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## Climate Change, Food Security and Agroecology



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Editor:  
**Roberto Jaramillo, SJ.**

Associate editors:  
**Eric Velandria, SJ.**

Publication coordinators:  
**Milton Mervin Raj, SJ.**  
**Rossana Mattei**

Translators:  
**José Maria Bernal SJ.**  
**Bernard Goubin SJ.**  
**Christine Gautier**  
**Nils Sundermann**  
**José Lozano Gotor**  
**Daniella Persia**

Graphic Design:  
**Isabel Valdivieso**

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**Social Justice and Ecology Secretariat (SJES)**


General Curia of the Society of Jesus Borgo Santo Spirito 4,  
00193 Rome.

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# AGROECOLOGY ON THE HORIZON OF IGNATIAN SPIRITUALITY

Roberto Jaramillo, SJ

Secretary SJES, April 2025



Social  
Justice and Ecology  
Secretary

Ignatian spirituality helps us to find and encounter a God who is present and recreates the world through human action. It invites us to experience God by building new realities marked by harmony, justice, solidarity, forgiveness and temperance. It is a call that requires commitment and creativity to imagine, generate and implement new realities. Refusing to do so might perpetuate a perception of a God who is remote, detached, and uninterested in human activities, including how we work, produce, consume, and live.

The creation that comes to us from God's hands is sacred. All things are good and beautiful; He made them and entrusted them to humanity so that we might find well-being, meaning, and fulfilment in their care. We are invited to "use" creation as much as it helps us express love and care for nature and love and be in solidarity with the most vulnerable.

In this way, Ignatian spirituality responds to a world and a civilization in crisis thanks to its capacity to offer us a solid experience of the love of a God who, to save us, becomes incarnate in all the realities of the world and invites us to continue to work joyfully for the re-creation of a "new heaven and a new earth" where love can reign fully.

Science, technology, and knowledge are appropriate for this purpose and should be used to the extent that they help to preserve the sacredness of creation and consolidate relationships of fraternity and justice with the whole of creation. However, it is important to acknowledge that scientific advancements have, at times, been utilized for deepening war, intensifying hatred and conflicts, perpetuating injustices, and exacerbating environmental degradation.

Today, an ecological dimension of sin brings Ignatius's vision in the Exercises up to date. The inappropriate and abusive use of nature and its creatures has created new hells in which millions of people seem to suffer forever. Creation, patient with human beings (in the double sense of waiting and suffering), suffers the consequences of a perverted relationship.

Our ethical position, both individually and collectively, is resolved not only within the limits of scientific content and debate but also through Ignatian indifference; that is, in addition to conclusive scientific data, we need to embrace and nurture the gift of interior freedom received from the Spirit in an attitude of detachment from inordinate attachments and undue accumulation; living a just relationship with all of creation, respecting our interconnectedness. It is not enough to know what to do. We must open ourselves to the gift of being transformed into THE Creator's co-creators.

We dedicated this volume (137) of *Promotio Iustitiae* to exploring the challenge of climate change and its political and social consequences for food sustainability and agroecology in today's world through weekly online discussions for nine consecutive months. We also presented some of the responses (experiences and testimonies) of the apostolic body of the Society of Jesus aimed at remedying, adapting to, or mitigating the effects

of climate change effects. We have also located and published online articles from past issues of *Promotio Iustitiae* that are directly related to the topic and remain relevant and insightful. We invite you to visit that collection at <https://www.sjesjesuits.global/>

In communion with all creatures, we are all invited to become aware of the realities of pollution and erosion, the contamination of water, soil and food, the overexploitation of natural resources, the disruption of natural balances and their manifestation in natural disasters; we are all invited to listen to what the millions of landless peasants, those displaced by the violence of war and the injustice of economic models, those who denounce the social, economic, political, cultural and ecological perversions of a civilization in crisis, are saying. For this, we need the natural and social sciences.

But the fundamental call is to accept the invitation that The Creator and his creatures give us, also through the General Congregations, to find in ecological balance and the sustainable and equitable use of natural resources an expression of reconciliation and justice with all forms of life in this global village and with future generations.



# FOOD INSECURITY, FINANCE, AND GENERATIVE AGRICULTURE

## Section 1: Why finance promotes famine and hinders agro-ecology

Food insecurity and agricultural finance are closely linked, forming a complex web of interdependencies that influence the ability of populations, particularly the most disadvantaged, to access sufficient, sustainable food. This interdependence could lead to large-scale chronic famines in the years ahead. However, measures are available to us to avoid the worst, notably through financial regulation, management of agricultural resources as commons and the use of generative agriculture.

The essential link between food security and market finance lies in the financialization of international trade in agricultural products. This is where we'll start. Then, we'll look at how, globally, reforms of the financial system, coupled with the implementation of agro-ecological programs centered around the management of resources as commons can help avoid the worst. Finally, I will suggest how original financing solutions for generative agriculture could simultaneously combat global warming, halt chronic famines and restore natural ecosystems endangered by urban expansion and agro-industry.

Appalling famines have already been caused by extreme climatic events, combined with the negligence of the (colonial) public authorities of the time: witness the devastating consequences of the series of El Niño phenomena which, in the early 1890s, ravaged Brazil, sub-Saharan Africa, India and China.<sup>1</sup> The question facing the international community today is therefore to find ways of ensuring that this tragedy is not repeated.

<sup>1</sup> Mike Davis (2001) *Late Victorian Holocausts: El Niño Famines and the Making of the Third World*, Verso Books, estimates the death toll at between 30 and 60 million.



**Gaël Giraud, SJ**

French Jesuit, trained in mathematics (PhD), theology (PhD), and economics. He served as chief economist and executive director of the French Development Agency and founder of the Environmental Justice Program at Georgetown University. Senior researcher at the French National Center for Scientific Research and a collaborator at the Centre Avec and the Forum Saint-Michel (Brussels).

## I. Food insecurity and HANPP

Food insecurity remains a major global problem: according to the State of Food Security and Nutrition in the World report, around 733 million people will face hunger in 2023, equivalent to one in eleven people worldwide, a significant increase on the 690 million in 2019. Global hunger levels have plateaued for three consecutive years, with a notable increase in undernourishment compared to previous years.<sup>2</sup> On the other hand, the World

<sup>2</sup> <https://tinyurl.com/4spnure4>



Food Program reports that 309 million people are facing acute hunger, underlining the severity of the global food crisis.<sup>33</sup>

The causes are multiple and, alas, well known. They include armed conflict, climate disruption, and endemic poverty, and financial crashes<sup>4</sup>. What's more, according to the Global Food Crisis Report (GFCR) 2024, 208.3 million people are expected to experience high levels of acute food insecurity in 2024.<sup>5</sup> Geographically, the African continent faces the highest levels of hunger, with around 20% of its population affected.<sup>6</sup> With between 1 and 1.5 billion additional people expected to live there over the next generation, it's hard to see how these problems of under- or malnutrition could spontaneously resolve themselves in this continent. In Asia, stable but significant challenges persist, with about 8.1% of the population facing hunger.<sup>7</sup> In Latin America and the Caribbean, the 2023 Regional Overview of Food Security and Nutrition report indicates that approximately 6.5% of the population suffers from hunger, amounting to about 43.2 million people. The stagnation in progress, or even regression, towards achieving Sustainable Development Goal 2 (Zero Hunger) is alarming. With just a few years left until the target date of 2030, urgent action is obviously required.

## 1.2. Global water demand gap

The lack of access to drinkable water is one of the key drivers for the famines looming in the world. Moreover, as 70% of fresh water used by humans worldwide are consumed for agricultural purposes, access to fresh water is a must for the development of agriculture.

By 2030, aggregate water demand is expected to increase by 40%, primarily driven by population growth, industrialization, and agricultural needs. This increase will lead to a significant supply-demand gap if current consumption patterns and management practices continue unchanged.<sup>8</sup> At the regional level, the Middle East and North Africa are expected to face extreme water stress, with projections indicating that 100% of the population will live under conditions of high water stress by 2050.<sup>9</sup> By 2030, China's total water consumption is projected to reach the limit of available resources, highlighting a critical supply-demand imbalance.<sup>10</sup> As for the global urban population facing water scarcity, it is projected to increase from 933 million in 2016 to between 1.693 billion and 2.373 billion by 2050. This represents a significant rise in urban areas where demand exceeds available supply.<sup>11</sup>

The projected water demand gap highlights an urgent need for improved water management

3 <https://www.wfp.org/global-hunger-crisis>  
4 <https://tinyurl.com/2p9sbeaf>  
5 <https://www.heifer.org/blog/understanding-global-hunger-and-food-insecurity.html>  
6 <https://tinyurl.com/2p84du2b>  
7 <https://tinyurl.com/ycxhd2i7>

8 *Charting Our Water Future*, McKinsey report, 2009.  
9 *Idem.*  
10 <https://pmc.ncbi.nlm.nih.gov/articles/PMC7932088/>  
11 <https://www.nature.com/articles/s41467-021-25026-3>

strategies, investment in infrastructure, and sustainable practices across various sectors. Without significant changes, many regions will face severe challenges related to water availability and quality in the coming years. Many human beings can live with no electricity, some of us can survive with no food for a few days, nobody can survive without water.

### 1.3 HANPP

Many regions of the world consume agricultural products that they do not produce locally. They are therefore dependent on international trade for their supplies. One way of measuring this dependence is to quantify HANPP (Human appropriation of Net Primary Production). This is an indicator that measures the proportion of “natural” primary biomass production (NPP, Net Primary Production, made possible by photosynthesis of solar energy<sup>12</sup>) that is diverted by human activities. Either because it is extracted by humans (e.g., when we eat vegetables or salad), or reduced due to changes in land use (e.g., when we build a house or a parking lot which, by artificialising the soil, prevents it from converting solar energy into biomass).

Generally speaking,

HANPP varies considerably around the world, depending on the intensity of land use and agricultural practices. However, it tends to be higher in industrialized countries and densely populated areas.

1. On a global scale, HANPP is estimated to account for between 20% and 30% of total terrestrial NPP, but this figure may vary according to the studies and methodologies used. No one knows exactly where the HANPP threshold lies, beyond which what we take from “nature” will prevent natural eco-systems from reproducing. This threshold certainly depends on nitty-gritty of the local reproductive conditions of each ecosystem. However, one thing is certain:

12 We're talking here “only” about biomass (measured in kg of carbon)-not biodiversity. The latter is a much more complex notion. However, it is clear that there can be no biodiversity without a minimum amount of biomass.

it has already been crossed for certain eco-systems, such as the edible fish fauna in most of our oceans. So much so, in fact, that some oceanologists anticipate that the breakdown of the trophic chains responsible for the reproduction of these fish, caused in particular by industrial deep-sea overfishing, pollution, and habitat loss, could see the disappearance of edible fish from our seas by 2050.<sup>13</sup> They will then be replaced by jellyfish.<sup>14</sup>

2. Regions with intensive agriculture or heavy urbanization generally have higher HANPP values. Conversely, preserved forest areas and sparsely populated regions tend to have lower HANPP values.

Figure 1<sup>15</sup> shows the probable evolution of HANPP linked to the consumption of agricultural products worldwide (called cHANPP) between 2000 and the projected figure for 2050.

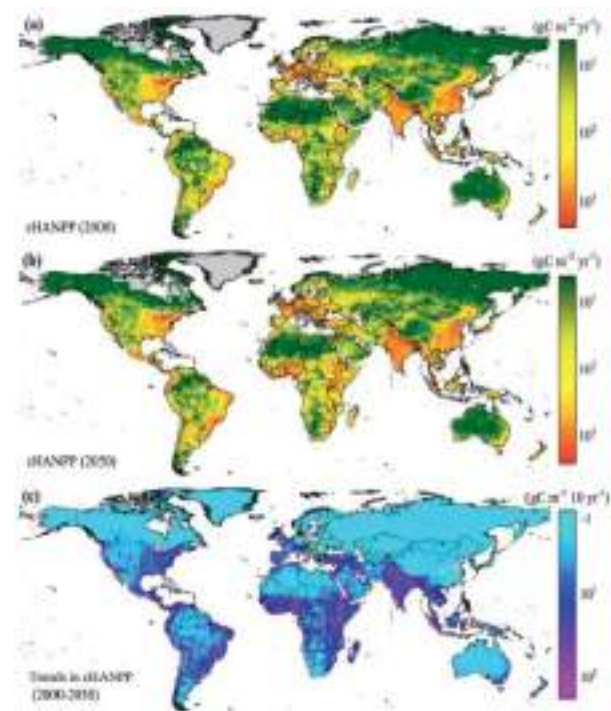


Fig. 1 HANPP linked to consumption (2000-2050)

13 Worm, B., et al. (2009). Rebuilding global fisheries. *Science*, 325(5940), 578-585.

14 The response from some of my economist colleagues that this will provide the right incentives for fish farming, which will boost GDP, is simply irresponsible.

15 Ma, T., Zhou, C., & Pei, T. (2014). Simulating and estimating tempo-spatial patterns in global human appropriation of net primary production (HANPP): A consumption-based approach. *Ecological Modelling*, 291, 51-59.

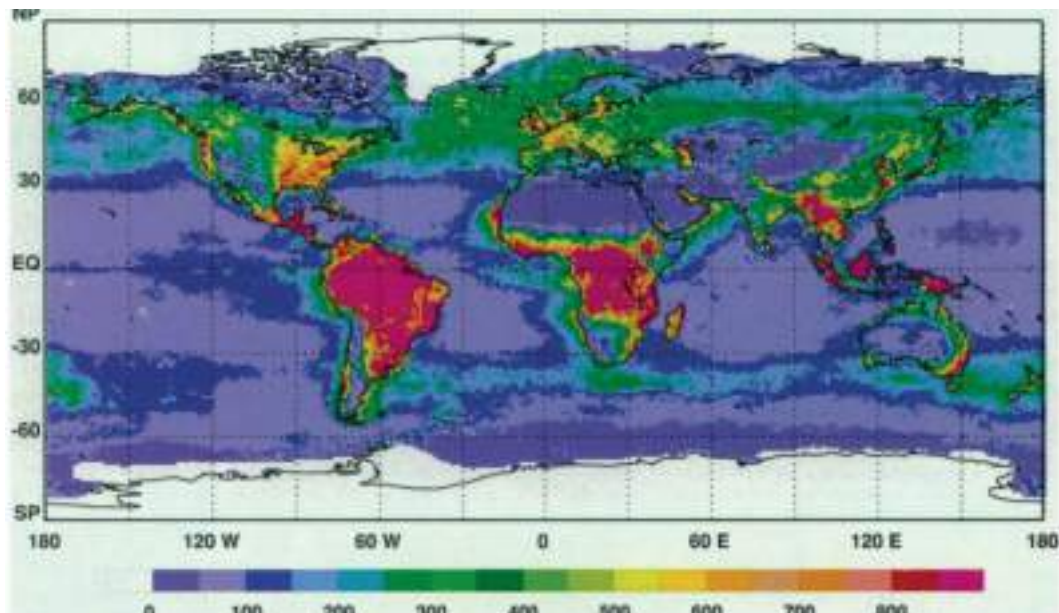


Fig. 2 Annual production of biomass (in grams of carbon per annum and m)

As shown in Figure 1, South Asia, Central Africa and parts of South America will most likely experience a significant increase in consumption-related HANPP over the coming decades. On the other hand, although the human population is expected to continue to grow in Eastern China and Southern Africa over the two coming decades (and to decline later on), HANPP is likely to decrease in these regions due to foreseeable improvements in agricultural technologies used in these areas by mid-century. A decrease in HANPP is also expected in Europe, Russia and Japan, mainly due to improvements in technology. The increase in HANPP in India, North America and South America is likely to result from two key factors: human population growth and rising per capita consumption. Finally, in most African countries, the increase in HANPP will probably result not only from the explosion in human population, but also from the intensification of the impact of agriculture on ecosystems, due to the low level of exploitation of natural resources in these regions today.

Of course, these are forward-looking scenarios which, as always, need to be interpreted with caution, but they nonetheless point to major trends. They suggest that the net loss of biomass caused by human appropriation could increase continuously over the coming decades, mainly due to the marked increase in the world's population and per capita consumption of forest and agricultural products.

This would not be entirely offset by the foreseeable increase in potential terrestrial NPP induced by global warming (just think of Alaska or Siberia, where some rather optimistic scenarios envisage the deployment of agriculture favored by melting permafrost<sup>16</sup>). Improvements in agricultural techniques can partially mitigate the negative impacts of human appropriation of natural resources on terrestrial ecosystems, particularly in developed and developing countries. But this improvement will be partial at best, and it would be irresponsible techno-optimism to consider that the problem of food security has already been solved thanks to technical progress. Especially since, as the debate among American economists about “secular stagnation” has shown, no one sees any technological breakthroughs on the horizon in the next two or three decades.<sup>17</sup>

As can be seen in Fig. 2,<sup>18</sup> comparison with the annual photosynthetic biomass production map

16 Such scenarios are overly optimistic, as the melting permafrost, while freeing up huge potential areas for agriculture, could also release a huge quantity of methane currently held captive as well as old, extinct pandemics (anthrax, etc.). Global warming could then accelerate to catastrophic proportions under significant health stresses analogous to COVID19.

17 Summers, L. H. (2014). U.S. economic prospects: Secular stagnation, hysteresis, and the zero lower bound. *Business Economics*, 49(2), 65-73. In particular, AI cannot be counted among the factors of net technical progress for humanity as a whole (even if its intelligent use enables the analysis of a large amount of data useful for agriculture), cf. Alombert, A., & Giraud, G. (2024). *Le capital que je ne suis pas ! Mettre l'économie et le numérique au service de l'avenir*. Fayard.

18 Field, C. B., Behrenfeld, M. J., Randerson, J. T., & Falkowski, P. (1998). Primary production of the biosphere: integrating terrestrial and oceanic components. *Science*, 281(5374), 237-240.



suggests that a growing discrepancy between human demand and ecosystem supply will most likely occur in densely populated regions, notably northern India, eastern China and the Wuhan region, the south-western Arabian Peninsula, the southern half of the Japanese archipelago and the island of Java. In these regions, external supplies of agricultural products are imperative, and will remain so in the future, to satisfy the needs of the local human population and support the development of ecosystems. This is where international trade in agricultural products comes into play in a way that is decisive for the survival of these regions.

What's more, the positive net balance between the potential aggregate supply of biomass from terrestrial ecosystems and human demand for photosynthetic products could be *reduced* after 2050, when the net productivity of terrestrial ecosystems is expected to decline as a result of increased ecosystem respiration induced by climate warming. In other words, today's chronic famines are essentially a problem of poor distribution of agricultural production which, in itself, would feed the whole of humanity. In all likelihood, this will continue to be the case until 2050. In the second half of this century, however, this could become less and less the case: famines could well become the consequence, not just of massively unequal distribution problems, but also of insufficient net aggregate agricultural production. It's hard to imagine what such a situation would generate in terms of international tensions and conflicts.

## II. International agricultural trade and finance

In addition to the causes alluded to earlier, the financialization of international trade in agricultural products is one of the major causes of current and future food disasters.

Market globalization accelerated sharply in the 1980s, with the introduction of structural adjustment programs in many developing countries, further opening up their agricultural markets. The Uruguay Round (1986-1994) led to the creation of the World Trade Organization (WTO) in 1995, integrating agriculture into multilateral trade negotiations for the first time. International agricultural trade then grew significantly, from a flow of around \$570 billion in 2000 to over \$1,500 billion in 2019. Emerging countries such as Brazil, China and India quickly became major players in world agricultural trade. At the same time, the development of global value chains has transformed the nature of agricultural trade, with an increase in trade in processed and intermediate products. However, the main transformation of the global agricultural commodities market in the early 2000s concerns its relationship with globalized financial markets.

### II.1. Financial derivatives on commodities

The financialization of the agricultural sector can be seen, first, in the explosion in the volume of transactions on commodity derivative markets, particularly in the agricultural sector. In the late 1990s, commodity trading on financial markets was marked by an increase in the participation of institutional investors, such as pension funds and hedge funds. Since then, commodity markets, particularly agricultural commodities, have become a preferred investment ground for a variety of financial players, with increased trading on dematerialized platforms and greater use of derivative instruments. These instruments enable financial players to speculate on the future prices of agricultural products and invest massively in land acquisitions, often to the detriment of local farmers.

The volume of transactions on the financial markets for agricultural derivatives is often greater

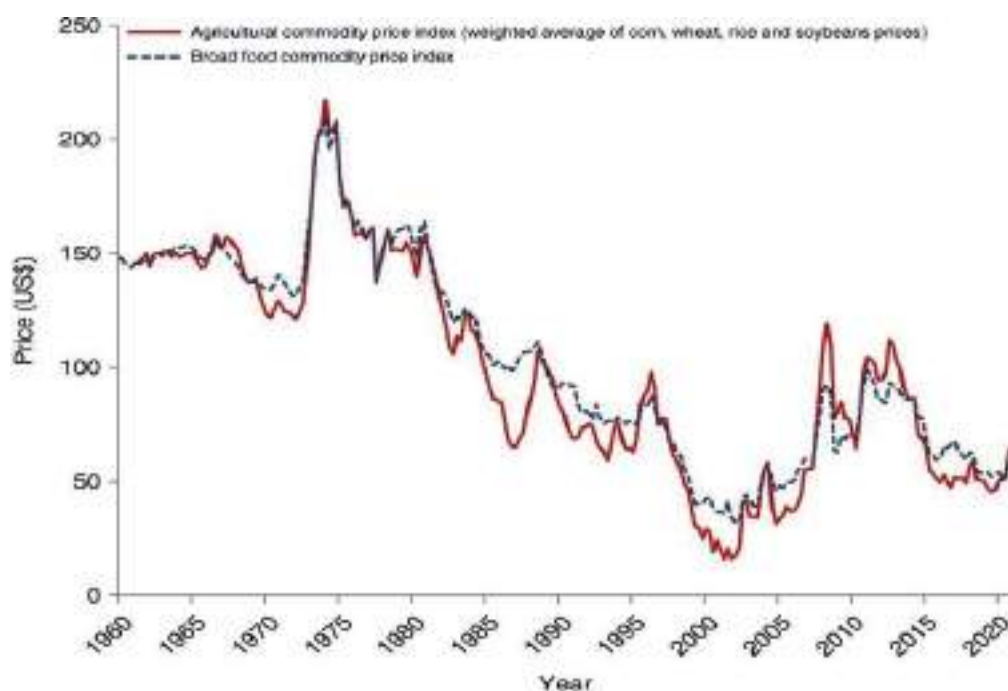


Fig. 3 Agricultural commodity Price Index (1960-2020)

than that on the spot market for the underlying commodities.<sup>19</sup> On the Chicago Board of Trade, for instance, financial actors dominate, holding about 74% of the open positions in wheat futures. This highlights a much higher volume of transactions in derivatives compared to the spot market.<sup>20</sup> More globally, it is well known that the overall volume of commodity derivatives trading far exceeds that of physical commodity trading. For example, in 2021, global commodity derivatives markets saw volumes reaching several trillion dollars, reflecting a trend where derivatives trading is often over 10 or 20 times larger than physical transactions.

As a consequence, agricultural commodity prices are no longer dictated by the supply and demand of spot products, but by the speculative supply and demand of derivative financial assets. This financialization has been forcefully denounced, among others, by Pope Benedict XVI.<sup>21</sup> It has never been regulated by the WTO, as the financial sphere is not part of the organization's mandate. As a result,

the WTO can only watch helplessly as commodity markets evolve, the ins and outs of which are largely beyond its control.

Indeed, the financialization of the agricultural world has led to great volatility in international agricultural prices (as shown in Fig. 3), to the detriment of farmers and consumers in developing countries, who have no means of protecting themselves against the new risks caused by this volatility (whereas companies in the North have access to financial markets to find assets to protect them). In other words, financialization has created a new risk (that of sudden, uncontrollable price variations) which the "poor" (and not the "rich") are powerless to face. Secondly, it has created new opportunities for capital accumulation by financial elites, consolidating the power and wealth of financial players within the food system. What's more, the quest for high returns for investors (often 10%/year in economies where GDP growth does not exceed 3% per year, which requires finding niches at least three times more profitable than the average) has encouraged the development of large-scale industrial agriculture to the detriment of small-scale farmers.

19 European Parliament. (2024). *The role of commodity traders in shaping agricultural markets*. Policy Department for Structural and Cohesion Policies.

20 <https://tinyurl.com/yzfmuzkk>

21 In his Address to FAO on the Occasion of the World Summit on Food Security, Nov, 16 2009.

Yet, as is well-known, it's the small farmers who feed humanity. According to the FAO, over 90% of farms are managed by an individual or a family, and rely mainly on family labor. These family farms produce 70 to 80% of the world's food. Smallholders", on the other hand, are those who work on less than 2 hectares: they are currently forced to occupy less than a quarter of the world's agricultural land, even though they produce around a third of agricultural products.<sup>22</sup> They therefore have an average productivity at least 33% higher than that of large farms! The majority of these small-scale farmers are women.

In many parts of the world, however, small farms are disappearing as a result of the financialization of agriculture, while large farms are expanding at the expense of agricultural productivity, which is bound to decline. Unfortunately, institutions such as the World Bank have accelerated this process. In Brazil, for example, a land titling program supported by the World Bank led to the privatization of 4 million hectares, threatening to evict 11,000 farmers in favor of international companies. The World Bank's "Maximizing Finance for Development" (MFD) approach promotes the use of public resources to attract private investment in the agricultural sector of developing countries.

Last but not least, small farms are the most likely to implement solutions inspired by agroecology in particular, regenerative agriculture.

## *II.2. Obstacles to the transition to regenerative agriculture*

It is estimated that expanding regenerative farming practices worldwide could remove between 15 to 23 gigatons of CO<sub>2</sub> from the atmosphere by 2050.<sup>22</sup> This represents 4% to 8% of the global quantity of CO<sub>2</sub> emitted by agriculture since the beginning of the industrial revolution and still trapped in the atmosphere today. Furthermore, some studies suggest that RA could sequester over 60 million metric tons of carbon annually in specific regions, such as California.<sup>23</sup> In the long

run, RA could potentially remove between 100 to 200 gigatons of CO<sub>2</sub> from the atmosphere by the end of the century if widely adopted -- nearly 60% of the global quantity of CO<sub>2</sub> emitted by agriculture since the beginning of the industrial revolution and still trapped in the atmosphere today.<sup>24</sup>

The financial challenges associated with regenerative agriculture (RA), however, are manifold. Firstly, high initial investment costs make adoption difficult. Small farmers in particular often struggle to cover these transitional expenses.<sup>25</sup> What's more, yields fall during an initial adjustment period, before rising again. This temporary drop in production can last 3 to 5 years, which is financially destabilizing for small-scale farmers.<sup>26</sup> Despite higher yields and margins in the long term, this high initial cost leads many investors to neglect RA, in favor of immediate returns rather than long-term investments. Consequently, there is a lack of real financing solutions to support the transition.<sup>27</sup> Of course, one may hope that markets will soon recognize the value of products from RA but this depends upon the recognition of certification options: for the time being, there is a lack of clear standards for RA and the multiplicity of certification options create uncertainty.<sup>28</sup>

In short, the planet is about to embark on a path of biomass appropriation that will make it increasingly difficult (if not impossible) to avoid the large-scale deployment of the chronic famines we are already experiencing. RA is certainly one of the solutions for reducing agricultural emissions, sequestering carbon naturally, protecting biodiversity, empowering small-scale farmers while increasing overall agricultural productivity, and empowering women. One of the major obstacles, though not the only one, lies in financing the transition from small-scale farming to AR. It is this issue that we will examine in what follows.

<sup>22</sup> <https://tinyurl.com/yym8ch2e>  
<sup>23</sup> Idem

<sup>24</sup> <https://tinyurl.com/5n6s9h73>  
<sup>25</sup> <https://tinyurl.com/yet5xmh3>  
<sup>26</sup> <https://tinyurl.com/n8sje5j9>  
<sup>27</sup> <https://tinyurl.com/yhwr6sxf>  
<sup>28</sup> <https://tinyurl.com/bdk8rznz>



## Section 2. Scaling up regenerative agriculture: towards a “multilateralism from below”

To try to remedy some of the problems alluded to in the first section--- bearing in mind that there is obviously no universal magic solution---, scaling up RA is most probably a necessary step. In what follows, we’ll work our way up to international institutions and, in particular, financial institutions in order to understand how to overcome the obstacles to scaling up. Then we’ll go back down into the field. This return trip is in line with what Pope Francis calls “multilateralism from below” in his apostolic exhortation *Laudate Deum* (2023), i.e. a form of international cooperation that relies on the actors of civil society, rather than on political elites alone. Indeed, “the most effective solutions will not come from individual efforts alone, but above all from major political decisions on the national and international level.” (*Laudate Deum* 69)

### 1. Debt swaps for Regenerative Agriculture

Obviously, in order to scale up RA, one needs to find funding solutions targeting small farmers. The public sector would be an obvious candidate

for that purpose. As is well known, however, the amount of public debt in the Global South has reached alarming levels, significantly impacting economic stability and development efforts. The Global South is experiencing its worst debt crisis ever, with an average of 38% of government revenue absorbed by debt servicing, rising to 54% in Africa.<sup>29</sup> As a consequence, in Africa, the average person spends more on debt interest than on education or health care.<sup>30</sup> The total external public debt stock in low- and middle-income countries doubled from \$1.5 trillion to over \$3 trillion between 2010 and 2021, further straining their economies and making it increasingly difficult to finance innovative solutions such as agro-ecology.<sup>31</sup>

Consequently, there is a growing demand for a new approach to debt sustainability that prioritizes the needs of Southern countries, particularly in light of the climate crisis. Civil society organizations are advocating for unconditional cancellation of unsustainable debts to allow these countries to invest in critical areas such as health, education, and climate resilience. Of course, in the 1990s, the Catholic Church took a strong stance, through Saint John Paul II, in favor of cancelling the public

29 <https://tinyurl.com/5n83nsw9>

30 <https://tinyurl.com/zf392vs2>

31 Vasic-Lalovic, I. et al (2023) The Growing Debt Burdens of Global South Countries: Standing in the Way of Climate and Development Goals, CEPR report.

debts of Southern countries. While this is not out of the question (especially as the growing power of the China Development Bank means that the Paris Club<sup>32</sup> is under increasing threat of being replaced, one day, by the Beijing Club), such a solution remains eminently political and subject to the agenda of the major powers.

Therefore, debt-for-climate swaps seem to be a less ambitious but more realistic solution in the current context. They are financial transactions where a portion of a country's debt is forgiven or refinanced in exchange for the country investing in climate action or conservation priorities. These swaps aim to address both debt burdens and climate change challenges, particularly in lower-income developing countries and small island developing states. The World Bank implemented hundreds of these swaps in the early 2000s' but only at a regional level.

At the national level, the French Development Agency (AFD) set up a "Contrat de Désendettement et de Développement (CDD)", with Côte d'Ivoire, as a way to convert (part of) its sovereign debt into grants for development projects. This mechanism was set up in 2012 and has already committed nearly €2.9 billion to Ivorian development. Having worked on its implementation when I served as a Chief economist and executive director of AFD, I can witness that it is as an innovative way to extend the logic of a debt-for-climate swap at the national level. More recently, South Africa is pleading since the COP27 for a national debt-for-climate swap on which the Georgetown Environmental Justice Program has worked for a while. Still more recently, Germany offers debt-for-climate swaps of up to €150 million a year to partner countries, with examples in Kenya, Egypt, and Tunisia.<sup>33</sup> Ecuador recently completed a large-scale debt-for-nature swap.<sup>34</sup> Moreover, 58 of the developing countries most vulnerable to climate change have almost \$500 billion in debt service payments due in the next four years.<sup>35</sup> Another group of 20

countries announced plans to suspend repayment of \$685 billion in debt, in the hope of exchanging it for investment in climate projects.<sup>36</sup> More broadly, the potential market for debt-for-nature swaps reached over US\$ 800 billion in 2023 and continues to grow.<sup>37</sup>

These amounts show that the total potential of debt-for-climate swaps is far greater than the amounts currently realized. What's more, current swap amounts are often considered "symbolic" in relation to total investment needs for the climate transition.<sup>38</sup> Indeed, one optimistic estimation of the later would be, at the world level, around \$90 trillion during the next 20 years or so.<sup>39</sup>

The point, therefore, is to argue that debt-swaps could be implemented conditionally in Southern countries investing in RA, specifically targeting small farmers. For this funding solution, however, not to be wiped out by gigantic movements of financial capital sent in the wrong direction, one also needs to consider regulating financial markets on commodities.

## II. Regulating financial markets on commodities

As said, the WTO cannot address the financialization of international trades of commodities since the financial sphere does not belong to its jurisdiction. This, by the way, partly explains the lethargy of the **Doha Round**, officially launched in 2001, and whose negotiations have stalled for decades. An important step for the rehabilitation of such an international body would therefore consist in repatriating markets of financial derivatives over exchange rates and commodities into its jurisdiction. Here is a list of reforms that the WTO could demand. They should be implemented by financial regulators (such as the ESMA in Europe, the SEC in the US, the FSA in Japan, the SFC in

32 The Paris Club is an informal group of creditor countries that provides financial assistance to developing countries facing payment difficulties. Its disappearance would imply a considerable loss of influence on the part of the West on the renegotiation of public debts and therefore on the evolution of the world.

33 <https://tinyurl.com/432s747f>

34 <https://tinyurl.com/dwvy5adp>

35 <https://tinyurl.com/3p5b67ec>

36 <https://tinyurl.com/552w3j8m>

37 Sullivan, S., & Kauffman, J. (2023). Are debt-for-nature swaps scalable: Which nature, how much debt? *Ambio*, 52(2), 123-135, see also <https://ecdpm.org/work/scale-debt-climate-swaps-in-fogographic-three-ways>

38 Al-Mashat, R. (2023). Climate financing that puts people first. *International Monetary Fund*.

39 Martin, H., & Giraud, G. (2024). Climate-induced economic damages can lead to private-debt tipping points. *HAL*. <https://hal.archives-ouvertes.fr/hal-04224077>



Hong-Kong, the MAS in Singapore, etc.), possibly under the authority, e.g., of the WTO, the United Nations or the G20.

First, given that these markets are profoundly inefficient,<sup>40</sup> we need to strengthen the regulation of derivatives markets. This would be in line with the Catholic social teaching of the past few years.<sup>41</sup> The financial regulators could impose stricter position limits on all financial players: Position limits specify clear quantitative thresholds for the maximum size of a position in a commodity derivative that persons or groups of undertakings can hold.<sup>42</sup> Contrary to what is sometimes proclaimed, it is perfectly possible to monitor compliance with these position limits. Unfortunately, several actors argue in the opposite direction in recent years, on the grounds that position limits are detrimental to market liquidity. However, market liquidity is a catch-all concept, which admits of at least 5 or 6 alternative definitions, and which has not been shown to have the slightest social utility (unless you want to maintain the myth of market efficiency).<sup>43</sup> Secondly, we need to improve the transparency of

transactions. Today, a large proportion of commodity derivatives transactions are OTC (Over the Counter) and therefore not subject to any control and reporting. Instead, these transactions should be carried out on centralized markets by clearing houses (whose margin requirements must be increased to make them more resilient in the event of a crash). The European directive MiFID II (Markets in Financial Instruments Directive II) of 2018 took a positive, but insufficient, step in this direction by imposing a new trading platform (OTF) for commodity derivatives.<sup>44</sup> Note that these reforms concern all commodities (including energy and mining) and not just agricultural ones. But the challenge of the programmed scarcity of these resources<sup>45</sup> means that it would also be very useful to free these markets from the danger of speculation.

Thirdly, the use of High Frequency Trading (HFT) should be limited, and eventually banned.<sup>46</sup> These are transactions that take place at millisecond (sometimes microsecond) intervals, managed by digital algorithms. More than 60% of commodity derivatives transactions are now handled by these machines in the US, which run the risk of speculative runaway and major crashes across the globe. Again, the only argument in favor of the spread of HFT is that it would support liquidity, which is false: as soon as prices fall, the overwhelming majority of HFT software withdraw from the market at precisely the moment when we would expect

40 Geanakoplos, J. & H. Polemarchakis (1986) "Existence, Regularity, and Constrained Suboptimality of Competitive Allocations When the Asset Market Is Incomplete" in *Uncertainty, Information and Communication: Essays in Honor of Kenneth J. Arrow*, Vol. 3 (Walter P. Heller, Ross M. Starr & David A. Starrett eds) Cambridge University Press, G. Giraud & A. Pottier (2013) "Debt-Deflation versus the Liquidity Trap: The Dilemma of Non-conventional Monetary Policy", *Economic Theory*, 62 (1), 383–408.

41 Pontifical Council for Justice and Peace. (2011). *Towards reforming the international financial and monetary systems in the context of global public authority and Congregation for the Doctrine of the Faith & Dicastery for Promoting Integral Human Development*. (2018). *Oeconomicae et pecuniariae quaestiones: Economic and financial issues*.

42 Irwin, S. H., & Sanders, D. R. (2012). "Testing the Masters Hypothesis in commodity futures markets." *Energy Economics*, 34(1), 256–269.

43 Cf. Giraud, G. (2013). *L'illusion financière*. Éditions de l'Atelier.

44 European Securities and Markets Authority (ESMA) (2017). *Questions and Answers on MiFID II and MiFIR market structures topics*. ESMA70-872942901-38.

45 Vidal, O., et al. (2017). Global trends in metal consumption and supply: The raw material–energy nexus. *Elements*, 13(5), 319–324

46 G. Giraud (2013) "La vitesse, nouveau fléau financier ?" *Projet*, No. 336–337, 172–181.

a liquidity-supporting mechanism to maintain its position to avoid inducing a crash. Insofar as the economic value of an agricultural product does not change a thousand times a second, we would lose nothing substantial by simply banning HFT on financial derivatives over these products.

Finally, a tax on financial transactions on commodities would make a lot of sense: we know that taxing transactions is an old proposal that goes back at least to James Tobin.<sup>47</sup> The only objection to it is, once again, that it would harm market liquidity ---an inadmissible objection for the reasons given above. Estimating the annual volume of transactions in commodity derivatives at a trillion (no doubt an underestimate), a 0.1% tax would raise between \$500 million and \$1 billion a year, which is consistent with other estimates.<sup>48</sup> This windfall could be used in an international fund analogous to the fund set up twenty years ago from the tax on airline tickets.<sup>49</sup> Such a fund could help finance the transition to RA.

As we will now see, however, it would not suffice to cover the cost of the bifurcation towards RA.

### III. The cost of Regenerative Agriculture

How much would it cost all the world's small farmers to switch to RA? Estimating such a cost is a complex exercise, as it depends on many factors. However, we can make a rough "guesstimate" that provides a rough order of magnitude.

According to various estimates, there are around 500 million small-scale farmers in the world. Regeneration estimates a cost of €50 to €60 per hectare per year at the outset.<sup>50</sup> Axéreal puts the cost at €150 to €200 per hectare.<sup>51</sup> Transition programs generally run over 3 to 5 years. Taking an average of €100 per hectare per year, over a 5-year period, and assuming that each small farmer owns an aver-

age of 2 hectares (which is an overestimate), we arrive at an overall cost of €500 billion over 5 years. In the same way, a lower bound would be 250 billion over 5 years, and an upper-bound should be €1 trillion. Of course, this estimate does not take into account regional variations, variance in farm sizes, and potential economies of scale or synergies that could reduce overall costs. However, this tells us that a Tobin tax over financial transactions on commodities would not be enough to fund the bifurcation worldwide. On the other hand, as already said, the potential market for debt-swaps-for-climate is around \$800 billion. This time, we're at the right order of magnitude.

### IV. Back to the field

These back-of-the-envelope calculations suggest that, contrary to popular belief, scaling up RA at the world level is a financially realistic project. These views, however, run the risk of overlooking an essential, on-the-ground difficulty: the need for concrete access to the world's small-scale farming families. This is the obstacle faced by most top-down projects decided in certain offices in major Western capitals, where it is very difficult to take into account the concrete reality of, say, a Cambodian peasant in Prey Nob (Cambodia). The large number of grassroots NGOs working today to improve agricultural techniques and support farmers can act as effective relays. However, within the Catholic Church, another, complementary network could be mobilized: that of religious and, above all, missionary nuns. They know the realities on the ground and, above all, they know how to reach out to the most disadvantaged. There are over 600,000 of them in the world today, and their numbers are growing in Africa and Asia.<sup>52</sup> Training these nuns to help farmers begin the transition to generative agriculture is a project which was vividly discussed, notably at the World Resources Institute, the World Bank, and Georgetown University's Environmental Justice Program a few years ago. To give but a few examples of why and how this is possible, let us just mention agroecology training for VTMMAs (Volontaires Techniques

47 Tobin, J. (1978). "A Proposal for International Monetary Reform." *Eastern Economic Journal*, 4(3-4), 153-159.

48 Schulmeister, S., Schratzenstaller, M., & Picek, O. (2008). *A General Financial Transaction Tax: Motives, Revenues, Feasibility, and Effects*. Austrian Institute of Economic Research (WIFO).

49 G. Giraud, "Les chantiers de la "taxe Chirac" ", *La Croix*, 05/20/2008

50 <http://bit.ly/3Cs6Yd2>

51 <https://tinyurl.com/e5c53ecu>

52 <https://www.fides.org/fr/stats>



Missionnaires de Madagascar), that took place partly on the premises of local nuns, in Mahazaza for farmers from the East. Also, the Farm project in Madagascar involves agroecology training for rural women.<sup>53</sup> It could be developed for nuns, enabling them in turn to promote training for farmers. The Kaydara farm-school in Senegal offers training in agroecology that could also be targeted at nuns.<sup>54</sup>

Finally, the Economy of Francesco could become a vector for transmission and training in this sense.<sup>55</sup>

This would illustrate that not only is the Catholic Church --in particular religious life-- not deprived, but it can even become an essential player in the “multilateralism from below” so dear to Pope Francis.

53 François, J.-B. (2014) “Empowering Women in Madagascar with the Transformative Impact of Agroecology”, *La Croix International*, Feb. 20 2024.

54 <https://tinyurl.com/59b3peum>

55 Giraud, G. (2020). The Economy of Francesco: A new economic paradigm for the future. *Civiltà Cattolica*, 2020(4), 1-12 and Giraud, G. (2021). The role of young economists in the Economy of Francesco. *Civiltà Cattolica*, 2021(5), 13-25.



# AGROECOLOGY: ORIGINS, DEVELOPMENT AND CHALLENGES



Agricultural production systems in place before the first Green Revolution<sup>1</sup> were described as traditional systems. The environmental, economic, social and cultural destruction caused by the Green Revolution in the 1970s subsequently led to the search for alternatives to mitigate damages. In seeking mitigation alternatives, important clues and work horizons were found that led to the recovery of traditional agricultural knowledge and practices. Dialogue between interdisciplinary teams of NGOs, certain academics, and exceptional support from some departments or state agencies in the agricultural sector of a few countries contributed to the recovery.

<sup>1</sup> With the dawn of the “green revolution”, rural areas were industrialized and directed towards the production of monocultures: thousands and thousands of hectares of corn, palm, sugar cane, banana or pineapple plantations. Corporations legitimized the rhetoric claiming superior production levels measured in tons per hectare. However, this vast production in terms of quantity ignores the associated environmental and human costs. States saw biotechnology and GM seeds as the solution to feeding the world. Twenty years later we have seen that GMOs have not helped feed the world; instead they have led to the disappearance of an immense variety of grains, fruits, vegetables etc. The resulting damage to biodiversity is evident. Taken from Pazmiño, C.P., Concheiro, L. Wahren, J. (November 2017). *Agriculturas alternativas en Latinoamérica*. Ciudad de México. Fundación Friedrich Ebert en México. PDF.

## José Alejandro Aguilar, SJ

Colombian Jesuit, PhD in Latin American Studies at the University of California at Berkeley (USA). He assists the Rector of Javeriana University in Cali (Colombia) in strategic planning, sustainable campus management, and support for research, teaching, and social outreach projects in agro-ecological and environmental aspects.

Early initiatives to recover traditional agricultural knowledge and practices met strong resistance from sectors of society wedded to the Green Revolution project, now also called conventional agricultural production. One of their main arguments to justify the Green Revolution technological package was that it would bring about greater efficiency in producing the required amount of food to solve world hunger. They argued that agroecological approaches could not meet this challenge and were viable only on a small scale.

Today, however, it has been proven that agroecological production has no scale issue; the dimensions of agroecological farms are not limited, providing adequate levels of sustainable productivity and income. While it is always difficult to give specific numbers, which will always be debatable, it is estimated that in 2021, 76.5 million hectares were dedicated to agroecology, representing 1.5% of the world's total agricultural land.<sup>2</sup> On the other hand, although food production increased, between 30 and 32% of food ended up as waste, and the levels of world hunger have not decreased. During the 2nd Green Revolution, leading corporations in the conventional agro-industrial sector focused on patenting genetic codes. They are now focused on earning from genetically modified organisms (GMOs), the catalyst for the 3rd Green Revolution; these corporations have now become one of the most profitable in the formal global economy.

Academic, political, and economic discussions should not focus on whether agroecology can solve world hunger. The Green Revolution was unsuccessful in such pursuit. Approaching the question from such a perspective distracts from the main challenge, how to feed the people of the world in a way appropriate to their culture and traditions, nutritionally complete, healthy for people and the environment; and, what must we do to make all this possible? The nay-saying by the opponents of agroecology has spurred research and the successful implementation of [agroecological] projects on different scales.

## How might we understand agroecology today?

Early conceptual developments of agroecology primarily focused on finding practical alternatives

to family farming to mitigate the Green Revolution's negative impacts; and to be scaled steadily to cover significant tracts of land. Initial approaches were centred around alternative practices, implementing appropriate technologies and organic agriculture methodologies framed in dialogue and knowledge exchange. All of this culminated in the current concept of agroecology.

The FAO proposes a widely accepted definition: "Agroecology is a holistic and integrated approach that simultaneously applies ecological and social concepts and principles to the design and management of sustainable agriculture and food systems. It seeks to optimise the interactions between plants, animals, humans and the environment while also addressing the need for socially equitable food systems within which people can exercise choice over what they eat and how and where it is produced. Agroecology is concurrently a science, a set of practices and a social movement and has evolved as a concept over recent decades to expand in scope from a focus on fields and farms to encompass the entirety of agriculture and food systems. It now represents a transdisciplinary field that includes the ecological, socio-cultural, technological, economic and political dimensions of food systems, from production to consumption."<sup>3</sup>

Some currents within the social movement emphasise methodological, technical and scientific aspects, while others prioritise the social, organisational and political aspects. These trends must work in harmony for agroecology to progress. If people or organisations in any of these sectors become polarised, we will fail in our mission to scale up agroecology, thus diminishing its political impact. The ideal scenario is to have ever-more healthy food on the table, and for public policies to facilitate this ideal.

## Transitioning from conventional agriculture to agroecology

Various methodologies are employed when consulting and accompanying initiatives around planning and expanding the coverage of agroecological production. In a scenario where the aim is to transform one or more conventional farms into agroecological farms, the first step is designing the future. Secondly, a profile of the current situation of the farms is drawn

2 Statista, Agricultura y Ganadería; <https://www.fibl.org/fileadmin/documents/shop/5011-organic-world-2020.pdf>

3 <https://www.fao.org/agroecology/overview/es/> Accessed February 17, 2024



up. Then, strategic steps are determined to transition the farms from the current situation to the envisioned future scenario. Finally, a phased work plan is made, consulted on, evaluated and adjusted according to circumstances.

Transition strategies must consider the different contexts and characteristics of each property, such as family size and age profile, the presence or absence of mutual support relationships and collective work with neighbours, the impact of the productive systems of neighbouring farms, farm size, the presence of woodlands and/or hedgerows, the characteristics and biological quality of the soil, the impacts of previous chemical usage (biological quality of the soil), topography, surface and groundwater supply, rainfall patterns, the availability of energy sources, proximity to the storage facilities and markets, road quality and transport conditions and cost, the level of support and consultation from institutional and/or private partners in the technical, administrative and financial aspects.

## Factors driving the transition

The transition from conventional to agroecological production can be bolstered by employing complementary strategies in formal and informal education, research and innovation. The latter should steadily lead to the optimisation of tools and processes, improving the ergonomic and practicality of tools, the quality of the alloys used in their manufacture, and avoiding planned obsolescence. Mechanical and industrial optimisation will require accompaniment and the digitalisation of procedures, once this is viable and convenient. Some examples are sensors that monitor and make real-time decisions on aspects such as humidity, temperature, acidity, and the presence and dynamics of insects and microorganisms; humidity sensors working in conjunction with automated irrigation

systems; drones that can quickly evaluate large areas under cultivation and facilitate the planning of farms and territories, in tandem with geographic information systems. The rise of alternative energies has led to the implementation of the first solar farms on terrain unsuitable for agriculture. The need to expand solar energy production on fertile soils has given rise to the integrated production of agriculture and photovoltaic energy on the same land. This development, known as *agrovoltatics*, improves both the efficiency and duration of solar panels by reducing their operating temperature, and it improves agricultural production by reducing evaporation.

Other strategies include agile and supportive financing schemes, especially in the initial phases of the transition, when greater investments may be required depending on the precise circumstances of each property and community. Likewise, sales strategies can be implemented based on demand—not supply—at agreed prices, hopefully with built-in short-circuit mechanisms and circular economy processes, such as institutional purchases and direct trade. Another option is to add value to primary produce to generate jobs in the territory and increase producers' income.<sup>4</sup> Participatory guarantee schemes are also important and are based on direct personal market relationships and trusted third-party certification. These systems strengthen sales strategies and solve the issue of the high cost associated with organic and fair trade certifications.<sup>5</sup>

Education and training programs are strengthened by communication strategies outlining the importance and benefits of agroecological production.

4 "In order to continue providing employment, it is imperative to promote an economy which favors productive diversity and business creativity." Laudato Si [129]

5 "This shows us the great need for a sense of social responsibility on the part of consumers. "Purchasing is always a moral – and not simply economic – act".[146] Today, in a word, "the issue of environmental degradation challenges us to examine our lifestyle"" Laudato Si [206].



Finally, advocacy strategies and developing public and institutional policies that support agroecology are also very important for the transition to agroecological production.

### When are agroecological products more expensive?

A controversial discussion around agroecological production is the opinion that the market price of its produce makes it inaccessible to low-income households. Consumers can find organic products more expensive if the producer purchases organic inputs and has to foot the bill for organic and fair trade certifications.<sup>6</sup> The alternative is to produce fertilisers and organic inputs on the farm and work with participatory guarantee systems in which producers, customers and assessors work together to design the protocols.

There is also a significant price difference between products sold at local agroecological farmers' markets and those on supermarket shelves. The sales price is also determined by the motivations and life plans of those dealing in organic and agroecological products. Some prioritise the well-being of their families, communities and customers while taking care of the environment. On the other hand, others see it only as a business scheme meant to maximise profits.

### Different Agroecological Schools and Practices

Different schools of thought within agroecology share and implement the same principles and prac-

tices. Some of their achievements have bolstered agroecological research, underscoring its benefits and expanding the scale of its implementation. Particularly noteworthy are the recent contributions made to agroecology by biologists, microbiologists and molecular biologists. They have allowed us to understand better the dynamics within production systems, such as the richness and complexity of the world of microorganisms. Their work has underscored agroecology's dynamic nature. At the beginning of the '80s in Latin America—in the early days of agroecology—a key role was played by agricultural technicians, agronomists, veterinarians, animal husbandry technicians and foresters in dialogue and knowledge sharing with the Afro, campesino, and indigenous communities.

The search for harmony between agroecological practices and cosmic elements such as the moon, planets and stars, is very explicit in **biodynamics**. Annual calendars provide a basis for this; they indicate the most favourable days for various activities of the agricultural cycles. Biodynamic agriculture is part of a holistic spiritual philosophy, anthroposophy, and educational philosophy (Waldorf pedagogy) inspired by the ideas of Rudolf Steiner (1861 – 1925).

Another current that is close to biodynamics is **natural farming**, developed by the Japanese biologist Masanobu Fukuoka (1913 – 2008). It is inspired by the Taoist concept of *Wu wei* which invites one to solve challenges and face situations naturally and without being forceful. Thus, it proposes, for example, to have the least impact on the land possible, to use organic fertilisers and incorporate weeds, among other practices. These practices are shared by other agroecological schools, though they may not necessarily be inspired by or even aware of their roots in Taoism.

<sup>6</sup> The main difference between organic farming and agroecological production is in the ability of agroecological farms to produce their own agroecological inputs, without having to outsource them. Both are healthy for the producer, the consumer and the environment, the main difference is whether they depend on external organic inputs.

**Permaculture**, which originated in Australia and inspired by Bill Mollison (1928 – 2016), is based on the theory of Trophobiosis (Francis Chaboussou 1908 – 1985). This theory has provided a wealth of knowledge to studies on the organic fertilisation of plants, explaining how plants can be encouraged to produce tissues that are more consistent and less susceptible to insect damage.

**Paramagnetism**, developed by entomologist Phillip Callahan (1923-2017), has contributed to the knowledge of the interactions between physics, biology and chemistry. He inspired the work on remineralising soils by using rock dust or sands. In addition to helping plants access micronutrients, these minerals have different paramagnetic levels affecting natural growth patterns.

**Syntropic farming** is an approach to sustainable agriculture focused on soil regeneration, which seeks to mimic the natural succession processes and ecosystem succession to create more resilient agricultural systems with greater biodiversity. It was founded in Brazil in the 1980s by Swiss researcher and farmer, Ernst Götsch. It is a form of agroforestry that shares and draws on many principles of agroecology and permaculture. The term (*syn*: “together”; *tropos*: “change” or “direction”) refers to the cooperation and positive interaction between the components of an ecosystem.

The concept of **regenerative agriculture** dates back to the Rodale Institute in the United States in the 1980s, which recently introduced a certification system. Recently, it has gained rapid momentum in [public] policy and the market. It essentially promotes values similar to agroecology and organic agriculture as a holistic land management practice focused on soil and its organic matter. It is mainly beneficial in terms of climate change, desertification and biodiversity.<sup>7</sup>

**Conservation agriculture**, which shares principles and practices with the other schools, is based on the interrelated principles of minimal mechanical soil alteration, permanent soil cover with live or dead plant material, and crop diversification through rotation or intercropping. It helps farmers maintain and increase yields and profits while reversing land deg-

radation, protecting the environment, and responding to the growing challenges of climate change. The main difference is that its practitioners do not till the ground.<sup>8</sup>

## Conclusion

To achieve and scale the integral purposes and impacts of agroecological production (such as food quality and safety, the health of producers, consumers and the environment, to mention just a few), dialogue and knowledge sharing between the various schools and agroecological practices is indispensable. Sharing and learning from successful experiences (and even failures) would avoid confusion and misunderstanding and expand the universe of producers and consumers of agroecological products.

The difficulties of reconciling agroecology’s technical and socio-political aspects should not become an obstacle to consolidating agroecological practices that can contribute to overcoming the enormous challenges of the planet and all creatures.

It is important to guarantee a balanced development between events, workshops, diplomas and academic training programmes in agroecology, with the upscaling (growth at scale) of agroecological practice and production in such a way that the supply of healthy food on the table for people’s consumption is gradually and significantly increased.

Inspired by St. Ignatius [of Loyola], we ought to remember that “Love is shown more in works than in words”. We must not be distracted by empty words. The call to love remains: to feed the hungry each day with nutritious food proper to their culture and traditions while safeguarding the health of our Common Home. Now, what more must we do to make this possible?

Original Spanish

7 Arbenz, M. (2022) Agroecología, Regenerativa, Natural y Ecológica: ¿competencia o familia armónica? In revista BioEco-Actual, p. 23

8 <https://www.cimmyt.org/es/noticias/que-es-la-agricultura-de-conservacion/> Accessed February 27, 2024

# SUSTAINABLE DIETS AND AGRICULTURAL PRACTICES



## Béla Kuslits

Senior officer in the Ecology team of Jesuit European Social Center focusing on environmental policy and in the ecological transition of the wider network of European Jesuits. He graduated in medicine, sociology and anthropology at CEU, and holds a PhD in environmental management.

### The ethical challenge

On a fundamental level, the planetary crisis is a collection of challenges where natural resources and processes are overused and overloaded by the growing demand of an increasing population. The planetary system and local ecosystems have some resilience to withstand the pressure, but their fragility is becoming increasingly visible. In the past decades – despite timely early warning – humanity decided to ignore the limits of the planet and crossed the planetary boundaries in multiple ways (Richardson et al., 2023).

After the energy sector (including energy for transport), the second most significant source of



# Global land use for food production

Our World in Data

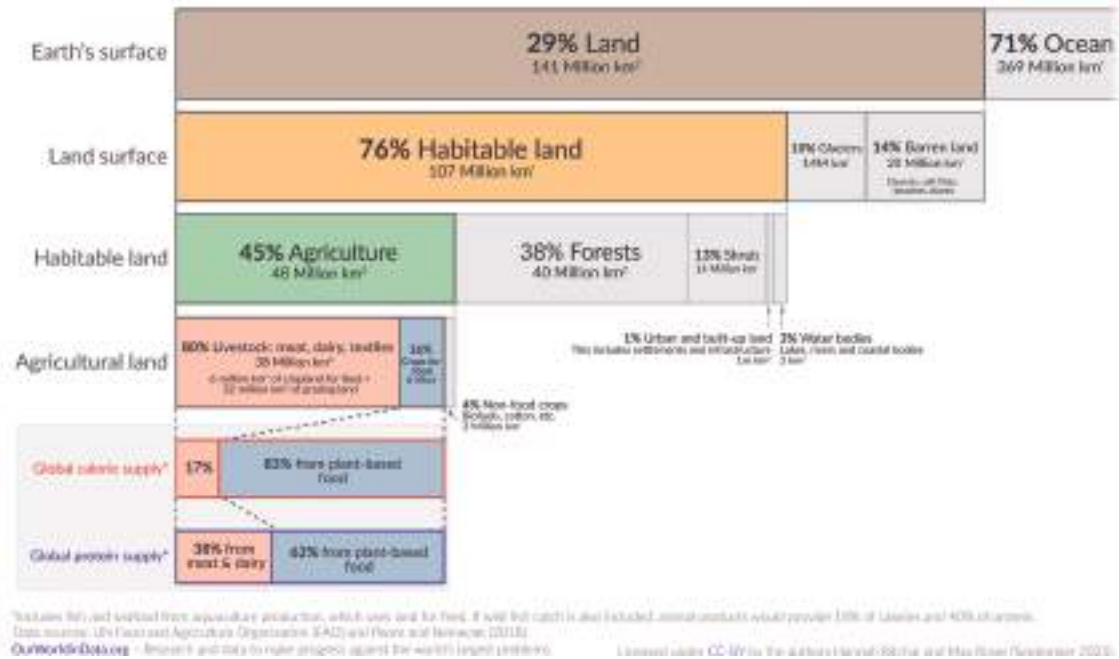


Figure 1: Global land use for food production (source: Our World in Data)

resource use and pollution is agriculture (Ritchie, 2019). The most widespread form of land use is intensive crop monoculture (wheat, maize, sunflower, soybean, rice). This production method produces greenhouse gases in multiple ways, destroys habitats, depletes and pollutes water systems and reduces soil fertility. In addition to these environmental impacts, this system establishes dependence on corporations that provide seeds, machinery, chemicals, processing capacity and market demand for the harvest. The highly optimized scheme provides little income on a smaller scale. Thus, the agricultural sector in Europe became increasingly centralized and dependent on a complex structure of subsidies that further stabilized an agricultural sector that is destroying our planet. This makes farmers vulnerable to economic challenges and takes away most of their control over food production (Neumeister, 2022).

While being among the most important causes of the planetary crisis, the agricultural sector is also highly vulnerable. Droughts, extreme weather events, and desertification are becoming increasingly common and cause significant losses to the farming sector. This further increases the social

vulnerability connected to food systems, as sudden shocks to supply can cause food shortages or price hikes (IPCC, 2021). The global trade system may occasionally ease these problems. Still, long value chains also introduce an additional vulnerability: supply may be disrupted by disasters and conflicts far away from the consumers.

The risks to the food supply often lead to a narrative in which food security becomes the primary challenge. Thus, proponents of this view argue for the further expansion and intensification of agriculture to increase the supply (Figure 1-2). (Hefele, 2023).

Perhaps surprisingly, the solution lies in the other direction: we need less farming and less intensive production, smaller farms, and shorter supply chains. Further increasing production would increase the economic challenges to farmers while also exacerbating the ecological destruction that is the root cause of the problems.

The risks that threaten food systems globally can be mitigated to some extent by nature-based solutions: restoring habitats, introducing complex

crop combinations, ecological pests, and water management. The critical component in all these methods is biodiversity: the variety and abundance of non-human beings that dwell in the landscape, from bacteria to shrubs, from birds to wolves. A healthy ecosystem is more resilient against all the challenges that occur due to climate change, and these ecosystems usually provide some degree of resilience to their surrounding agricultural areas, even if those are farmed intensively (Miles et al., 2021).

In this context, I approach biodiversity in an entirely utilitarian manner, as if it were a necessary unproductive area that serves as a protection service for maintaining the useful and productive landscape. On the one hand, the supporting function of healthy ecosystems cannot be overstated, and it is not an exaggeration to claim that without ecosystems, humans could not exist in a society that is even remotely similar to what we value in our world today. On the other hand, we need to go beyond this understanding. We have to recognize that the scientific term “biodiversity” refers to a great variety of beings who live, fear, and suffer, who are often surprisingly intelligent, and who are

often capable of comprehending the destruction that we cause to them and their homes as if they were just inanimate objects. In this recognition, our spiritual journey may encounter surprises in realizing similarities not just in our fate on a planet that is being destroyed but also in our existence that has the same roots and experiences and that awakens empathy in us. We cannot be fully human without non-humans (Naess, 1989, 1995).

## Ethical food policy with two feet on the ground

To stop biodiversity loss, we need to save habitats (BirdLife, 2020). We can do this in two ways: giving back land to nature and making land use more friendly to biodiversity. These two models are called “*land sparing*” and “*land sharing*”, respectively (Loconto et al., 2020). Land sparing is giving up economic activities or keeping them on a minimal level (like low-impact tourism). In this model, land management is essentially done by ecological forces, and depending on external factors, some conservation-oriented human activity

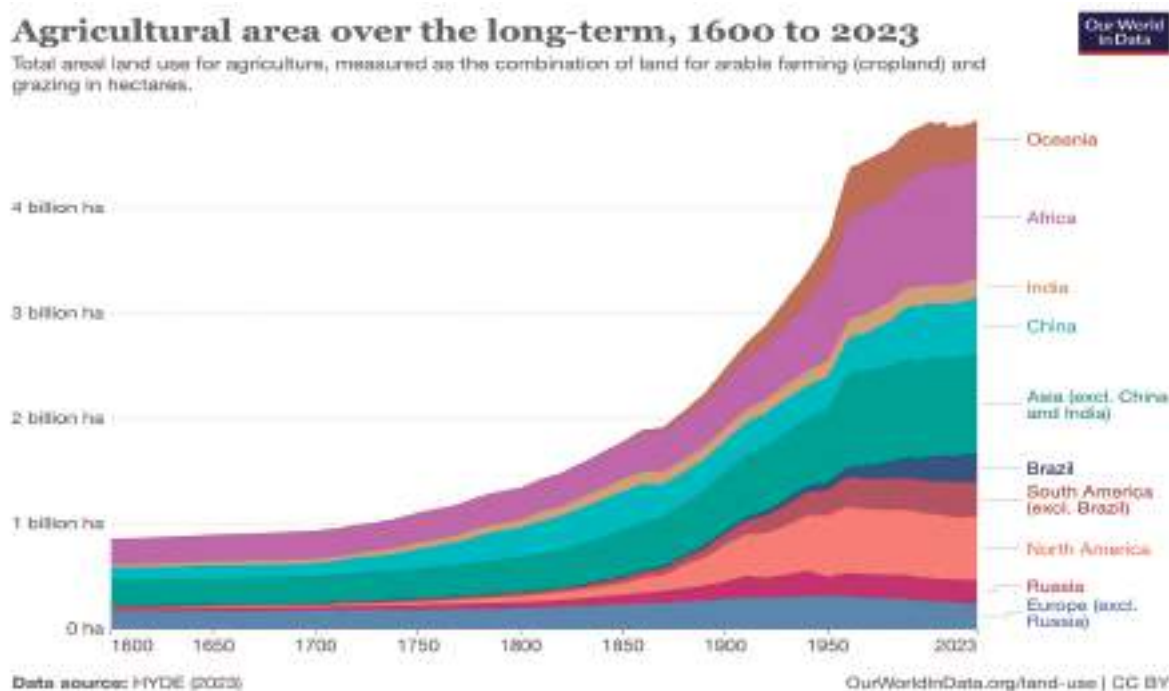


Figure 2: total areal land use for agriculture, measured as the combination of land for arable farming (cropland) and grazing in hectares (source: Our World in Data)

might be necessary. In ‘land sharing’, agricultural areas are used to produce food. Still, landscape management and agrotechnology are designed in a way that helps biodiversity to use the land on the side of agricultural production. This model does not work in all places and with all species but has a role in expanding the space available for biodiversity and connecting habitats. It is important to note that the policies that protect biodiversity also improve carbon sequestration (storing carbon in soil and biomass), water retention (essential for soil fertility), and many other ecosystem services crucial to human well-being and economic activities.

After all these arguments, I conclude that we need to develop food policies extending the area available for land-sparing and land-sharing. At the same time, we must take food security and affordability seriously, as we cannot protect biodiversity to the detriment of human health and well-being.

In practical terms, this means we need to produce food in less space and with less intensive technology, but we need to produce at least a similar amount in terms of calories and deliver all this at reasonable prices. The challenge sounds daunting, but a few factors show the way forward in practice.

First, I want to point out that reducing food waste can maintain food security even if production levels shrink. In the European Union, about 20% of all produced food is wasted, more than the total imported amount (Vera et al., 2022). Additionally, the EU uses a significant amount of land to produce biofuels. Biofuels, however, are inefficient for energy provision and provide less “carbon

neutral” fuel than the carbon uptake capacity of the same amount of land given back to nature. If we gave up on this practice, another significant area could be returned to nature. (Fehrenbach et al., 2023). These two decisions would have no substantial consequences or effects on our lifestyles but would offer important opportunities for habitat restoration.

Our primary interest, however, is agriculture for food production and how we could spare and share more land for and with nature. A key concept in considering this question is the efficiency of production systems. Efficiency means how many resources are necessary to produce a unit of food. If we want to use less land and produce at least the same amount of food (or more, as it is desirable), we need to increase production efficiency.

Probably the most widespread approach to land-sharing is organic agriculture. Using significantly fewer chemicals enables wild plants and animals to live alongside the production crop. Such a production system has a range of benefits but, in most cases, produces lower yields (between 8-25% on average) than the same crop in a conventional system (Reganold & Wachter, 2016; Tuomisto et al., 2012)2016; Tuomisto et al., 2012. Increasing the complexity of the land cover (by introducing more crop varieties, leaving space for hedgerows, trees, small water bodies, etc.) usually also reduces productivity simply by lowering the net area used for economic activity. To some extent, better organic technologies can close the yield gap. Still, the challenge will never be fully solved since the goal



is to give up some of the primary production to benefit biodiversity.

The most important and potent intervention point to increase food systems' efficiency is what we produce and what it is for. Different plants have different efficiency rates in their yields, and more importantly, different food types have staggering differences in their environmental impacts if we consider the product's entire life cycle. Animal-based protein is "grown" by animal bodies that are fed plant products throughout their life until they reach the point where they are slaughtered and processed. These animals are most often fed with plants suitable for human consumption; if not, the feed production occupies space suitable for producing human food. We do not consume the entire animal, and not all food the animal consumes becomes meat. Thus, this "protein production system" is inefficient. One thousand kilocalories of beef require about 119,5 m<sup>2</sup> of arable land, while 1000 kilocalories of wheat require 1,44 m<sup>2</sup>

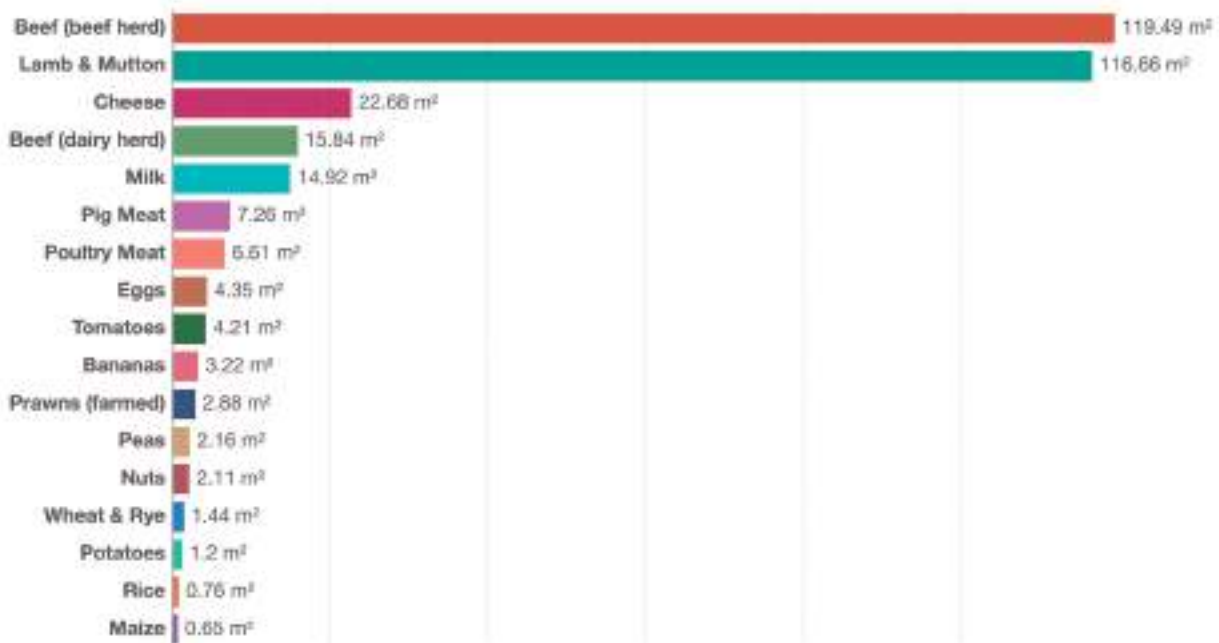
(Halpern et al., 2022; Poore & Nemecek, 2018; Ritchie et al., 2022 see also: Figure 3). For this reason, most of the cropland is producing feed for animals – to provide meat for humans.

The two orders of magnitude difference between these extremes show how inefficient animal-based protein consumption is. Additionally, ruminant animals (most notably beef and lamb) also produce methane, a powerful greenhouse gas (GHG), in their guts. If we produced less animal-based protein and replaced it with plant-based protein sources (probably the most qualified candidate for this role would be legumes), we would need much less land to produce the same amount of calories, we would make much less GHGs, and we would release much less chemicals in the environment.

If we need to adjust our production systems to significantly less animal farming, we also need to adjust our consumption patterns—diets—to make the change in production possible. One could ar-

### Land use of foods per 1000 kilocalories

Land use is measured in meters squared (m<sup>2</sup>) required to produce 1000 kilocalories of a given food product.



Data source: Joseph Poore and Thomas Nemecek (2018). Additional calculations by Our World in Data.

Note: The median year of the studies involved in this research was 2010.

OurWorldInData.org/environmental-impacts-of-food | CC BY

Figure 3: Land use (m<sup>2</sup>) of foods per 1000 kilocalories (Source: Our World in Data)



gue that changing diets is the first step towards changing the production system.

In a globally optimized sustainable food production system, animal protein is not necessarily eliminated, as certain ecological conditions are not suitable for human food production but could be used for producing animal feed, such as grass, and some of the byproducts of human food production (straw) can be used for similar purposes (Van Zanten et al., 2018). Low-intensity grazing is the best way to preserve natural grasslands in most cases. Large herbivores become extinct in most parts of the world, so farm animals are the best candidates for grassland maintenance. This intensity and the resulting volume of meat production is, however, negligible compared to the meat industry currently in operation (Tälle et al., 2016).

As we have seen, the resource requirements of plants are about a hundredfold less than beef and lamb and about tenfold less than pig and chicken. This also implies that changing our production portfolio would allow us to give up some of the efficiency gains made over the last century and could

transform the food production system (that is only about 8-25% less efficient than conventional) into a fully organic agriculture and still using less land than today.

## A healthy and sustainable diet

Defining a perfect sustainable diet is a complex task that may not even be necessary. Production costs of plant-based products are lower, even if an organic production system is applied. Diet change requires cultural change, and such a cultural change would also bring more affordable food (Figure 4.). Even if animal-based proteins are not eliminated from diets, eating less meat has significant health benefits (Pushkarev, 2021).

There is no single diet that is truly sustainable or healthy. Sustainable diets are primarily plant-based, and the plants used should reflect the production seasonality and the producer and consumer geography. Cultural factors, including traditional cooking methods, religion, and personal taste, also condition a good diet.



## How does the cost of a healthy diet compare to daily median incomes?

The cost of a healthy diet is the lowest cost set of items that would meet requirements for food-based dietary guidelines. These come from national governments or public health agencies, and are defined based on nationally representative guidelines. Median incomes and dietary costs are expressed in 2017 international-\$ per person per day.

Our World  
in Data

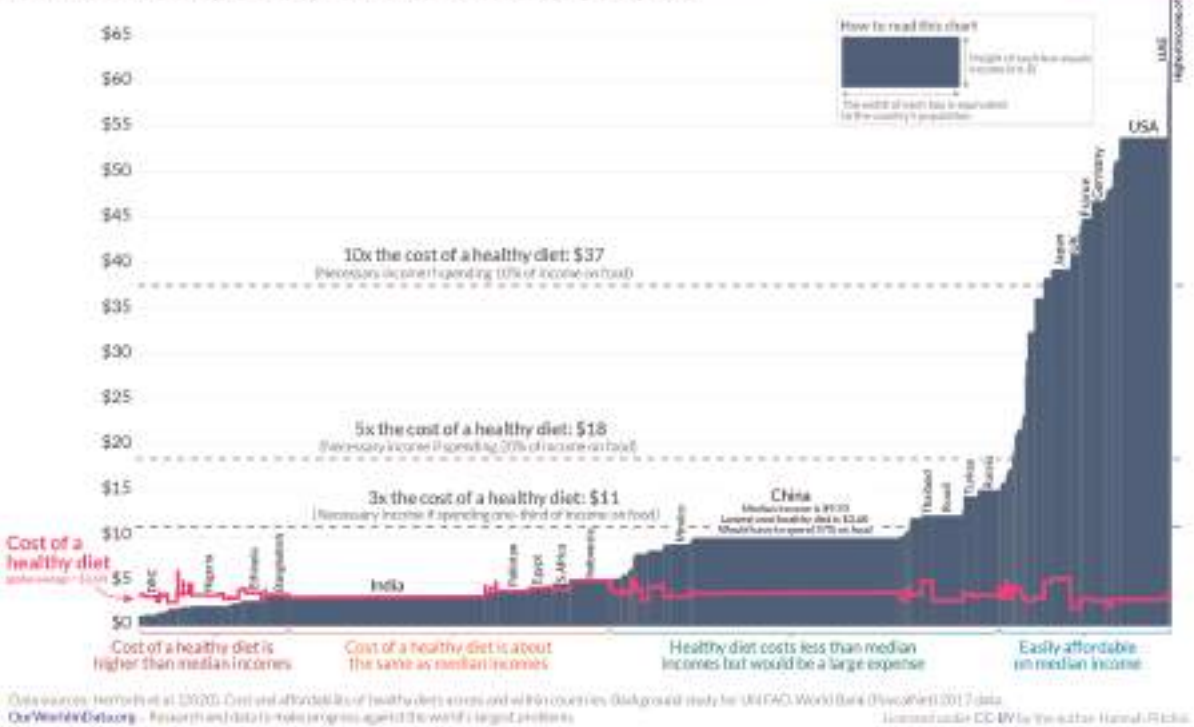


Figure 4: How does the cost of a healthy diet compare to daily median incomes? (source: Our World in Data)

I did not discuss seafood consumption (farmed or wild) in this paper. Those systems have similar considerations, and overfishing is a challenge in most fisheries globally. Yet, fish is considered a more sustainable protein source than farm animals, and fish production is generally a more environment-friendly operation (Ritchie & Roser, 2021). Fish consumption can be part of a sustainable diet.

The transition to a sustainable economy and food system is a great challenge to a society that is primarily to be solved through policies. Too many structural elements cannot be tackled on the individual level. The most effective action we can take to facilitate the green transition is to advocate for better policies. At the same time, reading the news, we can see significant resistance against such policies – even if the origin of the disagreements is not

always visible. Cultural change is, therefore, crucial, as our culture around food defines the policies that are acceptable in society. Our personal choices in our diets are, therefore, not just impactful through our ecological footprint but also through the cultural impact we have on others when we show that a healthy and sustainable diet can also be delicious.



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# ADDRESSING HIDDEN HUNGER THROUGH SOILLESS CULTIVATION OF VEGETABLES



## Ranka Junge

Heads the Centre Ecological Engineering at the Institute of Natural Resource Sciences in ZHAW, School of Life Sciences and Facility Management. Her expertise and research interest include nature-based, water and nutrient recycling technologies.



## Gertrud Buchenrieder

Professor in Development Economics and Policy at the Universität der Bundeswehr München (UniBw M). She has held several positions as a development and agricultural economics professor, especially in microfinance, structural change and poverty, and food and nutrition insecurity.

### 1. General Introduction

Urban Agriculture (UA), the practice of cultivating, processing, and distributing food in or around urban areas (FAO, IFAD, UNICEF, WFP, and WHO, 2023), is emerging as a sustainable solution to a global problem -- hidden hunger (Ulimwengu et al., 2023). A deficiency of essential micronutrients characterises hidden hunger despite adequate calorific intake. The Food and Agriculture Organization (FAO) recommends a daily intake of 400 g of vegetables and fruits. However, in many urban areas, especially in developing countries, people consume too little of these nutritious foods for various reasons: (i) unavailability due to lack of local production, (ii) lack of access due to affordability or urban planning issues, (iii) utilisation issues due to food loss and waste, and (iv) temporal food instability. This often results in malnutrition, an abnormal physiological condition caused by inadequate, unbalanced, and excessive macronutrients or micronutrients. Malnutrition includes undernutrition (i.e., vitamin and mineral deficiencies, leading to child stunting and wasting), overweight, and obesity (Ulimwengu et al., 2023).

While urban spaces do not have the production capacity to ensure their inhabitants' food security, they can supplement diets with locally grown fruits and vegetables, enhancing micronutrient intake and thus improving urban nutrition security (Martelozzo et al., 2014).

Beyond addressing food security and access to nutritious food, UA also promotes socioeconomic and environmental sustainability. When implemented effectively, it can enhance urban livelihoods, offer subsistence or cash income, reduce food loss and waste, and contribute to environmental protection. Moreover, because UA does not require great access to land, water, or wealth, UA opens up new opportunities, particularly for women and young adults, fostering a sense of community and empowerment.

However, the implementation of UA in sprawling urban landscapes has its own set of challenges. Limited space, poor soil quality, and often inadequate access to water, fertiliser, sunlight, and energy are common issues. Nevertheless, innovative food production techniques such as hydroponics, bioponics, and aquaponics offer promising solutions which do not require exceptional access to land, water, or upfront investments. These soilless techniques are flexible in size; thus, small units require just a couple of square meters of a backyard, a rooftop, or a wall to which they can be attached in some instances. Furthermore, they are mobile to some degree. Thus, if land tenure issues arise that force households to relocate, they can be moved along with the other household furnishings. Where water is scarce, reclaimed water, i.e. wastewater from kitchens and even laundry that has undergone treatment to remove contaminants, can be used (Tao et al., 2017). It can be enriched with liquid fertilisers to prepare nutrient-rich solutions for soilless cultivation. The liquid fertiliser can be produced from organic waste, including food waste such as vegetable scraps, fruit peels, chicken droppings, or insect frass (Szekely and Jijakli 2022). While simple forms of hydroponics and bioponics may not require energy, aquaponics, combining recirculating aquaculture systems with hydroponics (Junge et al., 2017) requires energy for water recirculation. Nevertheless, solar panels can provide renewable energy. Thus, soilless UA is a prime example of a circular economy (Ellen MacArthur Foundation, 2014).

This paper delves into the transformative potential of soilless UA, exploring how it can combat hidden hunger, i.e., nutrition insecurity, and promote socioeconomic and environmental sustainability in our rapidly urbanising world.

## 2. Why Is Urban Agriculture Relevant?

Urban areas face a plethora of challenges. For example, more and more people find themselves in so-called food deserts (Wright et al. 2016), areas with limited ac-

cess to supermarkets, grocery stores, and local food markets. Thus, urban areas face rising health costs linked to unhealthy diets, i.e., malnutrition. Malnutrition is an umbrella term for poor nutrition, whether inadequate consumption or absorption of nutrients (i.e., undernutrition or hidden hunger) or excess consumption (i.e., overnutrition), leading to obesity, diabetes, and heart disease.

In addition, growing cities with scarce green areas are subjected to a heat island effect, a phenomenon where urban areas are warmer than their surrounding rural areas. Shrinking cities (Meng et al., 2021) are characterised by unused areas, called brownfield sites, that are often heavily polluted and the soil degraded. Climate change will aggravate these challenges with rising average temperatures, flood risks, droughts, and other extreme weather events (Lumbroso, 2020), leading to widespread regional water and arable land shortages and aggravating food and nutrition insecurity (FAO, 2009).

UA can contribute to the resilience of food systems, combatting food deserts and thus improving consumers' access to fresh and nutritious food. This is especially important in mega-cities of the Global South, where the urban sprawl extends over several kilometres. In situations of broken supply and value chains (as experienced in the case of the COVID-19 pandemic, local unrest, or even wars), the urban population still has access to healthy food if it is produced super-locally.

On the one hand, UA facilities can be protected from weather risks associated with climate change using simple shading systems. On the other hand, UA can also help mitigate the heat island effect. By growing food locally, the emissions of greenhouse gases associated with transporting food from rural to urban areas are reduced. The green spaces within cities can help preserve biodiversity and support pollinators. At the same time, green spaces act as sponges and retain rainfall, which again evapotranspires and cools the surroundings.

### 3. What Are Soilless Cultivation Methods?

Soilless cultivation methods involve growing plants using water-based solutions containing nutrients (elements) essential for plant growth, such as nitrogen, phosphorus, potassium, and iron.

Conventional hydroponics mainly relies on non-renewable mineral fertilisers for nutrient supply (Maucieri et al. 2019). Moreover, some hydroponic farms still use open systems where the exhausted culture solution still contains nutrients and is discharged after a single use since many countries lack legislation requiring the recycling or treatment of the effluents.

Bioponics (Figure 1) refers to a cultivation method that uses organic nutrient sources within hydroponic cultivation methods (Gartmann et al., 2023). These organic nutrient sources, e.g. from food waste or chicken droppings, are typically recycled into a nutrient-rich solution that can be used for plant growth (Szekely and Jijakli 2022).

In addition to hydroponics, many "-ponic" terms have recently emerged, namely aquaponics, digeponics, anthroponics, fogponics, aeroponics, and organoponics. Fogponics and aeroponics are different methods of nutrient solution delivery to the plant roots. Anthroponics and digeponics denote the use of human urine and digestates in plant cultivation and are forms of bioponics.

Aquaponics is a system that combines aquaculture (raising aquatic animals such as fish in tanks) with hydroponics (cultivating plants in water) (Graber and Junge, 2009). The waste from the fish serves as organic food for the plants, and the plants naturally filter the water for the fish. Aquaponics is, therefore, also a form of bioponics. While aquaponics has received considerable attention recently (Goddek et al., 2019), other forms of bioponics have yet to be investigated in-depth. This contribution concentrates on hydroponics, bioponics, and aquaponics.



Figure 1. The concept of bioponics.

Illustration: Courtesy of Michał Słota, <https://www.contentfarmers.eu/>.

#### 4. Why Is Soil-Independent Cultivation of Fresh Produce Preferable for UA?

There are several reasons why soil-independent (or soilless) cultivation methods may be preferable to traditional soil-bound production within the city's footprint.

One of the main reasons is poor soil quality: Urban soils are often degraded, meaning they can be overly saline, have low organic matter content, compacted soil, and the surface sealed. In addition, degradation involves contamination due to industrial activities and waste disposal. This means that the conventional use of arable land is becoming increasingly complex, affecting the quality and safety of the food produced. One aspect of waste disposal is the potential contamination of soils with human pathogenic microorganisms such as *Escherichia coli* or *Salmonella* spp. Infections with these can cause disease and even death (Black et al. 2021). As hydroponics, bioponics, and aquaponics do not rely

on soil, soil degradation and contamination issues are largely eliminated.

The other reason is limited space: Farming is spatially and temporally bound. Finding space is, therefore, an essential requirement for any form of UA. Soilless cultivation can effectively use urban spaces such as backyards, rooftops, and walls to produce vegetables and fruits (Table 1). The systems can be stacked vertically, so they are ideal for urban settings.

Other benefits of soilless cultivation include water use efficiency and reduced infestation with pests and plant diseases. As the water is recirculated in soilless cultivation systems, this yields substantial water savings compared to traditional farming. Also, the controlled environment of soilless systems reduces the need for harmful pesticides and herbicides.

Table 1. Potential spaces for soilless urban agriculture.

Category	Description
Spaces between the buildings	Parks and other public green spaces Urban derelict land/brownfield sites Spaces along the roads Underground tunnels and caves
Spaces associated with buildings	Rooftops Facades and other walls Balconies, windowsills Indoor spaces (rooms, cellars)
Mobile systems	Growing boxes and bags Mobile containers Shipping containers
Water bound spaces	Urban streams Urban stagnant waters (ponds, lakes)

## 5. What Are the Challenges and Limitations of Soilless UA?

Despite its numerous benefits, soil-independent UA faces several challenges that can hinder its widespread implementation and effectiveness.

The limited space in urban areas restricts the scaling-up of UA systems. For example, the median commercial rooftop farm size was 650 m<sup>2</sup> (Bühler & Junge, 2016). Finding a sturdy rooftop or open space of this size is challenging in many European cities. Therefore, in contrast to conventional, soil-bound agriculture, UA cannot expand existing sites but needs to scale up either by multiplication of sites or by going vertical, and many small units need to be operated and monitored instead of a few large ones. This fragmentation and decentralisation pose their own set of challenges.

Urban farmers may struggle to access necessary water, energy, seeds, and farming equipment. Many sprawling cities have only intermittent water and energy supply. Urban land and water costs can also be high, and land tenure is problematic. On top of land tenure issues, UA may face additional legal and regulatory challenges. Zoning laws, for instance, may not permit agricultural activities in urban areas.

Depending on the technological sophistication, the construction and maintenance of soilless production systems may, but not necessarily, require a higher upfront investment than traditional soil-based cultivation (Fussy and Papenbrock, 2022).

Soilless cultivation may not require more labour than conventional agriculture. Still, it involves more human capital as it requires more extensive knowledge and skills, which urban residents may not initially have access to. Particularly in recirculating (closed) soilless systems, there is a risk of uncontrolled multiplication of pathogens. Management procedures and safety measures to prevent disease infections must thus be put in place and linked to human capital.

## 6. Introducing Soilless UA in African City Regions

The Project Integrated and Circular Technologies for Sustainable City Region FOOD Systems in Africa (INCiTiS-FOOD, <https://incitis-food.eu/>) focuses on the introduction of circular agri-food practices (namely hydroponics, aquaponics, recirculating aquaculture systems, and insect farming) in African city regions. The foundations of INCiTiS-FOOD are eight urban living labs in



six African countries: Tamale (Ghana), Nairobi and Nakuru (Kenya), Franceville (Gabon), Bamenda (Cameroon), Lagos and Ibadan (Nigeria), and Moyamba (Sierra Leone). Living lab staff gathered for the Training of Trainers in Tamale, Nakuru, and Franceville. The trainers, experts in soilless technologies, came from Germany, Israel, and Switzerland. The training sessions were intensive, participatory, and collaborative, encompassing theoretical knowledge and hands-on learning of sustainable agri-food practices.

What truly enriched these gatherings was the rich mixture of people, cultures, environments, and climates. Through the interactions with each other and immersion in the diverse cultures, all participants, including the trainers, benefitted, and mutual trust deepened, which fostered collaboration. Although theoretical knowledge can be imparted in online courses and webinars nowadays, the practical application of seemingly simple methods sometimes needs to be practised in vivo and on-site. For fruitful cooperation and understanding, it is of paramount importance to interact directly. Thus, the training was also a chance to co-create new knowledge and ideas. The INCiTIS-FOOD project will conclude by the end of 2026, but the impact will last much longer. This is because it is not just about knowledge transfer but about fostering a global community united in pursuing food and nutrition security and empowering women and young adults.

## 7. The Future of Soilless Cultivation in Urban Areas

For the reasons discussed above, different forms of UA will inevitably form an inherent and growing part of the future of the circular food economy of cities. The vast adaptability of soilless systems implies that they can be implemented in all kinds of spaces and at different technology levels, from low to high tech (Figure 2). However, choosing the appropriate system for climatic, spatial, and societal conditions brings inherent trade-offs: not all aspects can be simultaneously maximised. Hence, the customisation process must include co-creation with the future owners and operators of the systems.

Technological advancements, especially in soilless cultivation techniques and resource recovery,

will allow food to be grown where UA was previously difficult or impossible, such as zones of extreme aridity, on the water surface and underwater, or in disused underground tunnels.

Food production currently critically depends on mineral fertilisers. Yet, the supply of potash (K) and phosphate rock (P) is more and more subject to global shocks (e.g. the COVID-19 pandemic, war in Ukraine, and energy crises), and, consequently, prices are highly volatile. About 15% of P is discharged in domestic wastewater and sewage sludge, while losses from sludges and wastewater from food processing industries correspond to 44 kt P per year (Huygens et al., 2019). Another component of mineral fertiliser is nitrogen (N). The production of nitrogen-based fertilisers via the Haber-Bosch process consumes 1-2% of global energy and accounts for 1.4% of anthropogenic CO<sub>2</sub> emissions (Kyriakou et al., 2020). To protect the environment, the Farm to Fork Strategy of the European Commission (2020) aims to reduce the use of fertilisers by at least 20% by 2030 by managing N and P inputs better throughout their lifecycle. This can only be achieved in circular systems that can increase the efficiency of the entire use chain of fertiliser nutrients via recovery and reuse. Therefore, the development of soilless UA is a step in the right direction.

## 8. Conclusion

We are not only facing global food insecurity but also nutrition insecurity. Although we search for simple answers to address the challenges, none will be had. Soilless food production, including vertical farming and any other form of UA, is not an alternative or competition to traditional farming but a complementary form of providing healthy and nutritious food. We will need ALL possible forms of crop production in the future.

For soilless UA to thrive, we need to develop innovative solutions (including industrial symbiosis, resource recovery processes, and automation) at both ends of the spectrum, low-tech and high-tech.

Therefore, soil-independent technologies like hydroponics, bioaponics, and aquaponics will probably develop in two diverging directions:



Figure 2. Two very different examples of soilless cultivation systems.

Top: Low-tech hydroponic, so called “garafa”, system constructed from waste plastic water bottles (Photo: F. Orsini, University of Bologna).

Bottom: High-tech bioaponic system in a fully climatized chamber (Photo: Z. Schmautz, Zürich University of Applied Sciences).





- On the one hand, low-tech solutions to be predominantly implemented in developing countries and for non-professional applications and
- On the other hand, high-efficiency, hi-tech technology should be predominantly implemented in professional applications in high-income countries.

Both low- and high-tech soilless UA will spur job creation and thus create income (Verner et al., 2021). Jobs would be created in the soilless UA systems and along the value chain, including extension and capacity building. The exact number of jobs created would depend on various factors such as the scale of implementation, acceptance of the urban population of UA, market demand, or legislation and government policies, but will likely reach a 3-digit million number.

Thus, any solution needs to be integrated into the fabric of the urban areas and accepted by its inhabitants. This requires holistic, visionary, flexible urban planning, training programs at all education levels, especially in so-called green jobs, and supportive legislation and policies involving stakeholders and consumers. Each town and city would also benefit from an appropriate urban food policy roadmap developed participatively (IFAD, 2021).

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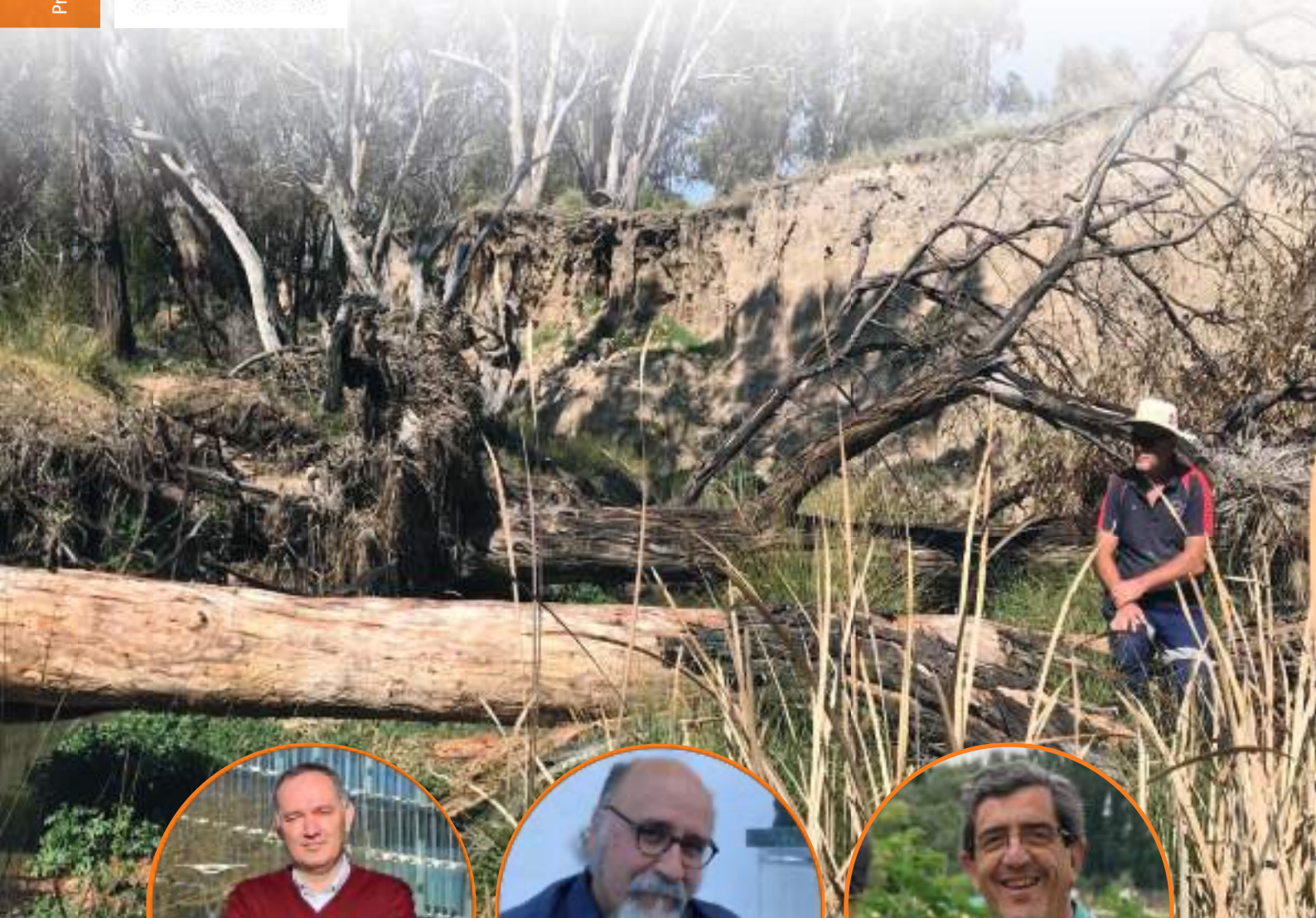
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# BETTING ON AGROECOLOGY AS A WAY OF AGRICULTURAL PRODUCTION AND ESTABLISHING SOCIAL RELATIONS



**José Ignacio  
García, SJ**

Spanish Jesuit, Director of *Cristianismo i Justicia* (Barcelona), and former professor at INEA, member of the 'Ana Leal' Ecology Working Group, Universidad Pontificia Comillas, Valladolid, Spain.



**Pedro Piedras**

Professor at the School of Agricultural and Agro-environmental Engineering INEA, and member of the 'Ana Leal' Ecology Working Group - Economics Area, Universidad Pontificia Comillas, Valladolid, Spain.



**Félix Revilla, SJ**

Spanish Jesuit, director and Professor of the School of Agricultural and Agro-Environmental Engineering, INEA, and member of the 'Ana Leal' Ecology Working Group - Economics Area, Universidad Pontificia Comillas, Valladolid, Spain.

## 1. Agriculture in Europe at the beginning of the 21st Century

European agriculture, as we know it today, was defined during the post-World War II period. Since the 1960s, while rural areas were being abandoned by a population increasingly attracted to industrialisation, the primary objective has been to ensure food supply to a growing urban population. This led to the Common Agricultural Policy (CAP); included among the CAP's objectives is to encourage farmers, through direct aid, to remain on their farmland and continue doing agriculture.

The first CAP concurred with the “Green Revolution”, which achieved a notable increase in productivity using intensive inputs—seeds, fertilisers, herbicides and pesticides. Production was fortified; however, its environmental effects were overlooked.

The CAP is a system of income transfer and subsidies to ensure farmers' income. Initially, these subsidies were solely linked to production (area devoted to crops, average yields, etc.). Other aspects, however, have been incorporated over time, such as rural development (alternative economic activities to farming). It most recently added requirements concerning environmental conditions (soil conservation and protection, agricultural land maintenance, and measures to prevent the deterioration of habitats).

The current debate within the European agricultural sector is whether to submit to the “yoke” of subsidies or enter the “market myth”. The market does not sufficiently reward products because it discounts the value of subsidies. In the case of the UK, this idea of market freedom was one of the arguments used for Brexit, for leaving the EU and abandoning the CAP. Despite this decision, the truth is that the UK continues to apply a system of subsidies to farmers.

As millions of farmers worldwide know, living off the markets is hugely unstable and, in the long term, keeps most farmers at subsistence levels. In these countries, a separate agriculture is often generated—an export-oriented agriculture that requires intensive cultivation of highly polluting



crops by exploited labour but generates minimal profit for the local population. The US and Europe heavily subsidise their agriculture because they are aware of the aggressiveness of markets towards farmers. The CAP can be strongly criticised, but it is a fact that it has undergone numerous modifications and has generated unprecedented income stability for farmers.

The protection of European farmers also has an important impact on agricultural production in third countries. While the EU is the world's largest exporter of agri-food products, it is also the world's second-largest importer of these products (229 billion in exports compared to 171 billion in imports). The EU controls, through tariffs and taxes, the importation of products from third countries. Therefore, we can speak of a protectionist regime which puts European agriculture ahead of other countries.<sup>1</sup>

Environmental conditionality [or cross-compliance] and bureaucracy have become among the most controversial issues surrounding the current CAP. Farmers feel that their efforts to preserve the environment are not sufficiently rewarded, making them less competitive with agriculture in non-member countries. Their anti-environmental

<sup>1</sup> [https://agriculture.ec.europa.eu/system/files/2023-01/agricultural-outlook-2021-report\\_en\\_0.pdf](https://agriculture.ec.europa.eu/system/files/2023-01/agricultural-outlook-2021-report_en_0.pdf)



talist approaches, however, are observed to have profound ideological bias. It is necessary to bear in mind that 1) the agricultural sector is responsible for more than 70% of the global environmental damage to the planet, 2) this sector is precisely the one most affected by climate change and its consequences, and 3) it relies heavily on immigrant labour. Thus, the same leaders who encourage farmers' protests paradoxically have climate change denialist agendas in their programmes and advocate for the expulsion of migrant workers, encouraging xenophobia<sup>2</sup>.

The development of intensive agriculture in Spain is a process undoubtedly linked to the arrival of immigrants, a solution to the loss of family members's contribution to their farms' labour and the disaffection of Spanish citizens concerning countryside waged work since production under competitive conditions has led farm owners to

reduce labour costs and to seek cheap labour<sup>3</sup>.

Between 2000 and 2021, foreign-born workers in the Spanish agricultural sector increased from 50,000 to 250,000. One thing that defines this group as a whole is their unjustifiable working and wage conditions, especially for those who do not have the documentation to reside and work in Spain. They are often forced to live in highly precarious socio-economic and health conditions in shantytowns close to workplaces, for example, in the strawberry-growing area of Huelva, the greenhouses of Almería, or the fruit-growing areas of Lleida<sup>4</sup>.

Comprehensive reform is urgently needed to address the direct work conditions of migrants employed in agriculture and the structural factors perpetuating their vulnerability<sup>5</sup>.

Implementing policies and practices promoting decent work, respect for human rights, and social integration is crucial to ensure Spain's sustainable and ethical agriculture sector<sup>6</sup>.

## 2. Agroecology

Approaching agriculture from the perspective of Integral Ecology could enable us to reformulate the vision currently driving agricultural activity and help attain a breakthrough in resolving its contradictions. Integral Ecology advocates for global development in agroecological approaches, essentially linking them to social justice and envisioning them as a way to approach Integral Ecology. We

2 A. Pedreño y P. Riquelme, "El trabajo asalariado agrícola en los territorios rurales españoles. Retos y oportunidades.", en *Mediterráneo económico* N.º 35, 2022

3 Muñoz Rico, A., "Trabajo digno también para los campesinos extranjeros" <https://elpais.com/planeta-futuro/3500-millones/2022-04-25/trabajo-digno-tambien-para-los-campesinos-extranjeros.html>

4 Véase Pedreño y Riquelme, pp. 268 y 274.

5 Véase [https://www.tierra.org/wp-content/uploads/2022/03/Alimentos-industriales\\_trabajo-precario.pdf](https://www.tierra.org/wp-content/uploads/2022/03/Alimentos-industriales_trabajo-precario.pdf).

6 [https://www.ccoo.cat/pdf\\_documents/Recerca%20AGREE%20complemt%20versi%C3%B3%2022\\_05\\_15.pdf](https://www.ccoo.cat/pdf_documents/Recerca%20AGREE%20complemt%20versi%C3%B3%2022_05_15.pdf)

could either conceive agriculture and socio-environmental justice as an inseparable whole or think of agriculture and the countryside as just another cog in the wheel of the technocratic paradigm which aspires to subjugate and control modern societies in all their spheres through technology.

Agroecology is incompatible with the current production system, mainly because agroecology is not merely an agricultural technique but a way of life, a production system based on sustainability criteria, encompassing much more than farming practices and focusing on caring for the land and the people. This makes agroecology, from the outset, incompatible with the capitalist system. Agroecology is a horizon that orients agricultural practice to the concept of Integral Ecology and its struggle against the technocratic paradigm. Agroecology is a challenge to the conventional agricultural system and the food industry. At the same time, it is a plea for proximity, austerity, simplicity of life and solidarity. Agroecology is a vector of profound social transformation towards a more just and sustainable society.

Vandana Shiva argues that the technocratic paradigm, which she defines as the industrial paradigm, considers the world as a machine at its service, nature as inert matter, and human beings as an entity independent from nature. In the technocratic paradigm, nature and human beings are mere agents of a production system that is called to produce more and more<sup>7</sup>. In Vandana Shiva's view, the industrial paradigm is opposed to the ecological paradigm of agriculture, which is based on life and its interconnections with the land and small farmers, especially women. Under this paradigm, people would become co-creators and co-producers alongside Mother Earth. In this paradigm, for Shiva, knowledge is not possessed [for dominion]; it is exercised and developed through agricultural activity, where we all participate in the fabric of life. In agroecological farming, the cycles of nature are intensified and diversified to produce more and better food using fewer resources. In addition, discarded plants serve as food for farm animals and the soil<sup>8</sup>.

Vandana Shiva pits the Law of Exploitation against the Law of Return, which posits that nothing is wasted and everything is recycled. Her vision focuses above all on small-scale producers, many of whom use the criteria of traditional agriculture (the kind of agriculture which, despite the technocratic hype, feeds 70% of humanity)<sup>9</sup> and whose ecological food systems are satisfied, primarily at the local level, where they grow what they can, export what is left over, and import what they cannot produce locally. In the medium term, however, our agricultural environment does not only appear to be unsustainable ecologically, socially or economically but will also devour itself eventually because it no longer directs food towards human nutrition but, to a considerable extent, towards animal fodder or industrial use<sup>10</sup>. Nevertheless, on a human scale, a different concept of agriculture should inspire a different kind of consumption.

Agroecology is thus proposed as an agricultural, environmental and ethical alternative, a horizon genuinely committed to the great transition.<sup>11</sup> It is crucial to take steps that respect the major socio-environmental values of agriculture: knowing how to produce and doing so in an increasingly efficient and sustainable way-caring for and shaping the landscape in a balanced way, and supporting the countryside. At the same time, this means protecting farmers and defending them from the abuses of big business; it will also involve taking care of them, paying them justly for their products, and finally, maintaining that farm workers expect fair working conditions.

### 3. INEA's Transition to Agroecology: From Intuition to Conversion

The INEA School of Agricultural Engineering (Valladolid, Spain) was established in the 1960s.

7 Shiva, Vandana, *Cosecha robada: el secuestro del suministro mundial de alimentos*; Ediciones Paidós. (2003).

8 Shiva, Vandana, *¿Quién alimenta realmente al mundo?*, Capitán Swing, Madrid. (2017) pp. 27-41.

9 FAO. The State of Food and Agriculture 2023. <https://openknowledge.fao.org/items/ca815d26-c876-4d54-9e90-f34432442bf2>

10 G. Monbiot, "Can we feed ourselves without devouring the planet?" [https://www.ted.com/talks/george\\_monbiot\\_can\\_we\\_feed\\_ourselves\\_without\\_devouring\\_the\\_planet?language=es](https://www.ted.com/talks/george_monbiot_can_we_feed_ourselves_without_devouring_the_planet?language=es). Del mismo autor, *Regénesis. Alimentar al mundo sin devorar al planeta*, Capitán Swing, Madrid. (2023) pp. 92-94.

11 Campus de la Transition. *Manuel de la Grande Transition*, 2020. [https://campus-transition.org/wp-content/uploads/2021/01/Intro\\_Sommaire\\_manuel\\_grande\\_transition.pdf](https://campus-transition.org/wp-content/uploads/2021/01/Intro_Sommaire_manuel_grande_transition.pdf)



It was then the height of the “efficient agriculture” boom, which used large amounts of inputs but was unconcerned about environmental impacts to produce huge quantities that consumers could afford. Producers and consumers were the weakest pieces of the chain; strength was found in the processors and marketers who provided the “value-added” and, thus, obtained substantial margins by paying low prices and selling large quantities.

Our School of Agricultural Engineering remained in this paradigm until 2005, and, as so often happens, it was a collateral initiative that led us to focus on the Agroecology paradigm, not only in terms of production but also in terms of social and environmental relationships. Our agreement with the Valladolid City Council to promote organic vegetable gardening for the city’s retired people on our school’s farm led us towards transformation. From intuition, we moved on to the conversion of our activity, even incorporating this perspective [Agroecology] in our curricula, research projects and participation in networks and social groups.

This approach has implications for soil management, water management, and crop diversification, as well as the integration of alternative value chains and business models that maintain locally adapt-

ed practices and offer other market alternatives to both farmers and consumers. The production of organic products has grown enormously throughout the EU, and these are now accessible in supermarkets and usual shops. Opting for Agroecology does not merely mean a chosen mode of production; it is instead a conviction for environmental sustainability and social justice, as we have already seen so far.

The first transformation [at INEA] was physical and affected the biodiversity of a 30-hectare farm. The Pisuega River irrigates plenty of riverbank vegetation for about a kilometre. The farm has extensive crops and trees, home to hundreds of species that coexist in the same space: some terrestrial, such as roe deer, badgers, foxes, snakes, snails, mice, and rabbits, etc.; others are aerial, such as pigeons, birds of prey, ducks, storks, jays, blackbirds, sparrows, goldfinches, etc.; and others aquatic, such as catfish, crab, carp, pickerel, etc. In addition, the land has been well-tended for twenty years, providing the soil with an extraordinary abundance of invertebrates and microbiological life.

More than 60 products can be counted in our organic agricultural production. Many fruit trees include apple, cherry, plum, pistachio, almond,

hazelnut, walnut, pear, raspberry, blackberry, currant, strawberry, acerola, quince, and peach. Present, too, are various garden crops such as tomato, pepper, cucumber, courgette, pumpkin, aubergine, potato, lettuce, chard, kale, cabbage and cabbage of all kinds, melon, watermelon, etc., as well as extensively irrigated crops, such as leguminous plants and cereals. We also breed Castilian black hens and produce eggs of this native breed.

Social interaction is crucial because we have a project of 430 organic vegetable gardens. Visitors come to buy our farm products, especially since they are farmed by older people who enjoy nature and gardening and by persons with disabilities, immigrants, employees, teachers, and students. It is a natural social ecosystem that operates more intensely each day.

This triad of natural, cultivated, and human biodiversity makes the INEA Farm a unique environment with enormous power for raising awareness concerning the paradigm shift that society needs.

This transformation animates our spirituality and the many people who come to know about this conversion. As Pope Francis often mentions, it is a spirituality that prioritises time over space. So, we try to generate change processes: individual and group transformation processes. We aim to promote unforced processes, adapt to natural cycles, respect [natural] rhythms, and seek balance, harmony, and solidarity. We apply this dynamic, which we recognise in nature when facilitating retreats, spiritual exercises, and various meetings, to provide the right rhythm for personal encounters with God.





# COMMUNITY GARDENS: INTEGRAL ECOLOGY IN PRACTICE\*



## Ciara Murphy

Works as Environmental Policy Advocate in the Jesuit Centre for Faith and Justice. She works on influencing policy change at a national level and focusing on community-based local initiatives.



## Kevin Hargaden , S.J.

Irish Jesuit. He is a Social Theologian and Director of the Jesuit Centre for Faith and Justice in Dublin. He holds degrees in Computer Science, Sociology, and Theology and completed his PhD. in Theological Ethics at the University of Aberdeen.

## INTRODUCTION

There is a sustained growth in interest in community gardens and allotment gardening across the globe.<sup>1</sup> In this paper, we propose that Christian communities should welcome and encourage -- and even experiment with -- this trend. We establish a theological basis for ecclesial community gardens by reflecting on the account of Eden in Genesis 2. We then describe the growing phenomenon before suggesting, by reference to community garden projects established in the Irish Jesuit Province, that while they offer tangible benefits around food production and environmental mitigation, other intrinsic goods around conviviality and community warrant our attention. They can be expressions of integral ecology in practice. They do not achieve dramatic measurable results, but they can serve as a witness to the flourishing that comes from pursuing both environmental and social justice.

\* This chapter is an expansion of an earlier work: Ciara Murphy, "Community Gardens - More than Just Food," Jesuit Centre for Faith and Justice, March 15, 2024, <https://www.jcfj.ie/2024/03/15/community-gardens-more-than-just-food/>.

<sup>1</sup> Dominik Bieri et al., "Increasing Demand for Urban Community Gardening before, during and after the COVID-19 Pandemic," *Urban Forestry & Urban Greening* 92, no. 128206 (2024): 1–11.

## GROUNDING THE GARDEN IN THE BIBLE

To think of the place of gardens in the Scriptures makes us think of Eden, the primal garden. Our reflections on this biblical text focus on the prominent dogmatic themes of the Fall and the promise of redemption. We can become so familiar with a text that we miss some of what it says to us. When we go beyond the huge overarching themes, closer to the ground of the text, in the details, we find a fertile place to plant our anthropology.

The second Creation account begins in Genesis 2 with a space waiting to be crafted into a place. God makes Eden from the ground and, like a potter, crafts humans from the same substance. The play on words here is commonly recognised: the ground is אדמה (*adama*), from which we get the human's name: Adam. And where does God put Adam? In a world that, as the acclaimed American writer Marilynne Robinson puts it, "is suited to human enjoyment."<sup>2</sup> Robinson aptly observes, "The beauty of the trees is noted before the fact that they yield food."<sup>3</sup> The garden has a goodness independent of its commercial benefit, contribution to national caloric intake, or increase in commodity markets.

The human that YHWH has created cannot be understood on their own. They are only completed when they are placed into a relationship with other creatures, first with the many other species at home in the garden and then within a community of human beings through their partner's creation: he and she, Adam and Eve. It is the human who is placed within this web of life, this thick ecology of creatures and plants and beauty, that is charged to till and to keep (Gen 2:15).<sup>4</sup>

The American scholar Alison Acker Gruseke interprets this text through the lens of Ivan Illich's concept of conviviality. For Acker Gruseke, the relational nature of human beings extends to communities with non-human creatures and the wider environment. Contemporary ecology has shown us that a "network of conviviality exists even within the soil itself."<sup>5</sup> If we only consider the functions of the subterranean threads that blossom above ground as mushrooms, we see that there is much more going on in the ground than we could have ever dreamed of.<sup>6</sup> However, the ancient biblical text pointed us to the significance of the earth's dust long before we started collecting soil samples. As Acker Gruseke puts it, "Moistened soil is the material from which God forms humans and animals" (Genesis 2:7-8, 19).<sup>7</sup> If Illich saw conviviality as one of the modes through which we "invest the world with meaning",<sup>8</sup> then "the joint roles of environment and work", which we find in the Edenic task of tilling and keeping, is paradigmatic for human thriving.<sup>9</sup>

## THE COMMUNITY GARDEN MOVEMENT

Tilling and keeping, at its most basic understanding, is unquestioningly related, to some degree, to food and its production. While the harvest of the garden is not the first thing that the Scriptural account mentions, food remains its most obvious good. It is a fundamental necessity of life. Every single part of the [food] process extraordinarily influences our health, communities, and common home. What we eat, how it is produced, what we throw away, and how we prepare and eat our food have outsized impacts beyond calorie intake.

Food production is where this relationship starts. The increasingly industrialised food production means that this aspect of the relationship is absent for many -- divorcing us from the knowledge and awareness of the effort required to grow and tend the seeds of our food system. There is little conviviality in the factory farm! The [industrialised] ag-

2 Marilynne Robinson, *Reading Genesis* (New York, NY: Farrar, Straus, and Grioux, 2024), 39.

3 Ibid.

4 As Ellen Davis notes, it is a mistake to let our familiarity with the texts render "to till and to keep" in sentimental terms. The words indicate care and attention but the kind of care that is hard work, the kind of attention that takes our energy. She goes further: "[T]he wider usage of the verb suggests that it is legitimate also to view the human task as *working for* the garden soil, serving its needs. Even the connotation of worship (cautiously applied) may inform our understanding. While biblical religion clearly forbids divinization of the earth, one might recall that the English word 'worship' originally meant 'to acknowledge worth'. In that sense, the Hebrew wordplay translates well into English. The soil is worthy of our service." Ellen F. Davis, *Scripture, Culture, and Agriculture: An Agrarian Reading of the Bible* (Cambridge: Cambridge University Press, 2009), 29 (emphasis original).

5 Alison Acker Gruseke, "Convivial Gardens: Genesis 2-3 in Agrarian and Space-Critical Perspective," *Interpretation: A Journal of Bible and Theology* 77, no. 1 (2023): 27.

6 Kevin Hargaden, *Theological Ethics in a Neoliberal Age, Theopolitical Visions* (Eugene, OR: Cascade, 2018), 177-178.

7 Gruseke, 27.

8 Ivan Illich, *Tools for Conviviality* (London: Boyars, 2009), 21.

9 Gruseke, 24.



ricultural production system, while responsible for the vast majority of the food we consume, is also responsible for the enormous amounts of water and air pollution, biodiversity loss, and habitat change.

Changing this dynamic requires not only top-down regulation to protect the water, and initiatives to support farmers in protecting biodiversity, but also grassroots projects that facilitate the blossoming of the relationship between people and how their food is produced. While community gardens and allotments are not new, there is a renewed appreciation of their potential in rejuvenating our relationship with food and, on another level, their potential in facilitating human thriving in a world where connection to the natural environment is increasingly constrained.

Sometimes used interchangeably, community gardens and allotments have some distinct characteristics. Allotments are plots of land that individuals or families work on, while in a community garden, cultivating the garden and harvesting are [communally] shared. Many garden initiatives have elements of both, with shared space and effort sitting comfortably alongside privately managed plots.

In its simplest terms, community gardens and allotments offer space for people who wish to grow their own food. They are becoming increasingly common in Ireland, with grants available<sup>10</sup> to facilitate community groups that want to establish a project. Their potential, however, goes well beyond that. These spaces are a hub not only for growing food but also for cultivating community and environmental care. They are spaces where people meet and share knowledge, news and stories. They are spaces where biodiversity can flourish. They are essential “third spaces” which foster a connection to biodiversity, food, and our neighbours. In this way, they are spaces which can prompt an ecological conversion, which Pope Francis asserts is necessary to care for our common home: “The ecological conversion needed to bring about lasting change is also a community conversion.”<sup>11</sup>

## FORM INFORMS FUNCTION

Form and function are intrinsically linked. How a plant looks and feels determines how it functions within an ecosystem. In the same way, how you plan, design, and what you include in your community garden influences the possibilities of that space. Every community and allotment garden is unique.<sup>12</sup> The available space, the proximity to other amenities, the existing community, and the desire of the community to use the space in specific ways all contribute to the uniqueness and the possibilities that each site offers. Accessible facilities can be features included in the project, including wheelchair-accessible planters, communal space to promote connection, and growing space for experimentation and teaching. Designing within these confinements allows the maximal contribution of everyone in the community. Dedicating space for biodiversity, either through planting native and pollinator-friendly plants or even establishing a pond, enables the garden to become a place where one can learn about ecosystem functioning, offers a retreat away from the busy noise of modern life, and teaches us to appreciate the wonders of the natural world. Fostering this relationship of awe with

10 Dublin City Council, “Community Climate Action Fund,” Dublin City Council. Access on 05/04/2024 <https://www.dublincity.ie/residential/environment/environmental-awareness/community-climate-action-fund>

11 Laudato Si’, §219.

12 Community Gardens Ireland, “What Is a Community Garden?,” Community Gardens Ireland, March 29, 2024, <https://cgireland.org/what-is-a-community-garden/>.



the natural world, and not only valuing ecosystems in their ability to provide us food, is an integral part of our experience as humans in ecosystems with other creatures.

Considering our opening deliberations, we might even say these are *Edenic* concerns. This conviviality is on display in *Laudato Si'*:

“If we approach nature and the environment without this openness to awe and wonder, if we no longer speak the language of fraternity and beauty in our relationship with the world, our attitude will be that of masters, consumers, ruthless exploiters, unable to set limits on their immediate needs. By contrast, if we feel intimately united with all that exists, then sobriety and care will well up spontaneously.”<sup>13</sup>

We also know that where people meet, possibilities emerge.<sup>14</sup> While the main function is usually the growing of food, these communal spaces can evolve and adapt to changing community needs and emerge as spaces of education, places for parents to bond with their children, spaces to combat mental health issues, and ecological hubs for communities to care for our common home.<sup>15</sup>

In *Laudato Si'*, Pope Francis alerts us to just these possibilities:

“Around these community actions, relationships develop or are recovered, and a new social fabric emerges. Thus, a community can break out of the indifference induced by consumerism. These ac-

tions cultivate a shared identity with a story which can be remembered and handed on. In this way, the world and the quality of life of the poorest are cared for with a sense of solidarity, making us aware that we live in a common home God entrusted to us. When they express self-giving love, these community actions can also become intense spiritual experiences.”<sup>16</sup>

The garden’s form as a cultivated space on a human scale maps onto its effect: a space where the human community can be cultivated.

## DIGGING INTO OUR COMMUNITY GARDENS

The Old Garden<sup>17</sup> is a new project beside the grounds of the Jesuit school, Clongowes Wood College. It has been established and will be maintained by The Blessed John Sullivan Community Gardens and Farm. The 7.5-acre site is a field but offers an incredible opportunity to cultivate something special. The local community is pulling together, driving this project, and making it a reality. Since the ground has been broken on-site, on the weekend of St. Patrick’s Day, 2024, nearly 2,500 native trees have been planted to create woodland. In years to come, this will be a haven for biodiversity. Over 60 people have secured a plot in this new venture, and many others have expressed interest in the project. This new community grouping will consist of people from the area surrounding the school, including local refugee families.

<sup>13</sup> *Laudato Si'*, §11.

<sup>14</sup> Community Gardens Ireland, “Creating Environmental Synergies With Community Gardens,” *Community Gardens Ireland*, March 29, 2024, <https://cgireland.org/synergies-in-community-gardening/>.

<sup>15</sup> Karin Bacon and Elizabeth Cox, “Reaping the Rewards of an Inner-City Garden,” *Working Notes* 36, no. 91 (September 2022): 31–39.

<sup>16</sup> *Laudato Si'*, §232

<sup>17</sup> Community Garden Ecosystem Initiative, “The Old Garden Kildare,” *The Old Garden*, March 15, 2024, <https://www.theoldgarden.ie>.



This is an exciting time in the new project. Keen gardeners have the opportunity to create something beautiful from a blank slate. Relationships will be forged as neighbours work together and try new ways of cultivating food. Knowledge and resources will be shared. Students insulated from the mechanics of the food production system will learn the effort and skill it takes to feed communities. Biodiversity will also be allowed to flourish where the land was only managed for grazing before.

While this project is new, and the results have not yet manifested, the commitment to this project from the community group, the school, and the wider Jesuit Province is long-term. Fostering relationships and creating a thriving community ecosystem takes time -- the environmental benefits of a community garden are largely realised in the years after initiation.<sup>18</sup>

Different opportunities and outcomes are possible depending on the scale and site of the project. The Old Garden is a relatively large site in a relatively affluent area. On the other hand, the St. Francis Xavier Garden is located on Gardiner Street, in a region of Dublin known for its deep social deprivation, the North-East Inner City. Poverty and all kinds of intersecting social marginal-

isations occur together commonly here. Access to green space in this part of the city is scarce.

In this context, the walled garden, part of the Jesuit community on Gardiner Street, is of immense significance. It is a much smaller space: under 0.5 of an acre. It had always been the private garden of the community. However, during the exceptional times of the COVID-19 pandemic, the garden gained a new lease of life as a playground for the students of an adjacent Jesuit primary school.<sup>19</sup> This welcome change allowed children, primarily residents in the inner-city, to have access and play in a green space surrounded by trees. Conviviality is the word to summarise this. The impact was immediately noticed by the teachers who spoke of students' behaviour improving after break times. Once the enjoyment this garden could offer these children was realised, plans progressed to formalise it as the threat of COVID-19 retreated. A polytunnel was installed where students were allowed to grow and wonder at the transformation of a seed into a plant. Members of the parish were invited to work in the garden weekly to "keep and till" the garden for food cultivation and biodiversity. The time spent getting our hands dirty digging the earth and encouraging plants to grow is time spent

18 Jason K. Hawes et al., "Comparing the Carbon Footprints of Urban and Conventional Agriculture," *Nature Cities* 1, no. 2 (February 2024): 164–73.

19 A comprehensive history and description of the collaboration between the school and Jesuit community can be found in Bacon and Cox, "Reaping the Rewards of an Inner-City Garden."



cultivating our wonder at the beauty of creation. The intersecting interests of social justice, environmental care, and spiritual growth represent a real-world enactment of integral ecology.

## CONCLUSION: CULTIVATING CONVIVIAL SPACE

These are small initiatives in the grand scheme of our transition to an ecologically sustainable way of living. Even the most ambitious commitment to such gardens would do very little to dent our global carbon emissions, and while each project would become a haven of life, the sum total would look small in the context of a mass extinction. However, just as community gardens are not primarily beneficial because of the harvest they yield, they are worthy of Christian attention because they mitigate the effects of our environmental crisis.<sup>20</sup>

They can be expressions of the common good in action. They cultivate community, and they encourage public health and well-being. They can be sites of pedagogy (for practical skills or spiritual

formation), have positive environmental impacts, and, at the end of the season, yield a crop!<sup>21</sup> But fundamentally, they warrant our attention because they bear witness to this profound theological truth: human beings were not made to compete and to strive; humans are not ultimately valued because of what they produce or consume; and they are not [meant to be] alienated individuals or even a solitary species. As the Scriptures testify, the human being is a person in relationship with their Creator, themselves, other humans, and the whole created environment.<sup>22</sup> The garden is a convivial space where we can discover what we were made to be. We are in an age of climate collapse and biodiversity breakdown. We are seeing technologised anxieties increase. We can think of few things more fruitful than for Christians to do than to set aside some space and to begin to “till and to keep” (Genesis 2:15) together. Community gardens can be a convivial space to put integral ecology into practice.

20 Benjamin Goldstein, Jason Hawes, and Joshua Newell, “Urban Agriculture Isn’t as Climate-Friendly as It Seems, but These Best Practices Can Transform Gardens and City Farms,” *The Conversation*, January 22, 2024, <http://theconversation.com/urban-agriculture-isnt-as-climate-friendly-as-it-seems-but-these-best-practices-can-transform-gardens-and-city-farms-221537>.

21 This list is partially inspired by: Anita Kwartnik-Pruc and Gabriela Droj, “The Role of Allotments and Community Gardens and the Challenges Facing Their Development in Urban Environments—A Literature Review,” *Land* 12, no. 2 (February 2023): 325.

22 “When we speak of the ‘environment’, what we really mean is a relationship existing between nature and the society which lives in it.” *Laudato Si'*, §139.



# CLIMATE CHANGE, FOOD INSECURITY, AND THE MARGINALISED OF INDIA



## Louis Prakash, SJ

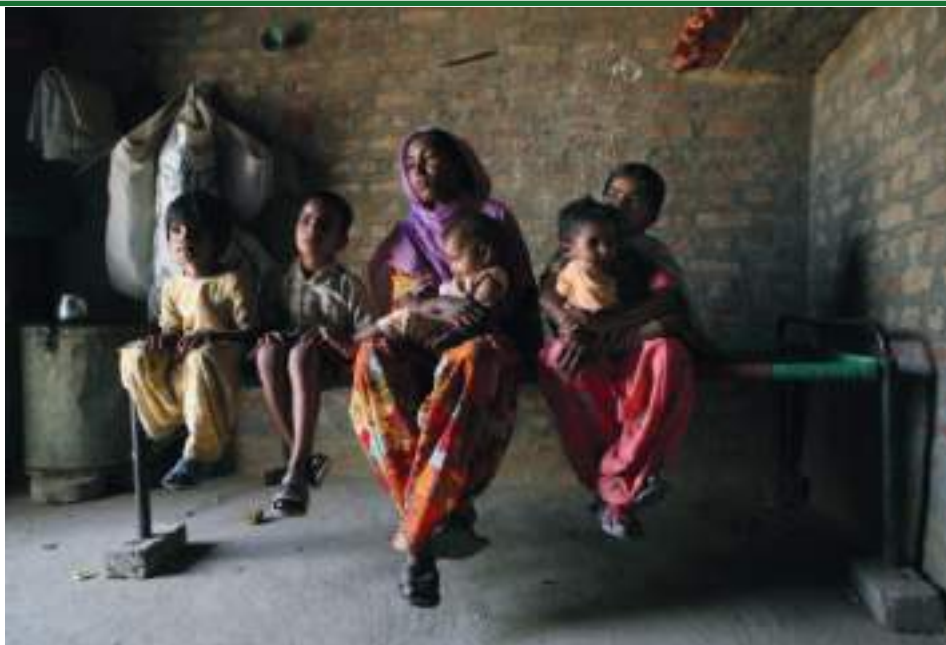
Indian Jesuit, director – Xavier Institute of Social Research, Patna, Bihar (India), and Coordinator Bihar Migrant Hub.



*“With the imposition of the Foreign Contribution Regulation Act’s new rules, I lost my small job. Having lost this job as an office assistant, I could hardly take care of the family, and now we are on the verge of starvation,” Virendra Manjhi bemoaned.* Virendra supports a household of seven: his wife, their three children, and their ageing parents; they are almost always on the road now, seeking various means to survive. He comes from one of the most marginalised caste or community groups in India, the lowest rung of the social order. Belonging to this community, people like Virendra cannot get credit from [commercial] banks to start a livelihood and be self-employed since Virendra does not have assets to guarantee repayment.

Virendra is not the only one who has been pushed to greater vulnerability. Millions of families in India now find themselves living in these conditions. Due to the caste and class structure of India, people who belong to Virendra’s caste are only ‘landless agricultural labourers’. These labourers work on someone else’s land, not owning any portion of the land they till. They get paid a meagre amount for hard labour and work throughout the day and year to keep the family out of starvation. Some take to raising pigs, which helps bring in some money.

COVID-19 has put families in marginalised communities at a higher risk of death. Lacking both reliable information about the virus and the resources to protect their families, many people faced immense suffering. As the lockdown dragged on, their already scarce income opportunities vanished. Many who had migrated for work were forced to walk long distances home due to travel restrictions. It is reported that COVID-19 claimed more than 4 million lives.



Reflecting on the journey of millions in India since the onset of COVID-19 restrictions reveals that they have endured a series of relentless disasters. How have all these impacted India's most marginalised? One keeps hearing that India's primary economic activity is agriculture. It is also said that over 70 per cent of India's population lives in rural areas, primarily engaged in agriculture.

India's production of food grains has been increasing every year, and it is among the top producers of several crops, such as wheat, rice, sugarcane, cotton, and legumes such as pulses. It is the highest producer of milk and the second highest producer of fruits and vegetables. In 2013, India contributed 25% to the world's pulses production, the highest for any country, 22% to global rice production and 13% to wheat production. Besides being the second-highest exporter of cotton for the past several years, it also accounted for about 25% of the total cotton produced worldwide. However, the agricultural yield (amount of a crop produced per unit of land) is lower in the case of most crops when compared to other top-producing countries such as China, Brazil and the United States (State of Agriculture in India. <https://prsindia.org/policy/analytical-reports/state-agriculture-india>).

Policy Research Studies (PRS) goes on to state that crucial issues affecting agricultural productivity include the decreasing size of agricultural land holdings, continued dependence on the monsoon, inadequate access to irrigation, misuse of nutrients that has led to a loss of soil fertility, uneven access

to modern technology in different parts of the country, lack of access to formal agricultural credit, limited procurement of food grains by government agencies, and failure to provide remunerative prices to farmers.

Over the years, committees and experts have recommended several measures, including implementing agricultural land leasing laws, adopting micro-irrigation techniques to boost water efficiency, enhancing access to quality seeds through private-sector collaboration, and establishing a national agricultural market to enable online trading of farm products. But none of these have been followed up on; no action has occurred.

Sukhdeo Mahato, a farmer from Arwal in Bihar, North India, lamented the fact that due to lack of rain and the flash floods from the Punpun River, wheat cultivation in the area has declined substantially. Sukhdeo owns around two acres of cultivable land on which his joint family survives. When the rains were normal, he and his family would cultivate two major crops: paddy and wheat. They would also grow vegetables for household consumption and sale in the local market. He disclosed, "Production has decreased for the last 10 years. Summer vegetable cultivation also has been badly hit since there has been a steady increase in temperature every summer. Due to this, my younger brother has gone to Chennai, South India, to earn money to take care of the family's needs. While he is away, I take care of his family. Since ours is a joint family, I am also expected to care for his children. If not, the entire family would suffer a lot".

Notably, the government of India's economic survey (2018) estimated an annual loss of US\$ 9-10 billion, that is, 700 crore Indian rupees, due to the adverse effects of climate change... Scientific studies have warned that the Indian sub-continent and other continents are highly vulnerable to climate change issues. Some of these changes involve

floods, droughts, storms, hail storms, cyclones, heat waves, etc. (Climate Change and Indian Agriculture: Impacts, Coping Strategies, Programmes and Policy. Indian Council of Agricultural Research. Govt. of India: New Delhi. 2019).

Bihar is India's most flood-prone State, with 76% of the population in North Bihar (northern India) living under the recurring threat of flood devastation. The rainfall was intense in four months, from June to September. Floods are recurring disasters that annually destroy thousands of human lives, livestock and assets worth millions [of Indian Rupees]. On average, the flood in Bihar affects 15 lakh hectares of land, around 1.5 million hectares of land, and 76 lakhs, 7.6 million of the population. The damage caused by flooding is worth about a hundred crore (1000 million) Indian rupees every year. In Bihar, the Kosi River region's floods are among the most disastrous. Hence, the Kosi River has been called "The River of Sorrow". (Raj Rajeev. Impact of Floods on the People of Kosi Region. Journal of Emerging Technologies and Innovative Research (JETIR). Volume 7, Issue 3. March, 2020).

The flood of 2008 was exceptionally devastating. The flood ruined 285,798 houses; standing crops of paddy, vegetables, fruits and pulses were smashed; 993 villages were displaced; at least 340,000 hectares of cropped area were damaged; over 33 lakh (3.3 million) persons were affected; 530 people perished; 10,844 livestock lost. In addition to these hard facts, there were indirect impacts. Lack of food led to malnutrition and starvation, crop patterns changed, cultivable areas shifted, settlements of villages changed, people became orphans, widows, etc.

The government of India declared a "state of national calamity". The Bihar government then initiated the 'Kosi Reconstruction and Rehabilitation Programme' (KRRP), covering 30,000 affected



families. Under the KRRP, 14,808.95 crore Indian rupees (US\$2,116 Million) was allotted to provide livelihoods, construct community facilities like elevated community halls and water sources, reconstruct the houses of those displaced by the severe flood, rebuild educational institutions, *panchayat Bhawan* or local governance offices, etc.

How does climate change affect food security, particularly for marginalised communities in India? Mahendra Yadav, a social worker associated with Kosi Nav Nirman Manch (Kosi Rehabilitation Forum), observed, "The 2008 Kosi flood deposited large amounts of sand and silt on agricultural land affecting millions of people in Nepal and India; Nepal from where this [Kosi] river originates and flows to India's Ganges River and finally joins the sea". Quoting some of the studies, Mr Yadav asserted that over 700 hectares of fertile land were made uncultivable because of the inundation, which left sand and silt sediments. He expressed regret that the hardest-hit villages remain as barren as deserts even a decade after the flood. The shift from fertile to barren land, caused by Kosi's flood sediments, has compelled people to migrate for survival.

Ranjeev Kumar, another social worker involved in the relief operations, said, "People [were] rushing to board any vehicle—from cycles to rickshaws to carts—to escape to safer places. The top priority of people was to escape by leaving everything behind, including their homes, cattle, and possessions, at the mercy of God."



Various studies examining the causes of migration in India have identified natural and human-induced causes. The natural causes of migration include floods, droughts, earthquakes, tsunamis, landslides, unseasonal rains, melting of glaciers, global warming, climate change, etc. The human-induced causes of migration may be displacement due to so-called developmental projects, conflicts like riots, communal or caste-based tensions and conflicts, wars, ethnic clashes, land acquisitions, land degradation, deforestation, industrialisation, urbanisation, etc. However, it is a fact that distressed migration is due to poverty and unemployment. Those with alternative livelihood options manage to escape poverty and food insecurity. But the marginalised who survive on meagre resources are pushed to the brim of food insecurity, leading to malnutrition and starvation.

Devastating floods in Bihar or north India are a significant migration factor. Here, both human and natural factors play a vital role. For instance, there has to be a tripartite agreement between the governments of Nepal, India, and Bihar to regulate the Kosi River. Those in power have not paid attention to this demand by the people and the region's civil society. The common masses are victims of the ruling elite's apathy.

Despite millions of Indian Rupees allocated for the post-2008 flood rehabilitation, most funds

were spent on infrastructure instead of helping people rebuild their lives. Moreover, in the interest of infrastructure development, massive bridges and flyovers were constructed in the area without adequately considering water resources and ways. There was a strong political will not to remedy the situation but to allow things to deteriorate, leading to further disasters and devastation.

Natural factors contribute to the floods in the Kosi region of Bihar, India. Countries comprising the Kosi Basin—Nepal, India, and China—feature consistently on lists of the most climate-vulnerable nations in the world due to drought and flood risks. Results from studies show a high likelihood of stronger monsoons, which will increase the impacts and risks for monsoon-related disasters, such as landslides and floods. Therefore, disaster risk reduction and management, especially related to floods, should be a priority for the governments of Nepal, India, and China. However, most planning in the Kosi Basin is still done at the individual project level without considering the impact on the basin scale. (From the Mountains to the Plains:



Impact of Climate Change on Water Resources in the Kosi River Basin. International Water Management Institute: Colombo, Sri Lanka. 2019.).

Based on various studies and reports, the following are ten selected recommendations to address the effects of climate change and food insecurity on marginalised populations in India.

1. Concerning any disaster, rescue, relief, and rehabilitation are the three strategies of the National Disaster Management Act, 2011 of the government of India. These are critical to alleviating the suffering of the affected. Hence, relief must be inclusive; rescue must be gender and discrimination-sensitive; rehabilitation should take a holistic approach, supporting the return of a good quality of life and sustainable livelihoods for disaster survivors.
2. Infrastructure development in flood-prone areas should consider human and nature-related issues and construct common or familiar places for rescue, relief and rehabilitation [efforts]. If there is large-scale corruption in infrastructure development, there will be unending problems in the future.
3. Searching and setting up large-scale alternative employment in flood-prone areas has



become one of the significant demands of the people so that they can still earn a living even during a flood.

4. Large-scale skill training among youth to enhance their employability according to the local context is necessary. These skills are needed to increase employability should they migrate. Both push-and-pull factors should be kept in mind when providing skills training.
5. With skill development, youth should have enough employment opportunities. Otherwise, they will get demoralised after the training. The Bihar government should decisively promote micro, small, and medium enterprises (MSME) in rural Bihar. This will create employment and generate income for the rural poor, contributing to nation-building.
6. Build women's organisations through thrift and credit facilities to enhance their leadership. Formal and informal organisations ensure women's rightful place and role,

leading to lasting change as they address various life issues.

7. Incidentally, the Bihar and Kosi regions face flood and drought alternatively or simultaneously. Large-scale afforestation and embankments or dams along the riverbanks are needed to contain intense flooding. Micro-irrigation projects would address drought.
8. Emergency preparedness helps address the emerging issues of climate change and its impact on people, especially the marginalised. According to the Indian Meteorological Department (IMD Annual Report, 2021), between 1970 and 2021, India experienced 573 disasters related to extreme weather, climate, and water events, resulting in the loss of 138,377 lives. Loss of property and infrastructure is even more immense. Hence, it is vital to make the citizens conscious of impending danger, prepare them to face these consequences, and reduce the negative impacts of climate change.
9. Promoting better health and education among all citizens, especially the marginalised sector, is the need of the hour. Educational reform, land reform, economic reform, etc., must be implemented to ensure overall and integral growth of all, especially the marginalised.
10. Ecological preservation, climate change and environmental protection must become integral to education at all levels. This is not to be done only in terms of environmental protection on an individual level but from a social perspective. Information passing, consciousness creation, and collective action for environmental protection and preservation must become a way of life, not [merely] an activity.

All religions point to Nature, not just the human race, as the integral creation of God. Islam believes that the earth is the sacred creation of Allah. Islam instructs its followers, “If a Muslim plants a tree or sows seeds, and then a bird, or a person, or

an animal eats from it, it is regarded as a charitable gift for him”. (*Sahih al-Bukhari, Book 41, Hadith 5682*).

Dr Karan Singh, an advocate of interfaith dialogue representing Hinduism in the Assisi Declaration on Nature in 1986 in Assisi, communicated a vision of ecological interconnectedness of all life and the divine as per Hinduism. He stated, “Nature is permeated by a reverence for life and an awareness that the great forces of Nature, the earth, the sky, the air, the water and fire as well as various orders of life including plants and trees, forests and animals are all bound to each other within the great rhythms of Nature. The divine is not exterior to creation but expresses itself through natural phenomena” (<http://www.arcworld.org/downloads/THE%20ASSISI%20DECLARATIONS.pdf>).

His Highness, the Dalai Lama, speaking about the present ecological crisis and the need to go back to the interconnectedness of all beings, said, “The natural environment sustains the life of all beings universally. Whether we like it or not, every being on this planet is a part of Nature. And this is particularly important when we face global issues like climate change and environmental degradation.” (Sofia Stril-Rever. H.H. the Dalai Lama XIV: My Appeal to the World. Tibet House. 2015).

The Global Environmental Forum, in its Global Ministerial Environmental Forum held in Nairobi in 2001, reflected on religious views on the environment. In this forum, the Sikh representative stated, “Sikhism teaches that all forms in the universe exist under God’s command and that, having brought a life form into being, God will protect it. The teachings of Sikhism are based on a premise of life liberated from conspicuous consumption” (<https://iefworld.org/unepegc21.htm>).

From these sociocultural and religious principles, we are invited to move towards individual and collective practices that save the creation, the human race, and the universe according to the plan of God, our Creator.

# UNITY IN DIVERSITY- FARMING, GOD'S WAY



## Claus Recktenwald, SJ

German Jesuit, currently Director of Kasisi Agriculture Training Center (KATC) in Zambia. He holds a Master's in Agricultural Sciences (Integrated Plant and Animal Breeding) from Göttingen University, Germany.

### Section 1: A Conceptual Approach To Different Ways of Farming

#### *Just about growing food?*

Over the last decades, images of protesting farmers have become nearly normal to us. Most recently, there have been big farmer protests in India, Germany, and Poland. Pictures of kilometre-long roadblocks of tractors, heaps of dung dumped in front of government buildings and banks, or the throwing of milk, vegetables, fruits, and other perishables in public spaces seem to be losing their impact on people. There is a danger that protests will become more and more violent or that farmers will opt for drastic actions like self-immolation because they cannot find alternative solutions to over-indebtedness.

This is one aspect of an underlying and ongoing process that some scholars describe as the corporate capture of our food systems.<sup>1</sup> In the course of agricultural industrialization, several huge companies increase their market power and profits, giving them the power to shift state and international laws worldwide in their favour. Farmers are forced into a type of agriculture that is not viable for many of them, leading to a steady increase in farm sizes that can function within the tight framework of industrialized agriculture.<sup>2</sup> Subsidy policies only slow down the process of farm death. Industrialized agriculture is the source of several problems like the degradation of farmland, pollution of water bodies, accelerated climate change, the rise of non-communicable diseases, and the deprivation of an essential cultural dimension—sovereignty over the food system. For most of these problems, the responsibility is not assumed by the originating agro-food industry but is passed on to the general public.

Farming is not just about producing food. Farming is a lifestyle, a way of life. Food itself is deeply connected to culture. The big cultures of the world have developed around “their” staple crop which often had the Gene Center in their area.<sup>3</sup> Cereals, like wheat and barley, have influenced the old cultures of the Near East and the Mediterranean. Maize and potatoes are at the foundation of the high cultures of the Americas. Rice is strongly present in Asian cultures while sorghum and millet are in Africa.

Many cultural and religious practices have emerged around these life-giving crops. In the Eucharist, wine and bread from unleavened wheat are used as staple food in the Holy Land. Groups also distinguish themselves from others by their eating habits and taboos, creating a strong group identity. So eating pork meat is taboo for Muslims, Jewish communities, vegetarians or the vegan movement. At times, food has become the cause of social struggle for justice. Not only when people did not



have to eat, but also when they were forced to eat that which did not express their culture.<sup>4</sup>

Farming or food production is deeply embedded in humanity’s culture, and is, therefore, the place where worldviews and different ways of perceiving the world are incarnated or, where a group’s cultural and religious beliefs surface. These can mutually fructify each other, but can also uncover lines of economic, social, cultural, or political conflicts with inherent power dynamics.

## Different Agricultures

There is no one *agriculture*, but many different *agricultures*. A multitude of agricultural concepts and names are on the market, whilst their exact meaning are often not very clear to practitioners and agricultural professionals. In some cases, too much clarity is not even desirable; some space is left open for people to organize and find a bigger base for promoting ideas. If an idea is too strongly defined it might lose its acceptability.

This article has two sections: a conceptual section and, another about our field experience. In this

1 Refer to Figure D. Corporate capture of agricultural and food policy in Southern Africa. in: Wynberg, R. [Ed.]: African Perspectives on Agroecology. Practical Action Publishing, 2024.

2 In developing countries, small-scale farmers are often exposed to land grabbing to create huge farms financed by international capital.

3 Vavilov, N.I.; Love, Doris (trans.). Origin and Geography of Cultivated Plants (Cambridge University Press,1992).

4 2 Maccabees 7.



first section, I attempt to provide a basic classification of different terms like Sustainable Agriculture, Conservation Agriculture, Climate-smart Agriculture, Regenerative Agriculture, Organic Agriculture, Agroecology, Biodynamic Agriculture, Natural Farming, Zero-budget Farming, and Integral Ecology. The list does not aim for completeness and the classification might need a more rigorous approach as it needs to consider typological, historical, and etymological criteria. Here, I suggest two main criteria for the [agricultural] classification process: the practice/input or goal-oriented approach, and the underlying worldview criterion.

#### a) *Practice/Input or Goal-Oriented Approach*<sup>5</sup>

Some approach content predominantly by defining the goals (ends) to be achieved. They leave open, as much as possible, the practices or means through which these goals can be achieved. This might lead to the fact that a concept is largely recognized, but players with very different practices might even exclude each other from subscribing to the same concept.

Other approaches are quite clear on allowed practices (for example, ploughing) or the allowed inputs (more common). Questions about allowed

inputs can include synthetic fertilizers, agrochemicals (pesticides, fungicides, herbicides), mechanization, GMOs or Hybrid-Crops, fossil fuel, etc. It can also concern the input-output relation if a more extensive or intensive system is desirable. Finally, there is differentiation also around the question of whether allowed inputs must come from within the farm or can be brought from outside the farm.

Most [agricultural] approaches include the practice/input and goal-oriented elements of the definition in various degrees.

#### b) *Underlying Worldview*

This second criterion is linked with the first one; this criterion looks at the underlying worldviews of an approach. There is a differentiation of approaches between a holistic worldview and, in the extreme case, a reductionistic worldview. In discussing approaches, tension is apparent between traditional knowledge and a modern scientific approach. Traditional knowledge often tries to give an explanation of the world as a whole, which might include very valid observations; whereas, Science tries to elaborate single causal relations. More recently, there have been attempts from the side of Science to tackle the complexity of the world through Big Data and Artificial Intelligence. However, there still seems to be a basic distinction between quantitative and qualitative approaches, where you can explain, in detail, the causal chain but are unable to deal with questions of personal taste or personal meaning. Philosophical analysis shows that reductionism is also a worldview that builds on assumptions out of its scope of verification. It is therefore not fundamentally different from more mystical views of the world like religious, philosophical, or esoteric approaches.

Further, it helps to understand what societal questions an approach tries to answer. It matters to look at the time of appearance and to see if an approach emphasizes continuity with the industrialised agriculture paradigm or if it proposes an alternative type of agriculture.

Finally, considering the people promoting an approach as well as their driving motivation helps in understanding better the underlying worldview.

5 Weil, R.R. Defining and Using the Concept of Sustainable Agriculture (J. Agron. Educ., Vol. 19, no. 2, 1990). Distinguishes between "ends" and "means" oriented definitions.



Is an approach originating from agricultural practitioners, academics, business people, or politicians? What is their main motivation--profit maximization (economic approach), protecting the earth's ecosystems (environmental approach), or building up of humanity or communities (social approach)? How are these dimensions articulated in a specific approach?

This criterion, underlying worldview, can provide some initial understanding of different approaches, especially to see where approaches are strongly insistent and where they are more supple or flexible.

## A Brief Historical Background

Traditional agriculture evolved over thousands of years. There was then an ongoing exchange between different groups regarding practices, seeds, livestock, and vast experimental knowledge that people acquired over time without modern scientific methods. Farmers had a basic knowledge of soil fertility (slash and burn, crop rotations, terra preta). They developed the genetic base for all modern crops (maize was developed in a span of a 6,000-year-process from teosinte to modern maize), and they also had some understanding of soil microbiology (the roots of Bokashi are believed to have originated in ancient Korea).

It was during the 19th-century industrialization that industrialized agriculture emerged. Industrialization led to a strong increase in productivity and set a large part of the population formerly working in agriculture available for other activities. The increase in productivity can be explained through

advances in the different fields of agriculture such as mechanisation, plant nutrition, agrochemicals, and hybrid seeds.

### a) *Mechanisation and Cultivation Methods*

In the modern era, the number of inventions simplifying agricultural tasks increased. In the second half of the 19th century, steam engines replaced horses. Steam engines were very heavy and led to strong soil damage, imparting lessons about soil compaction. From there, more advanced machines and equipment were increasingly designed to serve the farmers's needs.

### b) *Growing Knowledge of Plant Nutrition Requirements*

Since the beginning of the 19th century, guano gained fame as a natural fertilizer and its trade was established. Research by chemists, like Humphry Davy and Justus von Liebig, started the science of plant nutrition. The outstanding importance of three macronutrients—Nitrogen, Phosphorus, and Potassium—was discovered, and ways to add these to the soil were explored. In the time between the two World Wars, the Haber-Bosch method to fix nitrogen under high pressure from the air was developed and opened up the possibility of producing nitrogen fertilizer at scale. Phosphorus and Potassium meanwhile were mined from suitable and pure-enough deposits. Afterwards, concerns about their accessibility and depletion emerged.

### c) *Development of Chemicals for Plant Protection*

In 1896, the first major chemical herbicide Sinox was developed in France. Research during the period of the two World Wars led to the discovery of a large number of active compounds. In the late 1940s, the development of agrochemicals began. About 20 years later, more than 100 plant protection chemicals were released commercially.

### d) *Development of Improved-Seed-Varieties*

From the 1850s onwards, backed by growing interest in genetics research, the breeding of improved [seed] varieties took off. In the 1920s, research stations in the USA experimented with hybrid seeds and the Hybrids were first rolled out in the 1930s.

These were the principles that Borlaugh<sup>6</sup> would also later promote in the Green Revolution, a development approach to increase worldwide agricultural productivity to end world hunger.

After the 2nd World War, agricultural transformation accelerated enormously. In the upstream (agricultural inputs) and the downstream (food processing) areas of agriculture, huge aggregation processes took place. This gave rise to a small number of internationally operating companies having the biggest share of the market. As many States aimed to develop their agricultural sector, and while [commercial] companies were advocating for it, both international and national legislation increasingly shifted in favour of industrialized agriculture.

The negative effects of industrialized agriculture, however, became increasingly visible. Besides its intensified economic pressure upon farmers, its [negative] impact on the environment also became palpable. The famous book, “Silent Spring” by Rachel Carson appeared in 1962<sup>7</sup> and blamed industrial agriculture for the massive die out of insects. From the 1970s onwards a bigger number of people became concerned about these [adverse] devel-

opments. The underlying problem of social justice is that more and more profits were privatized while the costs for damages were socialized.

## Emerging Key Agricultural Approaches

From this situation, different agricultural approaches were developed to rectify the circumstances.

### a) *Agricultural Approaches Open for Inputs from Industrial Agriculture*

#### Sustainable Agriculture (SA)

Sustainable Agriculture (SA) is one of the widest concepts in the arena. It emerged from the late 1970s onwards in Australia and the USA. It is a more goal-oriented approach. The National Agricultural Research, Extension, and Teaching Policy Act of 1977<sup>8</sup> from the USA Department of Agriculture defines SA in the following terms:

- satisfy human food and fibre needs;
- enhance environmental quality and the natural resource base upon which the agriculture economy depends;
- make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls;
- sustain the economic viability of farm operations;
- enhance the quality of life for farmers and society as a whole.

The concept emphasizes economic, social, and production sustainability; and it strongly includes an environmental perspective. The term “sustainable” underpins its long-term perspective. The approach tries to correct the shortfalls of industrialized agriculture. It does not, however, exclude different agricultural practices; it remains open to

6 Jain, H.K., *The Green Revolution: History, Impact and Future* (Houston, TX: Studium Press, 2010).

7 Carson, R., *Silent Spring* (New York: Fawcett Crest, 1962).

8 USDA. National Agricultural Research, Extension, and Teaching Policy Act of 1977. <https://www.nifa.usda.gov/sites/default/files/resource/nar77.pdf>

industrialized agriculture. It is therefore a rather inclusive approach, with the risk of being watered down strongly.

The following two approaches namely, Conservation Agriculture and Climate-Smart Agriculture are closely related to Sustainable Agriculture. They further spell out the concept by remaining open to industrialized agriculture and the use of chemical inputs.

## Conservation Agriculture (CA)

The term Conservation Agriculture was coined in the 1990s but the roots of the work reach far back to the Great Dust Bowl in the 1930s which eroded the topsoils of the Great Plains during several unusual dry years. The combination of ploughed fields with a destroyed soil structure and crop failure due to the drought left the topsoil unprotected, eroding through the strong winds of the plains.

The focus of the work is to conserve soils from degradation and [to retain] water in the soil. Conservation Agriculture (CA), in contrast to both Sustainable Agriculture and Climate-Smart Agriculture, is characterized by a set of practices to attain its goal:

- Minimum Tillage (reduced tillage or, no-till)
- Soil Cover (use of cover crops; mulching)
- Species Diversification (crop rotation)

CA is an example of an approach defined by several positive practices, but without excluding other practices. CA allows for the use of chemicals and synthetic inputs but is reduced as much as possible; and, GM-crops are also allowed. It follows therefore the main strategy of SA by remaining as open as possible: “While for some, CA means resource-conserving, low-external input agriculture, others associate it with highly industrial, glyphosate-resistant, GM-based agriculture, resulting in unlikely bedfellows such as Charles, Prince of Wales (an ardent organic farmer), and the large agri-business company Monsanto.”<sup>9</sup>

With its clear practices, CA is more on the side of practical farming. In contrast, Sustainable Agriculture is more of an academic approach while Climate-Smart Agriculture opens itself more to the political space.

## Climate-Smart Agriculture (CSA)

CSA puts in its centre the attainment of the Paris Agreement and the realization of the Sustainable Development Goals (SDG). The concept was launched in a background paper by FAO in 2010 at the Hague Conference on Agriculture, Food Security and Climate Change.

CSA consists of a set of principles, like SA, which are:

- sustainably increasing agricultural productivity
- adaptation to climate change -- building up of resilience
- and mitigation of climate change (reduction of greenhouse gas emissions)

CSA aims to help in political decision-making and fundraising for implementing projects. It lists several sets of practices that fall under SA. One of the Climate-Smart production systems is Conservation Agriculture. However, it also avoids defining itself by omitting certain practices or inputs.

## Regenerative Agriculture (RA)

RA can be considered an intermediate approach. It has grown side by side with SA in the USA. Initially, RA was promoted by the Rodale Farm Institute from 1983 onwards. The Rodale Institute was founded by Robert Rodale (1930-1990), one of the pioneers of Sustainable Agriculture and Organic Agriculture. His father, Jerome Irving Rodale, founded a printing press that in 1930 published on health and organic agriculture, and in 1942 the Rodale Organic Gardening Experimental Farm. The main focus of interest was the production of healthy food. The Rodale Farm Institute

<sup>9</sup> Giller K.E., Andersson J.A., Corbeels M, Kirkegaard J., Mortensen D., Erenstein, O. and Vanlauwe. B. Beyond Conservation Agricul-

ture (Front. Plant Sci. 6:870. doi: 10.3389/fpls.2015.00870, 2015).



ran the longest comparative trials between conventional and organic agriculture.

Regenerative Agriculture emphasizes the need for farmers to regenerate soils by increasing soil organic matter. The transition of farmers's stands from conventional to organic agriculture is the focus of RA. During this transition, synthetic fertilizers and chemical inputs might be of use but should be replaced, bit by bit. In contrast to the steep transition required by Organic Certification, RA leaves farmers more space to establish a smooth transition and a case-by-case strategy development.

Interestingly, there is a strong cross-fertilisation between the approaches of Sustainable Agriculture, Conservation Agriculture, and Regenerative Agriculture. Rodale Farm Institute also promotes no-till organic agriculture, which links it closely to Conservation Agriculture.<sup>10</sup> The Institute developed special machinery for this purpose like the Rodale Roller Crimper, to prepare the cover crop for the planting of the cash crop.

#### b) *Alternative Approaches to Industrial Agriculture*

A second group of approaches describes itself as an alternative to the dominant industrialized agriculture. These approaches prescribe restraints on practices that are allowed and decisive in industrialized agriculture. Care for the environment is a priority but is strongly linked to social considerations. Economics plays a comparatively smaller role but is nevertheless an important factor. The approaches, however, differ in origin and underlying worldview.

#### Organic Farming

The organic movement developed from the early 20th century onwards, parallel to the rise of industrialized agriculture. The first conceptualization of the term is due to Lord Northbourne in his 1940 book, "Look to the Land".<sup>11</sup> The Biodynamic Movement in Germany, Rodale in the USA, and the Australian Organic Farming and Gardening Society were pioneers in Organic Farming.

In 1972, the International Federation of Organic Agriculture Movements (IFOAM) was founded in Versailles to spread organic agriculture and improve its worldwide research. As a membership organization, IFOAM has more than 700 members in over 100 countries representing around 3.5 Million farmers.<sup>12</sup>

In the 1980s, organic farmers advocated the creation of Organic Certification Standards, like the NOP Standard for the USA and the EOS Standard for the European Union. Accreditation is mainly done by governments.

The rules for certification state which practices are allowed in Organic Farming and those which are prohibited. The approach is therefore strongly driven by its agricultural practice. Disallowed are the use of synthetic fertilizers, agrochemicals, and GM crops. Some further regulations and specifications might differ in different member organizations or certification systems.

Besides this negative definition that provides its members with a clear sense of belongingness, there

10 Moyer, J. Organic No-Till Farming (Acres, USA, 2011).

11 Northbourne, J.P. Look at the Land (London: Dent, 1940).  
12 <https://www.ifoam.bio/celebrating-decades-of-success>

is a large amount of different practices defining the identity of each member.

### Biodynamic Agriculture

Biodynamic Agriculture is one of the examples of an organic approach from the European context. It developed out of the Anthroposophic Movement around Rudolf Steiner. He held, in 1924, a series of talks about natural agriculture guided by a holistic, esoteric worldview. He sees the farm as a living organism embedded in a holistic cosmology. At the centre of his interest are fertilizer preparations based on the homoeopathic approach from manure and chemical elements.

The nationally oriented Nazi Regime, especially some of its leading figures, had a vivid interest in the organic approach. However, they ensured that its anthroposophic aspect was eliminated, as far as possible, to make it compatible with the national-socialistic ideology.

There is a strong parallel that connects early pioneers of organic farming like the Biodynamic Movement and the Rodale Initiative. It is their interest in highly qualitative and healthy food in opposition to the food provided by industrialized agriculture.

Today, Demeter is one of the strictest Organic Certification bodies; and the Demeter marketing company helps biodynamic farmers market their products efficiently.

### Natural Farming

Even though the term “natural farming” has been especially adopted by movements in India, it originated from Japan. The Natural Farming approach was initially promoted by Masanobu Fukuoka (1913 - 2008). He laid out his principles in his book, “The One-Straw Revolution” which appeared in 1975.<sup>13</sup> It is another holistic approach, standing in the Asian tradition, where he combines the production of food with aesthetics and spirituality. The ultimate goal is the cultivation and perfection of the human being.

Positively spoken, the approach consists of observing and mimicking nature. Negatively, it entails no-till, no synthetic fertilizer, no chemicals, no weeding, no pruning. In Japan, there is a widespread network of no-tuition natural farming schools at 40 locations and about 900 students. The approach is mainly practical.

### Zero Budget Farming

Subhash Palekar from India developed, through observing the natural growth of forests, the principles for the Zero Budget Farming method. Between 1989 to 1995, he conducted a vast number of research projects on his farm.

The experience of many Indian farmers trapped by debts due to expensive external inputs stands behind the approach; therefore, it is an alternative position to industrialized agriculture that created the sorry situation [of over-indebtedness]. Subhash Palekar promotes a method that does not use chemicals or synthetic fertilizer but rather enhances soil life using the biomass produced on farms and liquid bio-fertilisers made from cow dung and dust. It minimizes external inputs and costs for the farmer to produce a crop basically out of his/her labour.

### Agroecology

The concept of Agroecology, promoted by the FAO, does not formally exclude certain practices or inputs. However, through its strong bottom-up approach, it is linked to the holistic traditions of communities that are the main drivers of Agroecology. It can be counted among alternatives to industrialized agriculture.

The agroecology approach can refer to different things: an academic discipline, a social movement, or an agricultural practice. The basic intuition is to bring ecology and agriculture together. How do ecological processes play a role in agricultural production? How can they be used to make production more efficient, resilient, and environmentally friendly?

The approach originated in an academic discussion and the term was first mentioned at the end of the 1920s. A book from Tischler in 1965 carries

<sup>13</sup> Fukuoka, M. *The One-Straw Revolution* (Rodale Press: Emmaus, 1978).

the term agroecology in its title.<sup>14</sup> Agroecology as an academic discipline is inherently multidisciplinary. It includes Agriculture, Ecology, Sociology, Economics, and History.

The studies and work especially of Miguel Altieri, Professor for Agroecology at the University of California oriented Agroecology towards a more political orientation<sup>15</sup> and the international smallholder farmer network, Via Campesina, has taken up the term Agroecology to designate a social movement that grows from the bottom-up and faces the top-down approach of industrial agriculture.

Agroecology was taken up in 2014 by the FAO. Ten Principles of Agroecology have been developed in consultation with international stakeholders.<sup>16</sup> A negative definition contrasting it with industrialized agriculture is avoided; the 10 principles positively provide a vision of an agriculture and food system which reflects and values traditional ways of farming and the cultures of different communities and smallholder farmers. However, the implications of farmer-managed seed and food systems and environmental trade-offs might lead to an exclusion of Hybrid Seeds, GMOs, fertilizer, and agrochemicals, but the FAO position avoids this conclusion.

## Integral Ecology

Even though not directly an agricultural approach, Pope Francis developed Integral Ecology in his Encyclical Letter, *Laudato Si'* in 2015<sup>17</sup> and can be easily connected to the efforts of creating an agriculture that is environmentally friendly, social-just, and economically viable.

Pope Francis links the environmental crisis with spiritual crisis. The different challenges that humanity faces, be it environmental, social, or economic are linked with humanity's profound

spiritual crisis. This crisis is rooted in the fact that humanity is not taking up the role of a caretaker but rather that of an individualistic ruler. Pope Francis's Encyclical Letter is an invitation to all cultures, religions, and sciences, to work together to overcome challenges. Everyone needs to contribute to the full development of what is human. The market alone cannot create this; also, modern science and technology need to find their right place. There is the risk of reducing reality, but they need to be transcended in a more holistic worldview on human existence.

“Francis [of Asisi] helps us to see that an integral ecology calls for openness to categories which transcend the language of mathematics and biology, and take us to the heart of what it is to be human.”<sup>18</sup>

“Ecology studies the relationship between living organisms and the environment in which they develop. This necessarily entails reflection and debate about the conditions required for the life and survival of society, and the honesty needed to question certain models of development, production, and consumption. It cannot be emphasized enough how everything is interconnected.”<sup>19</sup>

Allow me now to conclude this article's conceptual section where I provided a basic classification of different terms like Sustainable Agriculture, Conservation Agriculture, Climate-smart Agriculture, Regenerative Agriculture, Organic Agriculture, Agroecology, Biodynamic Agriculture, Natural Farming, Zero-budget Farming, and Integral Ecology. In the succeeding section, allow me to share some lessons learnt from our field experiences at the KASISI Agriculture and Training Center in Zambia and its membership in the Seed and Knowledge Initiative.

## Section 2: Hope-filled Actions -- Positive Experiences of Partnerships and Cooperation

Social, economic, environmental, and cultural aspects are part of the Integral Ecology. In this second part of the article, hopeful actions are shared

14 Tischler, W. *Agrarokologie* (Fischer: Jena, 1965).

15 Rosset, P., Altieri, M. *Agroecology Science and Politics* (Practical Action Publishing, 2017).

16 1) Diversity, 2) Co-creation and sharing of knowledge 3) Synergies: across food systems and ecosystem services, 4) Efficiency: produce more using fewer external resources, 5) Recycling: agricultural production with lower costs, 6) Resilience of people, communities, and ecosystems, 7) Human and social values: Protecting and Improving rural livelihoods, social well-being, equity, 8) Culture and Food traditions: culturally appropriate diets, 9) Responsible governance, 10) Circular and Solidarity economy: Reconnect producers and consumers.

17 Pope Francis, *Laudato Si'*: Encyclical Letter (Rome: Vatican Press, 2015).

18 Pope Francis, 2015. N°11.

19 Pope Francis, 2015. N°138.



from the African context, particularly through the Seed and Knowledge Initiative (SKI). Fifteen grassroots organizations in Africa collaborated to build the SKI, to develop and practice a viable and positive alternative within the field of tensions described in the previous section of this article.

The Seed and Knowledge Initiative started in 2013, spearheaded by Biowatch South Africa together with four other South African Organizations. The centre stood for the preservation of local seed systems as a condition for food security and adequate food, as well as the preservation and sharing of traditional knowledge within and among communities.

Over the succeeding years, SKI expanded to include 15 different organizations from various countries in South Africa. Currently, South Africa (4 members), Zimbabwe (4 members), Zambia (4 members), and Malawi (3 members) are part of this initiative.

SKI partner organizations have different backgrounds, centres of work and expertise. Here are a few examples to highlight the diversity within

the SKI. First, the Zambian Alliance for Agro-biodiversity (ZAAB) is an alliance to advocate for agroecology, farmer's rights, and food sovereignty to speak out against a silent corporate capture that changes the laws in favour of multinational companies and against the interests of smallholder farmers. Next, the Community Technology Development Trust (CTDT) is a grassroots organization working with communities on traditional seed systems, even providing farmers with the knowledge to start their participative breeding programs. Prof. Rachel Wyneberg from the University of Cape Town (UCT) and her laboratory are part of this initiative, bringing in the academia and a research perspective.

Still another example is the Kasisi Agricultural Training Center (KATC). Since 2019, KATC has been a partner organization of SKI. Incidentally, this Jesuit-run agricultural training centre situated about 15 km north of Lusaka, celebrated this year (2024) its 50 years of existence. KATC was founded in 1974 by a Canadian Jesuit brother, Paul Desmarais, with a mission to train smallholder farmers to help improve their livelihoods and communities.

It was during the second half of the 1980s when Br. Paul had his own “Damascus” or conversion experience. During the first 15 years of his work, he promoted the principles of the Green Revolution—the use of chemical fertilizer, pesticides and herbicides, improved seeds, and mechanization. Then, he realized that such an approach did not help farmers improve their livelihoods and communities but rather left them off worse. For example, Urea fertilizer made the soil hard and reduced the soil’s organic matter. Every year, farmers had to apply more fertilizer but farm yields continued stagnating. The high cost of inputs placed farmers at a high risk, especially in case of a failed crop. In the early 1990s, KATC shifted to Sustainable Organic Agriculture (SOA). First, it did only a few experiments -- later the whole production and training program shifted to 100% organic. On its learning journey, KATC understood, through time, the manifold reasons why organic farming is the better option for smallholder farmers.

Today KATC employs about 20 qualified staff members covering all relevant areas of agriculture and administration; the centre also has 60 helping staff members. KATC is organized around its program unit and production unit. The program unit covers the thematic and educative work of KATC. A wide range of 5-day training courses are offered spanning the basics of sustainable organic agriculture, over on-farm fertilizer production, horticulture, and small-animal husbandry up to marketing of farm products. Besides its training programmes, KATC conducts organic research and offers extension services.

Since 2022, KATC has offered a Diploma Programme in Agroecology, a 3-year blended learning programme, i.e., with online classes and residential times. This allows working professionals the flexibility to enrol and participate. This Diploma Programme is accredited by the University of Zambia (UNZA). Currently ongoing is the development of a 10-month Certificate Programme. It targets rural youth, those who would otherwise not have the possibility to access formal education.

Besides smallholder farmers, KATC also targets “multipliers” to spread knowledge on organic agriculture faster and further. It prepares farmers to become Farmer-to-Farmer Trainers and works

closely with the Zambian Ministry of Agriculture to enable government extension officers to train farmers on organic practices.

KATC runs extension projects in five Zambian provinces. Demo plots, Field Days, Bio-fairs, and radio programmes are used to support this work. The KATC production unit serves as the demonstration farm for small and medium-scale organic produce. Cows and pigs are also raised in the demo farm. To add further value to the farm, KATC has its own dairy and grain processing facility.

In joining SKI, KATC brought this strong background in organic agriculture and training. But it also opened up KATC to the agroecological approach, a new area of learning. Agroecology has three pillars, namely: social justice, environmental protection, and economic viability. KATC previously worked in all three areas but SKI changed KATC’s perspective, especially about building a community of practice with other organizations that share a common vision albeit having very diverse backgrounds, approaches, strengths, and scope of work. Also, as regards establishing responsible governance structures that unite different people and organizations. Finally, regarding helping create a movement with a stronger impact and capacity for positive transformation.

#### a) *Community of Practice*

SKI brings farmers and agricultural professionals together in a community of practice to foster the sharing of learnings. Regular online meetings and occasional physical meetings in one of the communities are part of the process of building communities. The Community of Practice work around the following topics—Indigenous seed and food systems, Biofertilizers, agronomical practices, rainwater harvesting, and local markets.

Strengthening the **indigenous seed and food systems** is the core concern of SKI. What agroecology is about becomes clear in this domain. Agronomically, indigenous seeds are linked with crop diversity, mainly impacting food security and better nutrition. As these crops have been selected in the area over generations, they are extremely well-adapted to the local climate. These crops have been selected by the farmers themselves following



their selection criteria, which are different from the criteria applied by commercial breeders. The farmers might have favoured taste and stability of yield over total yield and ease of process.

In Zambia, there is the example of Gankata, a maize type grown in the villages with large heavy grains. The farmers like this type of grain because the Shima<sup>20</sup>, made of Gankata, allows them to eat only once a day. It suppresses the feeling of hunger and slowly releases energy. In contrast, the maize mills do not like this type of grain because it does not make the light, white breakfast meal that can be bought in shops.

The hundreds of different crops and varieties, that smallholder farmers are custodians of, deliver the base for the development of modern crop varieties. As there is now a big drought season in the Southern African Region, breeders are scanning the fields for maize genotypes that perform well and can be considered drought-tolerant. Indigenous seeds, however, are endangered for several reasons. The fixation on maize as the nearly only cash crop has led to the fact that many farmers stopped growing other crops than maize.<sup>21</sup> As improved maize varieties made their way into the villages, farmers initially opted for them because of the “superior” properties that were promised or observed. The seed from hybrids, however, segregates when replanted, leading to poor yields if no new hybrid

seed is purchased. The hybrids also cross-pollinate with traditional maize varieties, losing their initial properties; consequently, this led to the farmers’s protest—they want their Gankata back.

Seed producers advocate for stronger seed laws, obliging farmers to buy seeds from seed companies every year and criminalising the recycling of seeds. SKI responds to this oppressive situation by creating community seed banks. There, communities store seeds of their chosen varieties to secure them from being lost. In case of losses through a failed crop or natural disasters, farmers can re-establish their crops from there. Annual seed fairs and a national seed and food festival help farmers present their seeds, to sell and share. This, however, is problematic in the eyes of civil authorities because such seeds allegedly do not comply with the standards defined by law.

Farmers also get trained in participatory plant breeding. In understanding the biology and physiology of crops they become better crop observers. Through this, they start improving their crops, putting the criteria that they judge important at the centre of their crop selection process.

Healthy soils are a prerequisite for healthy crops and healthy foods. Enhancing soil life is therefore key. This can be achieved through **Biofertilisers**, which not only add nutrients to the soil but especially bring in beneficial microorganisms. These can enter into symbiotic relations with the plants and make additional nutrients available in exchange for sugars from photosynthesis. These also occupy the space to prevent the uncontrolled spread of pathogens. Finally, these microorganisms also serve as

20 Shima is the Zambian name for the maize polenta building the basic food of many cultures throughout Africa.

21 Remarkably, maize was only promoted strongly in Zambia from the late 1960s onwards (after independence). It has since nearly completely replaced the more nutritious and drought-tolerant millet and sorghum varieties that were traditionally grown by the farmers. This replacement has been to such a point, that today farmers are considering the absence of nshima from maize as hunger.

food for other organisms in the soil, organisms that fulfil important functions in a healthy soil.

There are solid and liquid Biofertilisers. Bokashi is an example of a solid Biofertiliser. Farmers have taken it up very well due to its short preparation time and because, in comparison with compost, only a few bokashi are needed to fertilize a crop. Bokashi is made through a fermentation process, generating heat which needs to be handled well to keep the temperature at the right level. It is this bacterial fermentation that hastens the decomposition process and which at the same time leads to a multiplication of beneficial bacteria. Liquid Biofertilisers are most often made using both cow dung and topsoil through an anaerobic process because in them a large number of beneficial micro-organisms are available. While Bokashi can be applied directly beside the roots of the plant, liquid Biofertilisers are diluted and sprayed during the critical stages of plant growth. Farmers are helped to create Biofertilizer factories in their villages so they can produce Biofertilizer in bigger amounts for their use or for selling to other farmers. This fosters co-operation and the creation of a bottom-up or circular economy.

There is a wide range of **agronomical practices** promoted by providing farmers with a toolbox to establish a system that works for their farm, given unique soil and climatic conditions. For example, crop diversification helps farmers in manifold ways. Firstly, it helps them produce diverse food to improve family nutrition. Also, it helps maintain soil fertility, as every crop has a special pattern in taking up different nutrients; thus, single-sided depletion is avoided. The diversity of crops also helps keep in check the spread of pests & diseases as they create diverse micro-habitats. Finally, crop diversity helps in the organization of farm work as the different activities like planting and weeding are not done at the same time (good organization skills are needed). It also helps mitigate the risk of a completely failed crop since the different plant cycles make it unlikely that all crops will fail during the same season. Organizing diverse systems of crop rotations, crop sequences, or inter-cropping is needed. Minimum soil disturbance, through the omission or reduction of ploughing, helps maintain soil structure and the soil's fungal activity. If the amount of rainfall is a concern, then planting

basins and mulching are measures to increase and preserve soil moisture.

**Rainwater harvesting** can be done on the farm and community levels. Through contour ridges, re-forestation, weirs, and dam runoff, erosion can be reduced and allow more water to infiltrate the soil. This provides more water for the crops and eventually helps replenish water tables and dried water systems.

Helping farmers to **build up local markets** for their crops and by-products is another step in building up a circular, bottom-up economy. Besides securing household food, increasing household income is a key contribution to the long-term improvement of livelihoods since household income is very often used to pay school fees.

#### *b) Establishing Responsible Governance Structures*

SKI is currently on the way to becoming its own organization. In 2022, Biowatch informed the SKI's partners that I would not continue to be the fund-holder for the movement. This is because SKI had grown and was binding a lot of its energy in the administration of these funds. SKI is mainly funded by the Swiss Agency for Development and Cooperation (SDC) with support funding from Bred for the World, the Agroecology Fund, and SwedBio. A discussion among the partners was held if another partner should assume the role. After a process of exploring different options, a unanimous decision was taken to head towards the creation of an entity for SKI, one that can hold its funds. The risks of such a step were discussed carefully, as many organizations, after registration, have developed their own life, no longer serving the organizations and communities they were founded for. To have ample time for the process an intermediate step was taken. The Alliance for Food Sovereignty in Africa (AFSA), an alliance for farmer networks in Africa agreed to act as a fiduciary before the registration of the new legal entity can take place.

Besides legal discussions, discussions around the future structure have also been conducted. Who should be represented on the Board of Directors, and what are their roles and responsibilities? How

should the countries with their different realities be reflected in the organization? How can servant-leadership be ensured beyond partial interests?

### c) *Acting as a Movement*

To become a movement, where farmers take the lead in steering the development of their communities, SKI needs a strong but flexible organizational backbone. But it also needs spaces for farmers's exchange and dialogue. Each partner needs to ensure a strong connection with the farmers and a participative development of SKI programmes and activities.

Meetings among farmers of the different countries show that there is a shared vision which includes the care for nature, social cohesion/well-being, and the improvement of livelihoods.

Showcasing this positive vision through the practices applied in the communities and the ability to speak from different communities, organizations, and countries will help the Seed and Knowledge Initiative demand that the legal frameworks of the countries be kept open to realize this vision and even to actively support it.

Investment in youth leadership has been very important since the beginning. Currently, six young men and women from different organizations are undergoing six months of practical and theoretical training that prepares them to take on SKI responsibilities.

Being part of a bigger movement means also being part of international networks. This helps in getting connected to international specialists who can give advice and help build capacity. Currently, the Zambian Seed Act and the Plant Breeders Right Act have been revised; this threatens further the farmer-managed seed systems. As these laws are linked to international agreements, highly specific support from specialists is much needed beyond the advocacy of local farmers and their

organizations. As every partner brings in its networks, the strength of the initiative is even growing. KATC brings, for example, the connection to Church and Jesuit networks like the Jesuit Justice and Ecology Network Africa.

In his Encyclical Letter "Laudato Si'," Pope Francis calls for the collaboration of all people of goodwill beyond boundaries of religion, culture, nationality, and field of work. In SKI something of this call is being realized, where humanity joins together to care for our brothers and sisters and our common home. In nature, it can be observed that the creation tends towards diversity rather than monoculture. We need to imitate this dynamic of creation and it can be a place [for us] to more deeply understand the mystery of the love that animates the Holy Trinity.





Social Justice and Ecology  
Secretariat (SJES)  
General Curia of the Society  
of JesusBorgo Santo Spirito 4,  
00193 Rome.

