarian reform (Peterson *et al.* 2013). In 2004 the Brazilian Agroecology Association – a network of educators, researchers and extension workers – was created to champion agroecology, create academic and scientific space for agroecology, engaging in politics to defend peasant family farming, and record and share examples of successful projects on the ground for others to learn from (Peterson *et al.* 2013; Altieri *et al.* 2012).

Non-governmental organisations such as AS-PTA (Assessoria e Serviços a Projectos em Agricultura Alternativa) and CAPA (Centre for Support to Small Farmers) have been working to support family farmers in the States of Santa Caterina, Paranà and Rio Grande do Sul in southern Brazil to transition to agroecology. Interventions have included using locally adapted seeds as well as the management of soil fertility through mulching, cover crops, incorporating biomass, minimal tillage, and the use of rock dust. CAPA also fosters the formation of cooperatives. Farmers were supported to experiment on the best crop and mulch combinations by extension workers working with university researchers. These techniques helped to improve the soil, suppress weed growth and prevent erosion on the steep hillside farms. With limited finance and without using chemical weed killers or fertilisers, the farmers achieved average yield increases in maize from 3-5 tons per hectare and soya from 2.8-4.7 tons (Altieri *et al*. 2011; Altieri *et al*. 2012). In 2008-9 (10 years later) the same area experienced an extreme drought. Conventional farmers lost half of their yield, compared to only one fifth amongst agroecological farmers, who also had much lower production costs (Altieri *et al*. 2012).

In the late 1980s CAPA successfully lobbied the local government of Rio Grande do Sul to support agroecological producers by buying food for their canteens, schools and social welfare programmes at a 30% higher price (Altieri *et al.* 2012). There are also collective efforts to directly link food producers with consumers through community markets that ensure local food security and keep money circulating in the community. Rede Ecovida in southern Brazil is a network of approximately 2,400 family farmers, 30 supportive NGOs and 32 consumer and trader organisations. Produce is sold in 133 local markets located in the Rio Grande do Sul, Paranà and Santa Caterina States. Rede Ecovida promotes organic and agroecological production, but rather than using a third party certification system for their organic produce, the network uses a participatory guarantee system (PGS) where farmers and consumers agree on the organic standards required and participate in auditing farmers. This is more flexible, brings consumers and farmers together in the community and has been successful in promoting conversion to agroecological farming. Almost 70%

11. See for example http://www.mstbrazil.org/about-mst/history.

of farmers' land was used for organic production within the network in 2005 (Zanasi and Venturi 2008). Ecovida has become a major organic label in Brazil. In 2003 sales amounted to almost 14 million US dollars of which 27% was sold at local independent markets, 20% was exported internationally, 19% bought by institutions and 34% sold formally to supermarkets, shops and agro-industries (Altieri *et al.* 2012).

Emerging from the social movements, the newly elected President Luiz Inácio Lula da Silva introduced the "Fome Zero" (zero hunger) programme in 2003, which has been continued by President Dilma Rousseff. Fome Zero includes several interventions:

- A Family Agriculture Food Procurement Programme (PAA) purchases products from family farmers for government feeding programmes or for local food banks. This includes support to family farmers to improve their production such as subsidised credit, training and technical assistance, and insurance. The PAA creates a guaranteed market with stable prices for small growers (Kilpatrick 2010). In 2009 a law was introduced requiring that 30% of state food purchases must come from small-holders, and in 2011 a provision was added to increase the price paid for organically certified or agroecologically produced products by 30%, encouraging a transition to more sustainable agriculture (International Policy Centre for Inclusive Growth 2013).

- A National School Feeding Programme (PNAE) provides free school lunches to 47 million children a day. In 2009 a law was passed requiring that 30% of the food served in the meals must be bought from local family farmers. The programme also provides direct income to 12.7 million needy families on condition they access other social services, including schooling (Kilpatrick 2010).

The state has not only stimulated the market for agroecological produce, but is also enabling farmers to meet the demand. Brazil's National Supply Company (CONAB) supports local farmers and civil society organisations to undertake organic seed breeding programmes, and works with local farmer organisations to buy and redistribute agroecological seeds (Anderson and Campeau 2013). Furthermore from 2003 the Brazilian National Rural Extension Policy increased extension services fifteen-fold and, strongly influenced by organisations linked to ANA, agroecology was adopted as the guiding approach for Technical Assistance and Rural Extension initiatives in Brazil (Peterson *et al*. 2013). This has ensured the rapid dissemination of best practices, especially since the farmers are active participants in these training programmes (De Schutter 2010).

Between 2003 and 2009, the programme is credited with buying three million tons of food, mostly from small-holders using agroecological methods (Altieri *et al.* 2012), and reducing the number of hungry people by one third. Family farming provides 74% of rural employment, and grows most of Brazil's domestic food supply. Part of the success of the programme is that civil society is integrated into the design and implementation of the programme through a presidential advisory body (Kilpatrick 2010).

Following from these achievements government, civil society organisations and social movements met to develop a comprehensive national policy for agroecology in 2012. This focuses on the expansion of agroecological and organic products within the focus on family farm policies. Innovations include an agroecological youth programme and monitoring the impacts of agri-chemicals on workers with compensation for health costs resulting from exposure (McKay and Nehring 2014).

4

WHY DO WE NEED AGROECOLOGY?

The failing food system

From the 1930s to 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.[12] A New Green Revolution for Africa now seeks to extend the market for these products and new patented technologies such as GMOs. This intensive production linked to globalised distribution networks and markets has resulted in the currently dominant industrial food system. These "Green Revolutions" promote and perpetuate the myth that there is too little food for the burgeoning global population, and that their technological fixes are the only solution to raise productivity and thereby alleviate hunger.[13] Industrial technologies have boosted production of commodity crops; however, they have also laid waste to the environment and our health, and entrenched corporate control of the food system. On the whole the industrial food system is failing us.

While environmental degradation and climate change may impact productivity in the future, 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 production of cereal crops 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 (Patel 2013).

Despite there being more food, basic food insecurity still affects one billion people worldwide (UN Department of Economic and Social Affairs 2013). At the same time 400 million people were obese in 2008 (De Schutter 2014). Contrary to what one might think, obesity and other "lifestyle" diseases like diabetes are a symptom of inadequate access to nourishing food. One third of people globally, including in developed countries, suffer from "hidden hunger" – malnutrition caused by insufficient micro-nutrients and vitamins in their diets (De Schutter 2014; IFPRI 2014). Studies in California and India found that obesity is most prevalent in food insecure women in urban areas (Steyn 2006). This is also the case in South Africa where the prevalence of overweight and obese people is very high compared to the region, with more than 29% of South African men and 56% of women being overweight or obese (Steyn 2006). Diabetes has also become a major public health problem with high prevalence rates of 4-6%, especially in urban areas.[14]

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12. Nitrogen is a key ingredient in explosives. During World War 2 many chemical plants were built internationally to manufacture nitrogen in the form of ammonia for bombs. After the war this spare capacity was turned to agricultural chemical production, diversifying into more complex chemicals and plastics as time progressed (see for example http://www.ini-europe.org/node/16). As a consequence many multinationals involved in agriculture today originated as war-time chemical companies. In South Africa the mining industry created an early demand for explosives, which was invigorated by the two World Wars. Three explosive factories at Modderfontein, Somerset West and Umbogintwini were consolidated to form AECI in 1924; the Umbogintwini plant was converted to superphosphate fertiliser manufacture in 1930 while the other two plants produced ammonia. All three plants diversified substantially into chemicals for the mining and many other industries (see Rustomjee 2007).

13. See for example: Bill & Melinda Gates, Rockefeller Foundations Form Alliance to Help Spur "Green Revolution" in Africa. Media release by the Bill & Melinda Gates Foundation. http://www.gatesfoundation.org/Media-Center/Press-Releases/2006/09/Foundations-Form-Alliance-to-Help-Spur-Green-Revolution-in-Africa [14 February 2016].

14. See Liberty Life. http://www.liberty.co.za/our-products/latest-product-news/Documents/diabetes-information-flyer.pdf.

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. For example, in 2008 the international maize price rose in response to the US demand for maize to make ethanol for fuel. Consequently, in 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. Recent food crises, in 2011 and 2008, occurred "during years of record global harvests, record food prices and record profits for the world's agribusiness monopolies" (Holt Gimenez 2014).

The logic of industrial agriculture is to increase profits by increasing productivity while reducing input costs through economies of scale, mechanisation and mass production. Globally, increased production has been limited to select cereal and oil crops, which are traded on an increasingly competitive global commodities market. The technologies involved favour larger producers who can afford these, and inevitably leads to consolidation of land into larger production units at the expense of smaller producers. This in turn forces those who can't compete to abandon their farms and seek poorly paid work in cities or as farm labour. 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 local food production, making many developing nations increasingly dependent on food imports they must pay for with foreign currency earned from "cash crops" they must sell in the competitive global market. Poorer countries are thus vulnerable to increasingly volatile global food prices while inequality, poverty and hunger deepen. The real winners in this system are the multinational corporations that move commodities around the world and sell the technologies and inputs for the industrial agriculture system. Their increasing power enables them to further influence the global trade and governance regime in their favour.[15]

There are many social and ecological problems associated with industrial agriculture and the current food system. These are summarised in the following table:

PROBLEMS WITH THE INDUSTRIAL FOOD SYSTEM
SOCIAL PROBLEMS
• Disconnection between the producers of food and consumers.
• Globalisation of diets centred on a few main energy crops resulting in nutrient deficiencies and an increase in 'lifestyle' diseases such as diabetes.
• Increasing power and profits to a few multinational agribusiness monopolies; and corporate concentration and consolidation in entire farm-to-plate value chains.
• Resource grabs, especially of land and water, to produce commodities for wealthy nations.
• Increasing hardship for women in developing countries who are the main caregivers and food producers struggling with loss of environmental resources, health impacts of agricultural pollutants, hunger and malnutrition, water scarcity and pollution and increased labour.
• Increased vulnerability to pests, diseases and unpredictable weather resulting in economic losses.
• Increasing farmer debt as the cost of industrial inputs (fertiliser, pesticides, seeds) increase and larger farm infrastructure and mechanisation is required to create the economies of scale required to stay competitive.
• Small-holders and traditional farmers, who are the custodians of our agricultural heritage, are increasingly marginalised and forced off the land through economic pressures, collapse of the natural resource base and even forced removal in the process of land grabbing.

15. The problems created by the industrial system of agriculture are described by many sources. See for example, De Schutter, 2014; Parmentier, 2014; and Patel, 2007.

PROBLEMS WITH THE INDUSTRIAL FOOD SYSTEM
ECOLOGICAL PROBLEMS
• Destruction of soil life and long-term fertility (from tilling, chemical fertilisers and pesticides) resulting in accelerated soil erosion.
• Water resource depletion from irrigation and pollution from the overuse of chemical fertilisers leading to run-off and consequent phosphorous and nitrogen pollution of rivers and oceans. This leads to eutrophication – an over-supply of nutrients that encourages an excessive growth in algae or phytoplankton that uses all the oxygen in the water causing the death of fish and other aquatic animals.
• A shrinking natural resource base as ecosystems are replaced or degraded by expanding grazing and mono-cultures of crops or exotic trees.
• Decline in both agricultural and biological diversity due to the use of extensive crop or tree monocultures of only a few varieties; the imposition of uniform hybrid crops and animals; contamination through gene transfers from GMOs; and intellectual property rights that prevent the breeding and exchange of plants and animals.
• Environmental contamination with toxic pesticides and herbicides that cause poisoning and birth defects in non-target organisms, especially in species higher up the food pyramid. This includes impacts on human health resulting from unsafe use, storage and residues in food and drinking water.
• Increasing pest, disease and weed resistance to chemical pesticides and GMOs.
• Concentrations of industrial operations, such as factory farms, that result in a concentration of waste products and consequent pollution.
• High proportion of waste through each stage in the production and distribution chain.
• High use of fossil fuels to produce chemical fertilisers, in mechanised farm operations, packaging and a global distribution system.
• The highest contribution of all human activities to climate change, when considering on-farm emissions as well as the emissions from land use change and deforestation, processing, transport, packaging, retailing and waste. In particular the global meat industry, heavy use of chemical fertilisers, conversion of grasslands and forests to expand commodity production, and destruction of soils contribute have the greatest negative impact.

(Compiled from Parmentier 2014; De Schutter 2014; ETC Group 2013; GRAIN 2011.)

5

SOUTH AFRICAN AGRICULTURE: A MICROCOSM OF GLOBAL CHALLENGES

The South African food system is a microcosm of the inequities and challenges in the global system. The dispossession of land under colonialism and then apartheid, globalisation, and deregulation of agriculture post 1994 have all contributed to a dual agricultural system. On the one hand there is a small but powerful commercial farming sector supplying a corporate dominated formal food system, and on the other, a vast subsistence farming sector that is inadequately supported, and whose contribution to South Africa's food security is under-valued and poorly documented.

According to the 2011 Census, 20% of households in South Africa – almost 2.9 million households –were engaged in agriculture. Of these, the majority (approximately 2.5 million households) practice traditional subsistence farming.[16] Most subsistence farmers are in provinces with large percentages of communal land area arising from the former apartheid homeland system: KwaZulu-Natal (24.9%), Eastern Cape (20.7%) and Limpopo (16.3%) (Stats SA 2013). These small-holders only have access to 14% of South Africa's 100 million hectares of farmland (DAFF 2013).[17]

In contrast, only 35 000 farmers occupy the rest of South Africa's farmland with commercial production, which it is claimed supplies 95% of marketed produce (De Schutter 2012).[18] Although government aimed to redistribute 30% of the land held by white commercial farmers, only 6.9% of agricultural land had been transferred to black communities by September 2009 (AgriSETA 2010). Government has not been able to provide the post-settlement support required for productive use of the land; while some beneficiaries are subsistence farming, others have leased land back to commercial farmers. Nevertheless approximately 200 000 "emerging" black farmers are navigating the transition between subsistence and commercial farming (De Schutter 2012). These entrepreneurs have received more than 90% of the support allocated through agrarian reform and black economic empowerment policies, at the expense of the majority of small-holder farmers (Hall and Aliber 2010), following government's determination for black farmers to commercialise.

Commercial agriculture contributes only 3% to the country's gross domestic product (GDP), and the entire agricultural value chain contributes about 12% to GDP (DOC 2013). In 2011, commercial farming employed 391 119 casual and 430 848 full-time workers (Stats SA 2011) providing approximately 7% of South Africa's employment. All in all, however, it is estimated that as many as 6 million farmers, workers, farm dwellers and labour tenants depend on agriculture for their livelihoods (De Schutter 2012).

South Africa is not well suited to crop production. Only 17% of farmland is arable, and 1.3% is under irrigation. The rest is used for grazing (DAFF 2013). In total, farming uses 80% of South Africa's land area. Prime agricultural land is

16. In one third of these households the household head reported having no income, and the greatest number of household heads were found to be in the 45-54 year age bracket (Stats SA, 2013).

17. Note that although published in 2013 DAFF statistics still refer to 1991. However, this percentage is confirmed in De Schutter (2012).

18. There is little documentation quantifying the amount and value of food consumed through traditional farming and gathering.

under threat from other uses including mining, residential expansion, industrial timber and sugar plantations, and manufacturing, but also from golf estates and game farms (DEA 2011).

International trade liberalisation and post-apartheid deregulation of agriculture have furthered and enabled considerable corporate control and consolidation in the food value chain. For example, almost 70% of the food South Africans consume is bought in supermarkets owned by five companies: Shoprite, Pick n Pay, Spar, Woolworths and Massmart. The maize and wheat seed market is owned by the US companies Monsanto and Du Pont-Pioneer. Former co-operatives established under apartheid (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 the milling industry for bread and wheat as well as the maize and bread retail sector (African Centre for Biosafety 2013; 2014).

Commercial farming is also experiencing increasing consolidation and control by fewer and larger farming entities. Although net agricultural income has grown and South Africa is self-sufficient in field crops, horticultural produce and almost all livestock (97%), the cost of farming inputs has risen steeply and production has become more capital intensive. This has resulted in job losses and the consolidation of farms into bigger units. The number of commercial farming units had dropped dramatically from about 60 000 in 1996 to just under 40 000 by 2007 (DAFF 2013). Between 1993 and 2002, 150 000 agricultural jobs were shed. Already in 2002, half of commercial farmers earned gross annual incomes of less than R300 000 per year while the top eight companies earned gross annual incomes of over R1-billion (Hall 2009). Hans van der Merwe, the Executive Director of AgriSA, is quoted as saying that only those farmers who are willing to change will survive the structural changes that are taking place in commercial agriculture: "In 10 years we can expect to see a different kind of farm. There will be shared ownership in far bigger farms with owners effectively being managers working for bigger companies. We will eventually get to a point where 1 000 farmers will produce 70% of the food" (Agripen 2013).

Adequate water and good soils are an intertwined and ongoing challenge for most farmers. South Africa is the 30th driest country in the world, with an average rainfall of 450 mm per annum. It is predicted that climate change will worsen this situation; the western three-quarters of the country will become even drier and the east will experience higher but more variable rainfall and more frequent extreme weather events. Despite this scarcity, agricultural irrigation is highly inefficient, using as much as 60% of fresh water resources (DWA 2013). Irrigation reduces soil fertility by building up salts in the soil. This salinisation has affected 260 000 ha of irrigated land in South Africa. Another 5 million hectares have been acidified as a consequence of excessive use of chemical fertilisers, which destroy soil life and organic matter (WWF 2010). Every year South Africa uses 2 million tons of fertilisers, with maize production alone accounting for 40% of this (DEA 2011). South African soils are also 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 one-third of the land currently used for cultivation and tree plantations (DEA 2011).

6

AGROECOLOGY FOR A SUSTAINABLE FOOD SYSTEM

From the perspective of social movements and organisations, including Biowatch, agroecology and the traditional and small-holder farming on which it builds has a completely different logic to the profit motive of industrial agriculture. Agroecology aims to satisfy diverse local needs through optimal use of available resources, including a small-holders' most important resource – their labour – for the collective benefit of the local community. The producer of food and the consumer are closely linked and can respond to each other's needs, and the value generated in exchange or sales is retained in the local economy. Thus the application of agroecology in terms of practices and technologies is varied; grounded in and responsive to the local environment, society and economy of that place. These practices are synergistic and intrinsically avoid or mitigate many of the problems created by the industrial food system, while benefitting society and nurturing the planet.

Taking the ecological, social and political dimensions into account, agroecology provides the principles and practices needed to transform the current food system into a more ecologically sustainable and just system.

Agroecology produces healthy and nutritious food where it is needed

Not only is more produced per hectare, but a greater variety of products are produced in an agroecological system – including building materials, medicines, fibres, fuels and foods. The food is healthy and nutritious because healthy soil provides more nutrients and no chemicals are used. Local production for local markets makes affordable and culturally responsive food accessible to communities, thus ensuring food security.

Agroecology ensures food sovereignty and livelihoods for many

Agroecology satisfies diverse local needs through optimal use of available resources, while avoiding the use of harmful outside inputs that create debt and dependency (De Schutter 2010; Parmentier 2014). In contrast industrial agriculture creates scarcity to generate profits. Multinational corporations own the inputs, and retail and distribution networks. Patents and intellectual property rights control seeds and inputs; without money one cannot use or share them. Technologies like GMOs which commodify and own life have no place in agroecology, which thrives on co-operation and sharing. 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, resilient gene pools and relationships of reciprocity which provide insurance for difficult years.

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

Biowatch specifically works with small-holder farmers, both because they are most in need of support, but also because these 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 (Altieri 2008). 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. (HLPE 2013). Furthermore, comparisons between several countries show that GDP growth in agriculture is at least twice as effective in reducing poverty compared to growth in other sectors (such as manufacturing), and the multiplier effects in the local economy are significantly higher when this growth is related to improved incomes for small-holders (De Schutter 2010).

Biowatch strongly supports women, who comprise 90% of the small-holder farmers with whom they work, because their empowerment is most beneficial in alleviating poverty. Although women produce as much as 80% of the food in sub-Saharan Africa (FAO 1997) they typically only receive 7% of extension services and less than 10% of the credit offered to small-scale farmers – possibly due to women representing only 15 percent of landholders (UN DES, 2013). However, improving women's access to these resources has the potential to reduce the number of undernourished people globally by 12-17% (FAO 2011).

Agroecology is knowledge intensive

Agroecology is knowledge intensive and "bottom-up", based on local and traditional knowledge and farmer's experimentation. Farmers learn from and mimic the natural systems in the area, to enhance the productivity of the diverse animal and plant species in the system without harming the ecological or human environment. Rather than focusing on individual species or technological quick-fixes, beneficial on-farm (or wider system) interactions are enhanced to increase the cumulative productivity of the agroecological system while reducing the need for outside inputs (De Schutter 2010; Parmentier 2014).

Agroecology is resilient in diversity

Agroecological systems are diverse in cultivated and wild species 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 agroecological 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 (FAO 1997) 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, in the centre of origin of potatoes in the Andes some communities grow as many as 178 different types (FAO 1997). Southern Africa is the centre of origin for Finger millet, Pearl millet, Sorghum and Melon (FAO 1997).

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 (Anderson and Campeau 2013). Maintaining the diversity of wild plants is also important – two thousand plant species are used for medicinal purposes in South Africa (DEA 2011), and an estimated 42% of the natural food basket of rural households in Southern Africa consists of indigenous fruits (De Schutter 2010).

Agroecology conserves water

Agroecology conserves water through plant cover and water harvesting techniques that slow run-off so it 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 and without toxic chemicals. In contrast, industrial crops are often water intensive and require irrigation, and poor plant cover and impact from machinery damage soils leading to high water losses through evaporation and run-off. This run-off carries chemical pesticides, herbicides and fertilisers into rivers and groundwater. Salinisation and toxins affect the quality of groundwater on which 65% of South Africans 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 all the oxygen, killing fish and other aquatic animals.

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. Agroecological methods also avoid tilling soils, which 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, which prevents water infiltration and causes the topsoil to wash away. Instead, cover crops and micro-organisms are encouraged that will naturally turn and fertilise soils.

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.[19]

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 (UN DESA 2013).

Agroecology cools the planet

Agroecology responds to the greatest crisis of our time: climate change. The diverse polyculture in an agro-ecological 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 (Hoffman 2011). Agroecology also helps to mitigate and reverse climate change. By focusing on local production for local consumption foods are likely to be consumed close to where they are produced and are more likely to be in season; greatly reducing the energy and resources needed for refrigeration, packaging and transport. Energy demand related to mechanisation is also reduced. Prevailing industrial agriculture uses 10 times more energy than ecological agriculture, consuming on average 10 energy calories for every food calorie produced (Hoffman 2011).

GRAIN (2011) calculated 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. 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 of 2-4%. Agroecology's biggest mitigation potential relates to the practice of conserving and building soils. Chemical fertilisers are avoided, thereby avoiding the catalysts and enormous energy consumed in the high pressure process used to make ammonia – the first step in most fertiliser production – and the nitrous oxide emissions that off-gas from fertilisers in the field. Instead, organic waste is returned to the soil as compost. This also avoids landfilling, where a lack of oxygen creates methane as organic

19. In 2004 some of the most toxic agri-chemicals, which have dispersed to and accumulated in remote areas of the globe, were banned through the Stockholm Convention on Persistent Organic Pollutants. Multinationals continued to promote their less toxic brands, but even several of these were classified as probably carcinogenic to humans by the World Health Organization in 2015, including Monsanto's blockbuster herbicide Glyphosate, which they had claimed has no long-term effects. See http://chm.pops.int/TheConvention/ThePOPs/ListingofPOPs/tabid/2509/Default.aspx. Several pesticides, including the most used herbicide Glyphosate, are classified as probably carcinogenic to humans by the World Health Organization (See http://monographs.iarc.fr/ENG/Classification/index.php).

waste decompose (Magdoff 2007). Methane and nitrous oxide have a much greater impact on the climate than carbon dioxide.

Ecological farming conserves and fits into the natural environment and minimises soil disturbance. There is over three times more carbon stored in soils than the carbon dioxide in the atmosphere (Magdoff 2007); however, 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. A portion of this goes into the atmosphere as carbon dioxide, contributing to climate change. This process can be reversed through agro-secological farming practices. GRAIN (2011 and 2014) calculated that 25% of the excess carbon causing climate change could be returned to soils, providing one of the cheapest and most beneficial ways to reduce climate emissions.

In summary, **AGROECOLOGY**:

- Is inextricably linked and embedded in the culture, traditions and knowledge of the farmers and communities in the particular area in which it is practiced.
- Encourages the participation of all members of the community (including women and youth) in identifying challenges and innovating solutions in the agri-system.
- Responds dynamically to localised climatic and resource opportunities and constraints and thus utilises diverse methods appropriate to the local environment and culture in which it is practiced.
- Mitigates climate change by increasing the carbon in soils, conserving ecosystems and avoiding fossil fuel use.
- Applies appropriate technological innovation based on an interdisciplinary approach in response to farmer-led and defined research agendas.
- Mimics nature by emphasising the interactions between plants, animals, humans and the environment within agricultural ecosystems.
- Promotes agricultural diversity, including the conservation of local biodiversity, to create a "polyculture" of many plants and animals with diverse uses rather than large "monocultures" of the same species.
- Is highly productive and resilient to natural and economic upheavals because of the many products that can be harvested in a diverse system. These include food, animal food, fibre, shelter, fuel and medicines.
- Maintains and renews the natural resource base so that these resources and the agri-ecosystems relying on these can continue to thrive into the future. Agroecology is based on the premise that communities and species within the agri-ecosystem should be inter-linked in a way that enhances the sustainability of life into the future.
- Contributes to food sovereignty by defending traditional knowledge, food, seed and land and building resistance to commodification and corporate control of the food system and productive resources. Land rights are thus a cornerstone of agroecology.
- Contributes to healthier livelihoods for food producers and better relationships between food producers and consumers.
- Provides varied, safe, nutritious, affordable, and accessible food to communities.

7

BIOWATCH AND AGROECOLOGY

Biowatch advocates for agroecology as a proven, multi-faceted approach to creating a sustainable, diverse, just food system that applies ecological principles and methods to farming, while addressing wider environmental, economic, social, cultural, and political dimensions in order to transform the industrialised food system.

Introduction to Biowatch

Established in 1999 as a public interest non-governmental organisation, Biowatch South Africa challenges industrial agriculture and demonstrates ecologically sustainable alternatives to ensure biodiversity, food sovereignty and social justice. Biowatch works with small-holder farmers, other civil society organisations and government to ensure that people have control over their food, agricultural processes and resources, and other natural resources, within a bio-diverse, agroecological and sustainable system.

The organisation's approach is two-fold:

1. Biowatch works simultaneously at policy level and directly with projects on the ground involving small-holder farmers. This means that any policy interventions are grounded in the experiences of rural people working the land, rather than in a think-tank vacuum.
2. Through the policy work, farmers become more aware of their context, of what needs changing in our society, of their collective power, and of the need to ensure the accountability of decision makers in a democracy. In this, Biowatch serves to provide multiple linkages to all its stakeholders, and this approach serves to orient the organisation in a clear commitment to securing small-holder farmers' rights.

Biowatch's work currently encompasses three interconnected aspects:

- ***Advocacy and research***
  Lobbying nationally and regionally for agroecology and biodiversity conservation in support of farmers' rights, food and seed sovereignty and social justice, and against destructive industrial technologies such as GMOs.

- ***International experience sharing***
  Creating solidarity with others working on food sovereignty and environmental justice; contextualising Biowatch's work within global struggles through regional and international networking, events and farmer exchanges, and the Seed and Knowledge Initiative (SKI).

- ***Promoting agroecology***
  Working towards food sovereignty where the control of seed and land remains in the hands of farmers, and the land is used in an ecologically sustainable way.

Biowatch gained wide public prominence in 2009 with its Constitutional Court victory. What's become known as "the landmark Biowatch Case", one of the most quoted cases in recent South African legal history, clarifies that in future, public interest litigants acting in good faith will not have to fear that costs will be awarded against them.

Biowatch's battle with the South African state and Monsanto

The establishment of Biowatch in the late 1990s coincided with both a fundamental transformation in environmental governance and the proliferation of GM crops in South Africa.[20] By 2000 there were five commercial releases of GMOs and 175 field trials were underway.

> "It was astounding just how much was going on without the public's knowledge. South Africa's lax regulatory framework, strong commercial seed sector and active scientific lobby had, without public consent, positioned the country as the biotechnology hub of the African continent" (Wynberg and Fig 2013:18).

In 2001, after repeated attempts to access information were ignored, Biowatch used the constitutional right to state information to take legal action against the National Department of Agriculture. In a surprise move the biotech multinational Monsanto entered the case on the side of the state. The ensuing nine-year-long legal battle nearly crippled the organisation. Although Biowatch effectively won the case,[21] the judge ordered the NGO to pay Monsanto's legal costs. Instead of allowing a dangerous precedent to be set for law suits in the public interest, Biowatch appealed the judgment. The appeal process continued all the way to the Constitutional Court where justice finally prevailed in 2009.

Despite the enormous strain placed on organisational resources and those involved, Biowatch tenaciously continued to support the rights of small-holder farmers and biodiversity, while advocating against the injustice of the industrial agriculture model (Wynberg and Fig 2013). However, the Biowatch Board and staff felt strongly that advocacy also needed to include a sustainable alternative to the industrial model. In 2003 Biowatch employed two field staff to support small-holder farmers implementing sustainable agriculture alternatives. For a time this work took place in Limpopo, KwaZulu-Natal and the Eastern Cape provinces, but with the constraints imposed by the court battle Biowatch made a decision to focus on-the-ground support in northern KwaZulu-Natal.

Promoting agroecology in northern KwaZulu-Natal

Projects in the areas of KwaNgwanase, Pongola, Ingwavuma, Tshaneni and KwaHhohho in the northern part of the KwaZulu-Natal Province currently link Biowatch to more than 600 small-holder farmers, of which approximately 90% are women. The high participation of women is not forced, but is a reflection of women's keen interest in farming to secure their family's food security.

Biowatch's approach to agroecology is representative of the broad principles of agroecology, encompassing both the ecological and socio-cultural aspects discussed earlier, and includes the following processes:

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20. For a detailed and historical account of this period – as well as Biowatch's role in raising the alarm and the public's awareness about the rapid expansion of genetic engineering in South Africa – see Wynberg, R. and Fig, D. 2013. *A Landmark Victory for Justice: Biowatch's Battle with the South African State and Monsanto*. Biowatch South Africa. 16-22. Available: http://www.biowatch.org.za/docs/misc/2013/A%20Landmark%20Victory%20for%20Justice.pdf.

21. The judge ordered that Biowatch had a constitutional right to 8 out of 11 categories of the requested information, that access to this information was in the public interest, that Biowatch had been forced to go to court to get the information, and that granting such access was a necessary part of the correct administration of the GMO Act.

Farmer-centred training and support

Biowatch provides training and facilitates farmer-to-farmer support and exchanges so that farmers can improve their methods. This is not top-down: farmers' traditional knowledge, experience, learning and sharing are central. Training events are in some instances farmer-led, and at the very least, are farmer-directed in terms of the skills they wish to learn. Farmers are self-organised as farming projects and associations in each area in ways that suit the members of each group. Within these larger associations, Biowatch encourages farmers to work together in smaller groups of five members to provide week-to-week mutual support and learning.

Agroecological practices

Biowatch supports farmers to firstly consolidate their own home food security, and secondly to increase surplus production, by strengthening agroecological practices based on their own traditional farming knowledge. In this way farmers fine-tune their agroecological methods while gaining the confidence for farming larger plots and participating in communal market gardening projects.

To facilitate farmer commitment to agroecology, Biowatch has distilled its approach into eight simple practices that each farmer can apply to their farming. These practices are also used to measure the extent to which individual farmers have adopted agroecology.

Agroecological Practices:

1. No synthetic fertilisers
2. No synthetic pesticides, insecticides or herbicides
3. No GMOs
4. Composting
5. Fertility beds (including trench gardens, and single and double-dug beds)
6. Use of grey water
7. Mulching
8. Saving the seed of at least 14 traditional varieties

The practices on each farm are more nuanced, linking together to fulfil the five main ecological principles of agroecology described on page 8. They are also adapted to the planning of the homestead which combines aspects of modern functionality with traditional spatial relationships relating to gender roles, systems of respect and security for livestock.

The size of farms is typically not more than two hectares. In general each farmer has an area dedicated to crop production in the vicinity of the homestead. This area may be divided according to production needs: home vegetables, growing of cereals and slower maturing plants that require less water, fodder plants, an area for creeping squashes and melons, and plots grown specifically for market crops and seed production. These are intensely inter-cropped and change through the seasons. There may also be an area dedicated to bulk composting using garden wastes and animal manure.

Soil fertility is also built in other ways: trenching methods where organic matter is built into beds; composting bags around the edge of the garden; as well as soil-improving cover crops and nitrogen fixing trees and legumes along plot boundaries. Fruit and nut trees are increasingly being incorporated around homesteads, or in an orchard area. The homestead also includes enclosures for securing livestock at night (including cattle, goats and chickens) that free range in communal lands.

Why no GMOs?

The biotechnology industry claims that GMOs help farmers to grow more and healthier food, but this is not true. GMOs are usually based on hybrid plants and thus have the production advantages and disadvantages associated with these. Many commercial GMOs are currently designed to create their own pesticide in every part of the plant, or make them resistant to spraying with chemical herbicides. An increasing number of scientific studies are finding that the genes added to these GM plants, and the alteration of the crop's DNA, are dangerous in several ways. These include, amongst others, damage to human and animal health, passing on unwanted genes to bacteria, damage to soil life, increase in the use of toxic herbicides, killing of beneficial insects, and the build-up of resistance in pest plants and insects to create "super pests or weeds" that can't be controlled. GMOs are patented and may not be replanted without paying patent fees to the company that owns them. The particular herbicide of resistant GMOs must also be bought. This makes farming with GMOs even more expensive and increases farmer debt.

Revival of traditional knowledge and crops

The validation and revival of traditional agricultural knowledge and practice is at the heart of Biowatch's approach. Promoting household seed saving and banking, especially of traditional crop varieties, is central to this. These traditional foods are celebrated as part of the community's heritage.

The seeds are "banked" in readily available containers: glass bottles of various sizes and buckets with lids for large seeds. Farmers in the Pongola area have also recently constructed granaries from available materials to store their maize harvest, including maize for grinding as well as seed for the next season. Training on seed banking has included improving skills in seed collection, breeding, selection, harvesting, multiplication and storage. Traditional crop species grown and banked have now grown to 20 and include beans (*Phaseolus vulgaris),* calabash (*Lagenaria siceraria),* cassava (*Manihot esculenta*), cow pea *(Vigna unguiculata),* finger millet (*Eleusine coracana),* jugo bean *(Vigna subterranea),* maize (*Zea mays),* mung bean (*Vigna radiata*), peanut (*Arachis hypogaea*), pearl millet *(Pennisetum glaucum),* pigeon pea *(Cajanus cajan),* pumpkin (*Cucurbita maxima*), sesame (*Sesamum indicum*), sorghum (*Sorghum bicolour*) and sweet sorghum, taro/amadumbe *(Colocasia esculenta),* water melon (*Citrullus lanatus*) and sweet water melon, and Zulu potato *(Solenostemon rotundifolius).*

On-farm seed saving from season to season is crucial. It is this ongoing and dynamic process, combining farmer-influenced and natural selection, that ensures adaptation to local growing conditions and cultural preferences, as well as ensuring that traditional farming systems are resilient and flexibly respond to stress. On-farm saving not only conserves the biological heritage in the seed, but also inherited knowledge of seed storage, processing, crop cultivation and preparation of the food.

Spiritual practices weave cultural tradition and identity into agricultural practices that contribute to the context in which food is understood and produced. Ceremonies include asking for rain and blessing of seeds and fields to ensure a good harvest. There are also rituals related to the exchange of seed, which strengthen community networks through the reciprocal bonds that are created. Seed blessing and exchange ceremonies are thus vital occasions in Biowatch's annual calendar where both the farmer's individual skills and the groups' traditional knowledge is showcased and celebrated.

Facilitating markets

Ongoing improvements to farming methods and seed security have ensured that farmers have steadily increased their production. Some groups have secured land in addition to their homestead gardens for communal projects. Farmers exchange and sell their surplus, mostly within their communities to neighbours, groups such as school

teachers, hawkers and at pension pay points. Biowatch has also been supporting farmers' aspirations to enter the 'formal' market by building capacity on developing a participatory guarantee system (PGS) to build consumer confidence in their organic produce, establishing marketing committees and negotiating formal sales agreements with retail outlets. Even without these formal agreements several groups are already selling to supermarkets.

Monitoring and evaluation

Monitoring of the progress being made and evaluation of innovations is also participatory. The farmers are involved in developing methods that are inclusive, not too onerous, and accommodate members who are not literate. Farmers have also been involved in establishing the minimum requirements for being recognised as an agroecological farmer by the group, and have taken part in a process of peer assessment within and between project areas to review each other's farming practice and award agroecological certificates of compliance to those meeting the high standards of practice set by the group.

Scaling up agroecology?

Biowatch is frequently asked, "but can agroecology be scaled-up?" Biowatch specifically works with small-holder farmers, both because this is where the need is, but also because small farms are optimal for agroecological production. When small-holder polycultures are compared with large industrial monocultures, the productivity in terms of harvestable products per unit area in small farms is higher by 20% to 60%, and are economically more efficient because fewer inputs are bought (Altieri 2008). Direct comparisons were made in the Argentinean Pampa, and the value per unit area of small-holder production is on average 1.5 times (and up to 5 times in some regions) greater than that of large-scale producers. Similar comparisons can be found in Brazil (HLPE 2013). Small farms also contribute more to the local economy in terms of permanent jobs and per capita income (Altieri 2008).

The agroecology movement supports land rights and social equity. Rather than having massive land holdings converted to agroecology we want to see the dismantling of this consolidation and the land returned to small-holder and family farmers. Agroecology can be applied globally because it is a holistic approach that translates ecological principles into locally appropriate practices based on the specific socio-economic, environmental and cultural context of that place. Thus for Biowatch "scaling-up" is about extending the awareness and knowledge of agroecological principles and systems to many more community and small-holder farmers, as well as working to change the policy and economic context to foster agroecological farming and food system transformation.

Onwards to food sovereignty!

Biowatch advocates for agroecology as a proven way to farm with nature that is empowering to farmers and enables food sovereignty – local community control over our food and the way it is produced.

Biowatch's approach to agroecology fosters food sovereignty in four key ways:

1. Improved agroecological practices make the most of on-farm resources that free the farmers from the need to buy external inputs, thus avoiding unnecessary costs and debt.
2. Seed saving and household seed banks ensure tangible future food security.
3. Farmers' rights to decide what they want to grow (traditional foods) and how, is affirmed and supported.
4. Farmers conserve and have control over their land, productive resources, biodiversity and cultural heritage.

Despite the proven benefits of an agroecological approach, agribusiness corporations continue to influence governments and structure the global agricultural system in a way that commodifies food and makes farmers

dependent on their toxic inputs. This industrial agriculture is altering the climate and laying waste to the soil, water and biodiversity we depend on. A system change is needed.

In South Africa Biowatch has lobbied against policy and legislation that compromises the rights of small-holder farmers and the environment, advocating for agroecology. The Department of Agriculture, Forestry and Fisheries released a draft Agroecology Strategy for South Africa for public comment in 2012. Having been through several revisions and a constrained public consultation process, and with no prior policy to ground it, the strategy seems to have stagnated at Draft 7. Rather than taking bold steps to integrate agroecology as a key approach to rural development, the strategy located agroecological farming as a niche sector for select markets; and government continues to support agribusiness in making inroads into our rural areas. Biowatch is disappointed at this missed opportunity, and calls for political commitment to agroecology, with the aim of food sovereignty, as the essential way to feed the nation without destroying the natural resources on which we depend, and bring meaningful rural development to the 2.5 million small-holder farmers in South Africa.

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