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The Crocus: Global Complementary Currency Pegged to the Production of Organic Living Biomass

31-40 minutes

Pitch

The Organic Monetary Fund, set up as a division of the International Monetary Fund, will help to achieve almost all SDGs in record time

Description

Summary

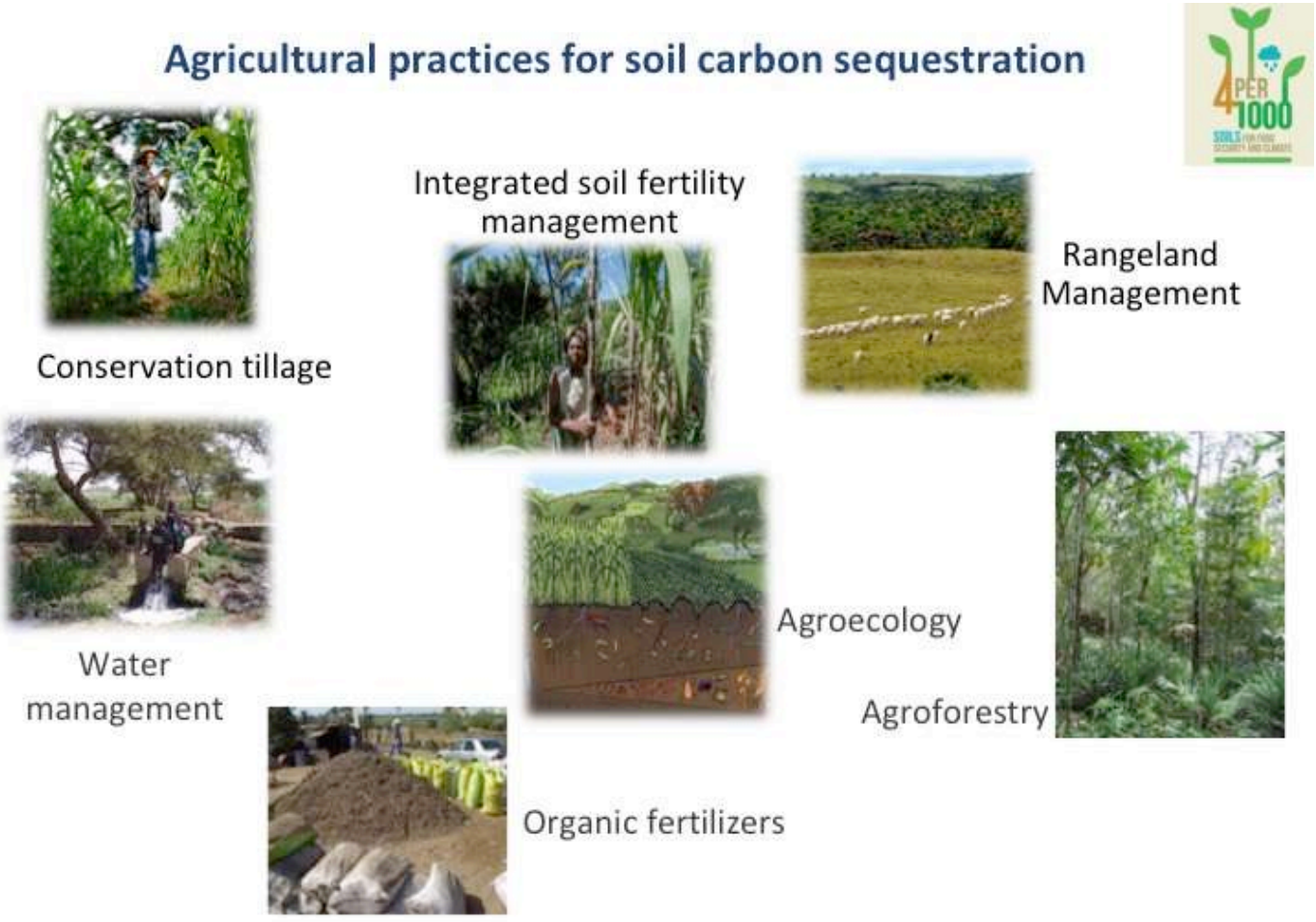
A good part of the SDGs can be achieved with the help of a powerful tool that will: cool the Earth, save biodiversity and the major balances, feed people and give them jobs, hope and peace. All this needs is for the International Monetary Fund (IMF) to set up a division called the Organic Monetary Fund (OMF), which will issue a global complementary currency, the crocus, the volume of which is pegged to the growth of healthy living biomass produced under a "Micro-farm Cluster" (MFC) label.

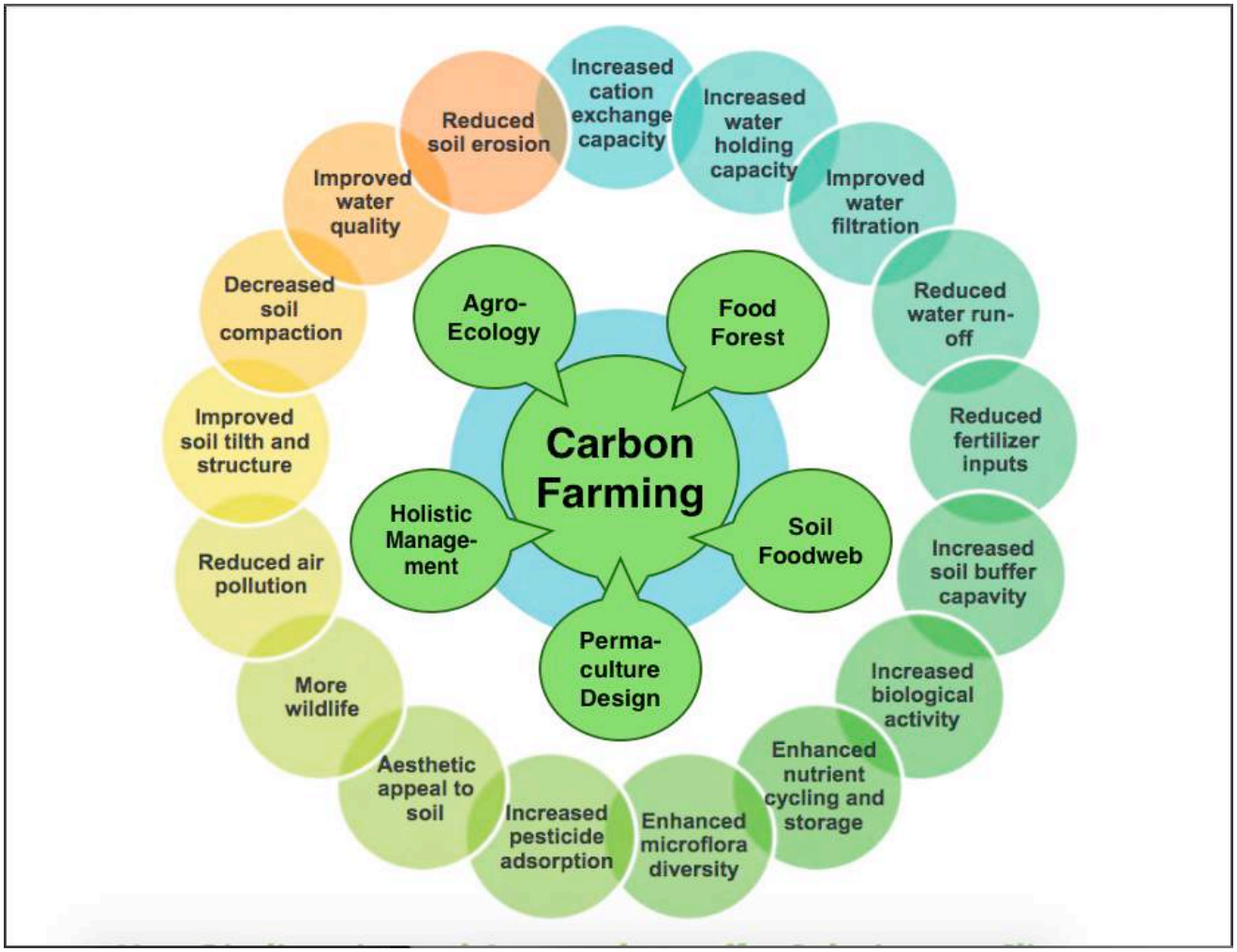
All IMF member countries can volunteer to be part of the OMF scheme provided that their country features MFC-labelled farming cooperatives. An MFC is a group of small, multi-purpose agricultural units applying the principles of agroecology and permaculture (no chemical fertilizers, synthetic pesticides, GMOs, or intensive livestock farming). It allows farmers to share their knowledge, equipment, and services.

The global scientific community provides annual figures on the growth of healthy living biomass produced by each MFC in the volunteering countries. The OMF then grants each member country a sum of corresponding crocuses, then allocated by the country's government to the MFCs, where they are

distributed among the natural persons working in them. These can then exchange crocuses for the local complementary currency (LCC, in parity with national currency) of their place of residence. The LCC collective, government certified, is entitled to include in its accounting the crocuses received, considered as units of the collateral account to which the LCC is attached. As a last resort, crocuses are repayable from the IMF in the relevant national currency.

Through the power of photosynthesis, the OMF crocus scheme is true natural geoengineering on a very large scale. Diversified living biomass is good for water and spontaneously inflationary. It makes the land indefinitely fertile instead of depleting it, which means growth and abundance for communities all over the world.





Briefly described in the above summary and further developed below, the present project is smart because its originality lies in its cross-cutting nature, which makes it the most decisive and rapid means of effectively achieving the Agenda 2030 Sustainable Development Goals.

Whether or not we choose to acknowledge it, the economies that we create are embedded in the natural economy.

In addition, the OMF/Crocus proposal articulates the SDGs harmoniously without their contradicting each other.

If implemented, this measure will have the following beneficial effects:

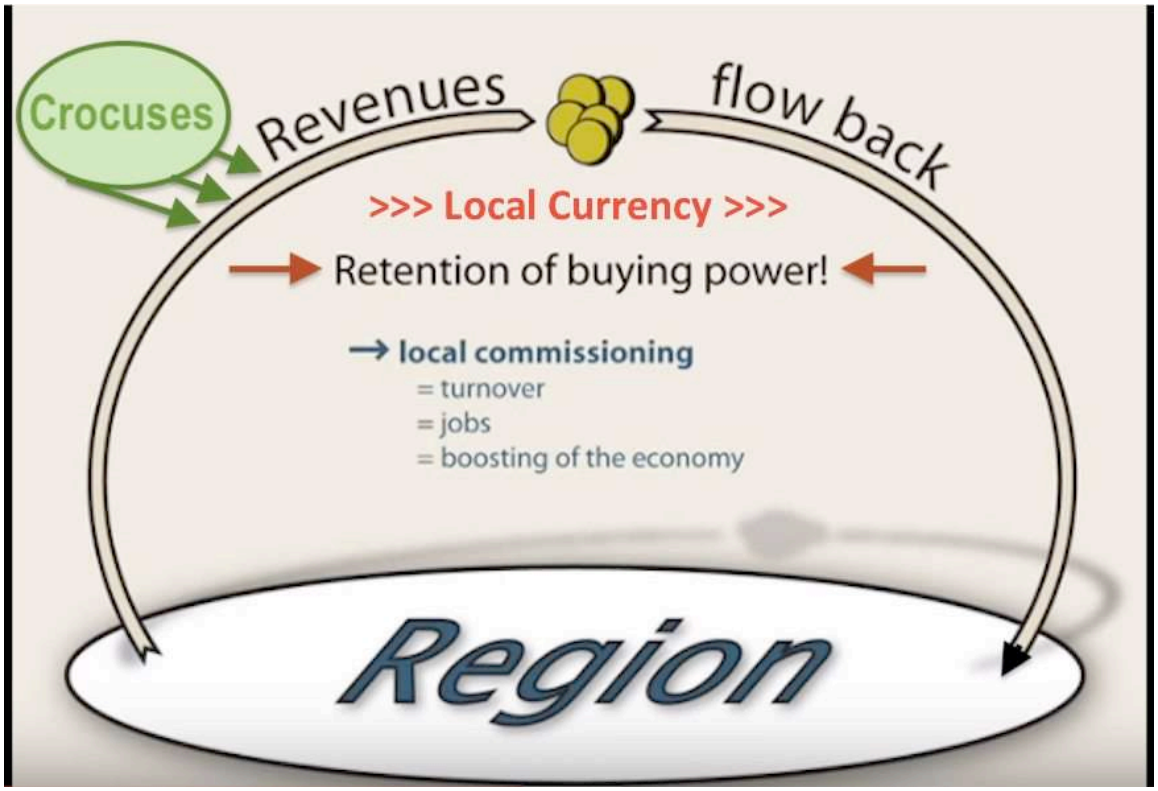
1) It will help to end poverty in all its forms everywhere (UN Sustainable Development Goal – SDG – #1) by providing additional income in crocus currency to anyone involved in augmenting healthy living biomass under an OMF-delivered "micro-farm cluster" (MFC) label. This will ultimately involve a very large number of small farmers and agricultural workers, as the agriculture practiced in these micro-farms should develop very rapidly worldwide.

2) It will help to end hunger, achieve food security and improved nutrition, and promote sustainable agriculture (SDG #2) because the type of agriculture that makes farmers eligible for crocuses is extremely productive, and because the living animal and plant matter taken into account for crocus allocation is produced in accordance with ecological principles and interactions (primarily pollination), with no chemical pollution of water, air, or soil, resulting in excellent nutritional qualities.

The industrial food system externalizes much of its true costs by passing them on to society and the environment.

Center for Food Safety

3) It will help to ensure healthy lives and promote well-being for all at all ages (SDG #3) thanks to plentiful and good-quality food, and to the fact that local communities are invigorated by the use of local complementary currencies with which the crocus is articulated.



4) It will help to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all (SDG #4) as families benefit from an improved quality of life, including the education of their children (especially girls) thanks to the income provided by the crocus. In approved micro-farms, farmers and farm workers apply to the field, in a way adequate and efficient for food production, the vital principles at work in nature, which are universal and powerful, allowing the emergence, everywhere, of solutions that will be very diverse but always relevant and adapted to local conditions, including social ones. These principles include nonlinearity, diversity, concentration, integration, function stacking, redundancy, interdependence, the fencing effect, the edge effect, etc. (there are about 20 of these principles), all providing lifelong learning.

The individuals who comprise the MFCs will thus develop their skills. Moreover, they will share them widely through the Internet, as is already being done by permaculture communities, which are interconnected via the Internet all over the world. Communities of the future will use traditional knowledge as well as the latest progress in natural sciences, systems science, environmental techniques, etc.

5) It will help to achieve gender equality and empower all women and girls (SDG #5), for whom the crocus will be a privileged means of access to proper financial income.

6) It will help to ensure the availability and sustainable management of water and sanitation for all (SDG #6), because the deep and rich soils of agroecosystems in the approved MFCs will have a beneficial effect on the freshwater resource, reducing pollution, regulating the water cycle, filtering out impurities and preventing erosion.

FIGURE 3: THE SOIL - CLIMATE CONNECTION

Food

Climate

Water

Greater Availability of Nutrients

Reduced GHG Emissions

Increased Water Retention & Supply

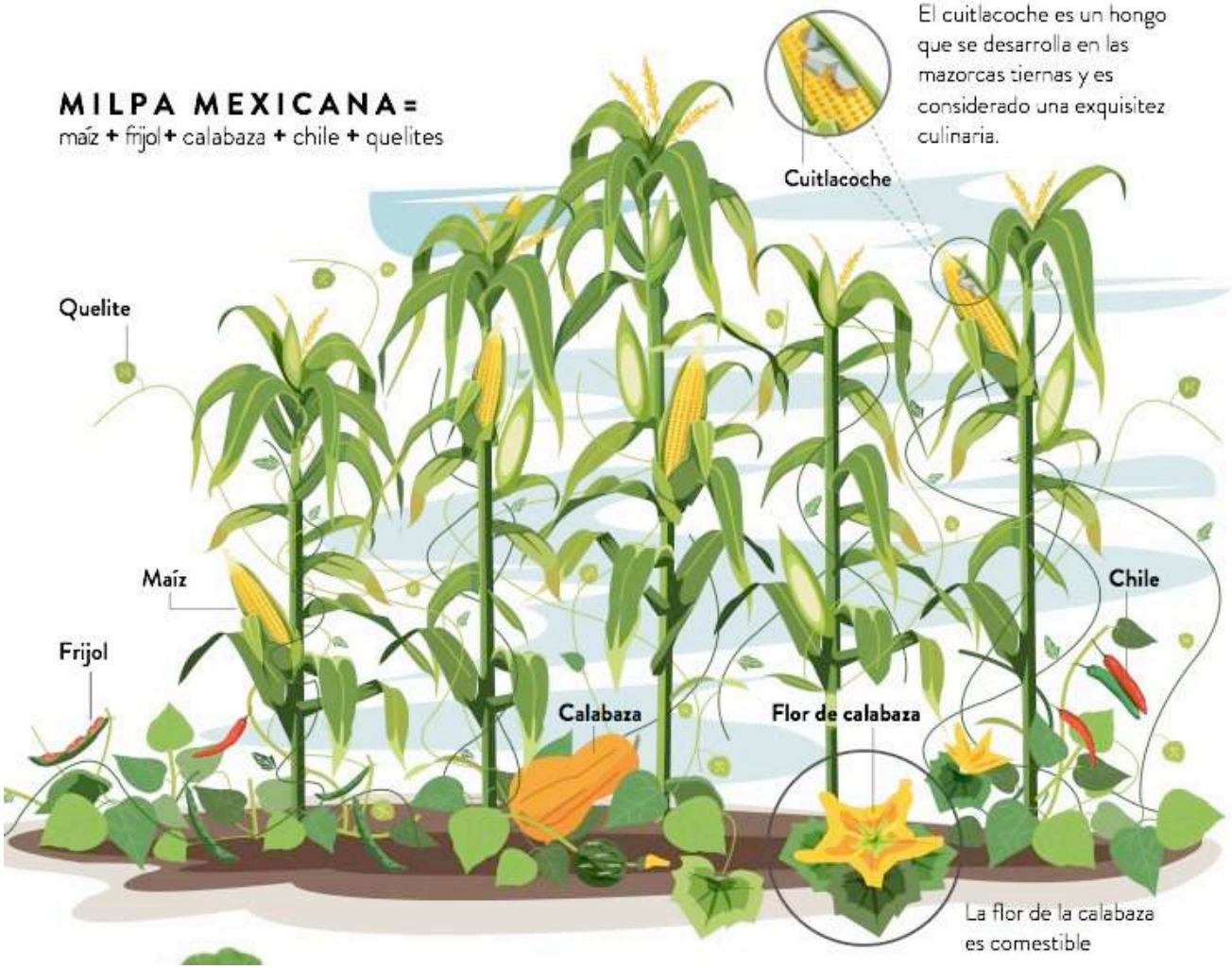
Improved Yields

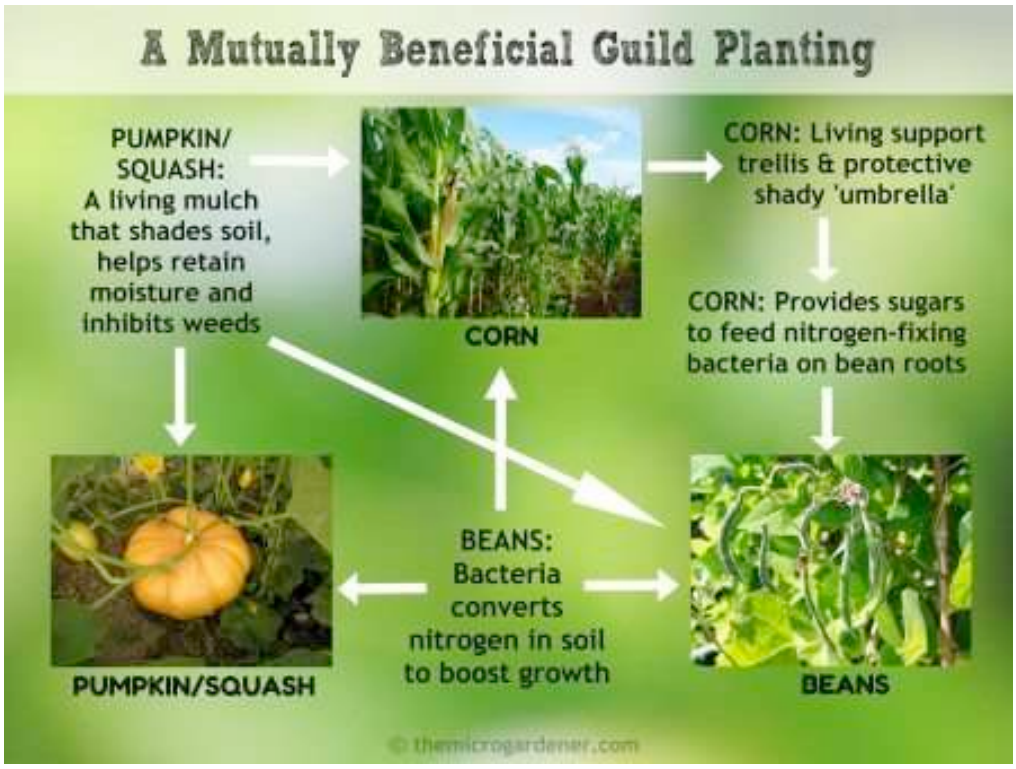
More Soil Carbon Stored

Less Severe Droughts & Floods

Healthy Soil

LA MILPA ES UN COMPLEJO SISTEMA AGRÍCOLA Y CULTURAL CON MUCHOS SIGLOS DE EXISTENCIA. LA ROTACIÓN DE SUS CULTIVOS MANTIENE LA FERTILIDAD DEL SUELO Y REDUCE LA EROSIÓN.

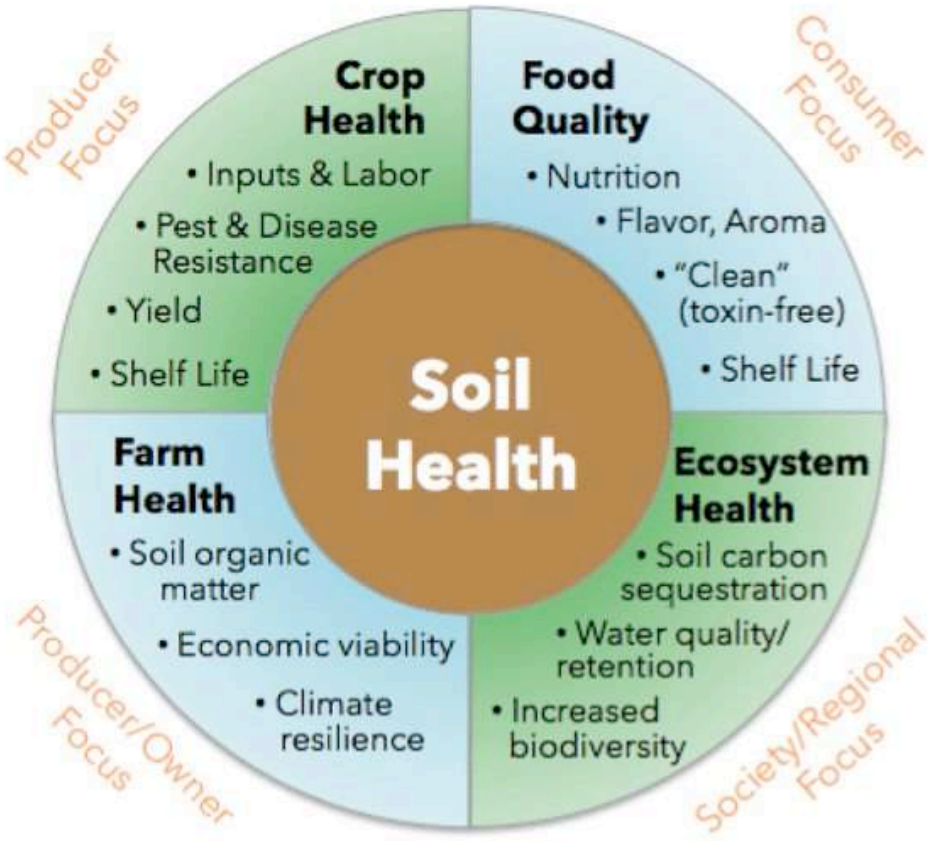




Milpa, a crop-growing system used throughout Mesoamerica

Soil Health is Central:

Food, Crop, Farm and Ecosystem Health
Dependence Upon Soil Health



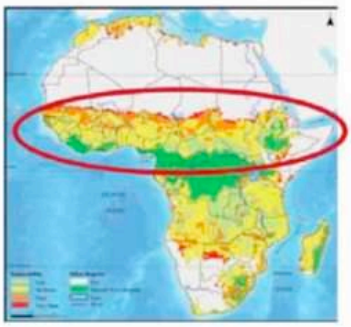
7) It will help to ensure access to affordable, reliable, sustainable and modern energy for all (SDG #7), since raising the populations' standard of living—thus increasing the resources of local communities hosting MFCs, will facilitate pooling the resources needed to equip them with clean and decentralized renewable energy systems (solar, wind, biogas, geothermal energy, etc.).

8) It will promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all (SDG #8), for when farming respects ecological balances, healthy living biomass increases perpetually. Micro-farms will therefore provide more and more sustainable, quality and highly productive jobs (in this scheme, agricultural employees are required to have trade-union rights for their employer's micro-farm license to be renewed).

9) It will help to build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation (SDG #9), because implementing the crocus will lead to a more massive use of bio-sourced products, stimulate the circular and/or local economy, stimulate research on ecological engineering, biomimicry, and favor all systems inspired by the functioning of nature such as: urban permaculture, social and human permaculture, bio-regional and social-territorial planning, cities in transition, etc.

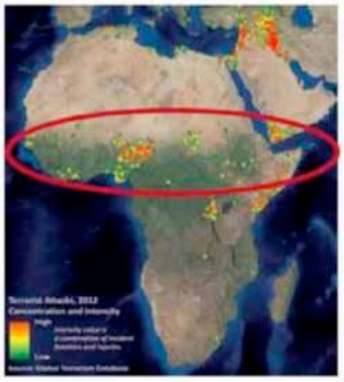
10) It will help to reduce inequality within and among countries (SDG #10). The resolution, through the crocus, of many current problems such as hunger, unemployment, women's hardship, etc., will mechanically promote social justice and democratic vitality in solidarity and resilience within local and national communities. It will enable the least developed countries to reduce their handicaps, and those already impacted by climate change (often the same ones) to be supported as a priority.

Desertification vulnerability in Africa
2008



Conflicts and food riots in Africa
2007-2008

Terrorist Attacks
2012

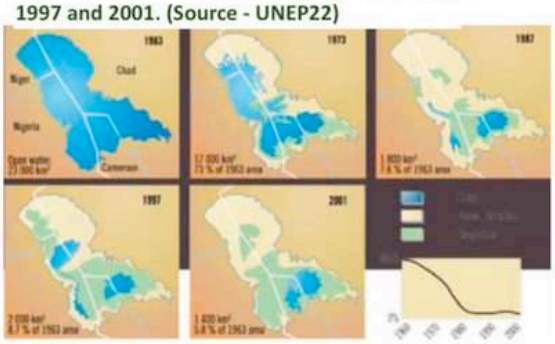


These three maps of vividly show the concentrations of past terrorist attacks, food riots and other conflicts in areas thatare vulnerable to desertificatio.

Desertification - Inaction, recipe for international political and economic chaos
(Source - UNCCD)[26]

Desertification - Inaction, recipe for international political and economic chaos

Lake Chad - decrease in area 1963, 1973, 1987, 1997 and 2001. (Source - UNEP22)

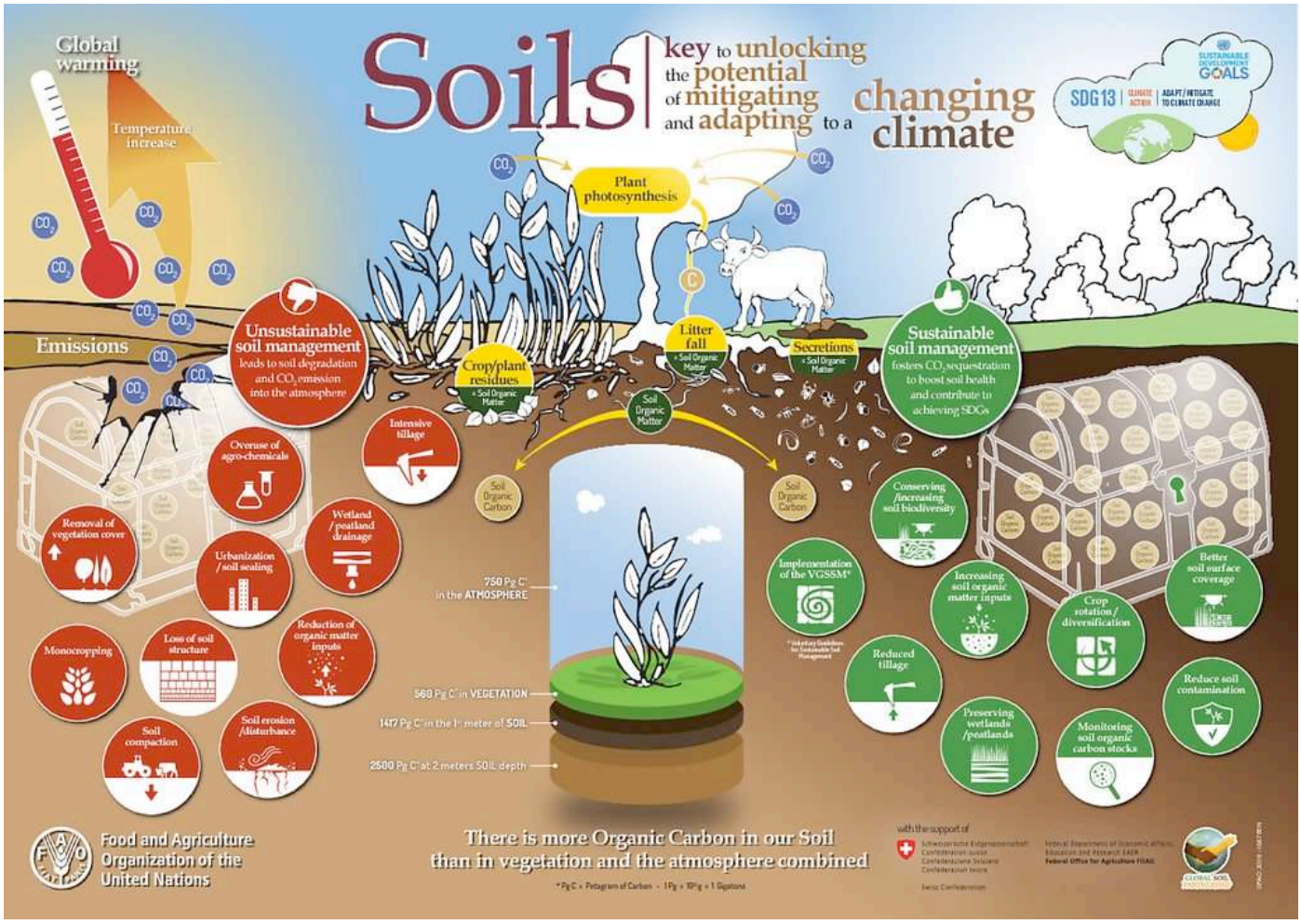


11) It will help to make cities and human settlements inclusive, safe, resilient, and sustainable (SDG #11):
- either by producing the immediate effect of relieving urban congestion thanks to the creation of a considerable number of jobs outside cities;
- or by leading to the establishment of clusters of urban micro-farms wherever possible, thus contributing to the food autonomy of cities and to cooling their climate conditions through the ensuing microclimates.

12) It will help to ensure sustainable consumption and production patterns (SDG #12), as the crocus will favor short distribution channels, thereby reducing the transportation of foodstuffs, packaging, and food waste. Thanks to the link between the crocus and local currencies, the agricultural, craft-based, and industrial productive fabric will be relocated as close as possible to their need.

13) It will be part of taking urgent action to combat climate change and its impacts (SDG #13). From this point of view, the OMF is a perfect complement to, and even reinforces the diplomacy of the COPs (United Nations Framework Convention on Climate Change; Convention on Biological Diversity; Convention against Desertification) because it will rapidly set in motion a virtuous circle.

Communities will have an interest in taking ownership of the regeneration of their agricultural environment because they will receive rapid financial contribution in the form of crocuses, which will irrigate the local economy. This "snowball" effect will ultimately enable us to sequester massive amounts of atmospheric CO2 and store carbon in living matter, with the resulting positive impact on global warming.



Furthermore, if the drive to set up innumerable MFCs is confirmed at the global level, and even more so if the crocus is extended to the living biomass of forests and reforestation, OMF action will allow decentralized, clean, and renewable energies to complete their maturation (particularly from the point of view of electricity storage techniques) and their large-scale implementation, thus putting an end to the world economy's addiction to dirty energy (fossil and nuclear).

14) It will help to conserve and use sustainably the oceans, seas, and marine resources for sustainable development (SDG #14). The crocus will act directly on the cause of sea-level rise and ocean acidification (due to the excessively high CO2 levels in the atmosphere), as well as of eutrophication, which is largely due to pollution discharges from industrial agriculture. If extended to include living forest biomass, the OMF's role would be crucial in safeguarding sensitive coastal natural areas and ecosystems such as mangrove forests, the function of which is essential for the health of oceans but which are currently fragile and threatened.

15) It will help to protect, restore, and promote the sustainable use of terrestrial ecosystems, to manage forests sustainably, combat desertification, halt and reverse land degradation, and halt biodiversity loss (SDG #15). The crocus is indeed the ideal tool for organizing the regeneration of degraded agricultural land, rapidly and on a very large scale.

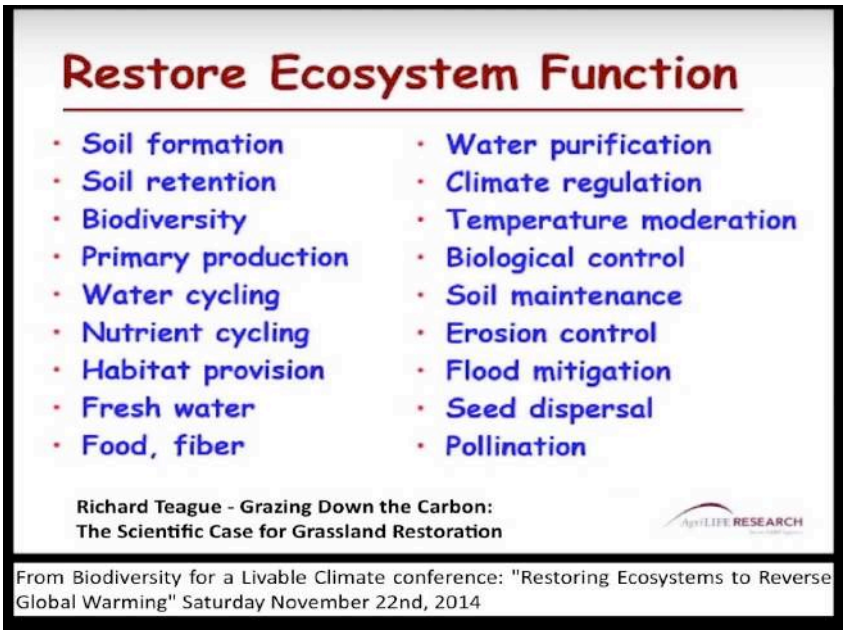
In fact, the "regenerative" model it aims to generalize is characterized by a holistic approach and a very precise definition of energy, according to which a land tenure system (natural or human) is regenerative only if it produces more than it consumes in total energy. (excluding sunshine).

Land and soil management

Promoting healthy soils for healthier agricultural systems

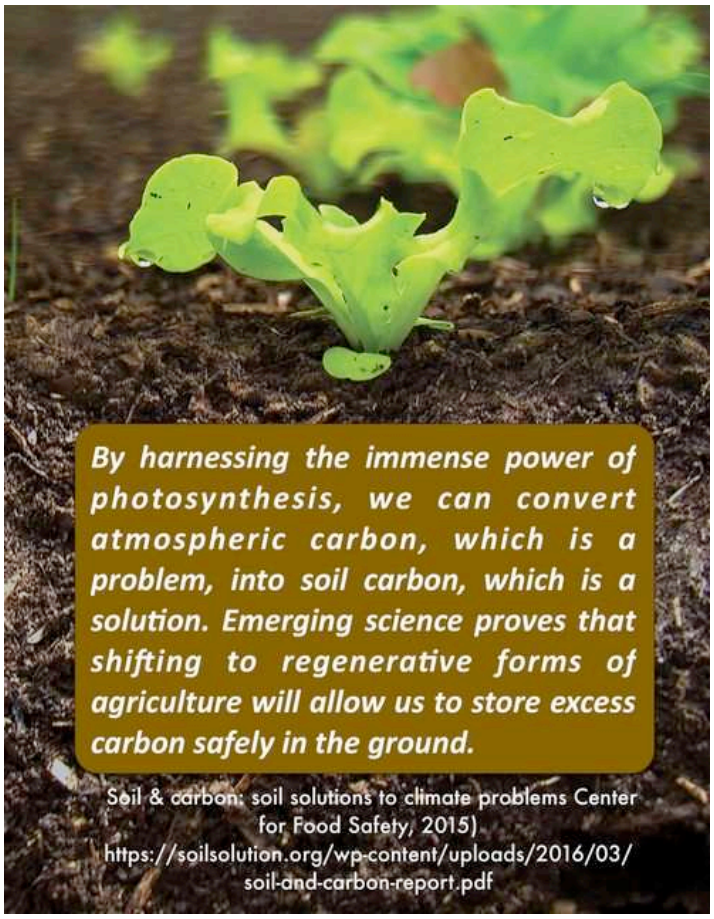
Source: Koo et al. 2016

Regenerative agriculture improves soil health, primarily through the practices that increase soil organic matter. This not only aids in increasing soil biota diversity and health, but increases biodiversity both above and below the soil surface, while increasing both water holding capacity and sequestering carbon at greater depths, thus drawing down climate-damaging levels of atmospheric CO2, and improving soil structure to reverse civilization-threatening human-caused soil loss.



Specific regenerative practices that have been shown to increase soil carbon levels include no-till/minimum till, cover crops, composts, multispecies plantings, biological soil enhancement, agroforestry, multi-paddock grazing, and a return of lands to grasslands/pastures or forests.

This model allows agro-ecosystems to be restored as sufficiently diversified, rich in interactions of all kinds, and perennial, because resilience spontaneously emerges from a complex and regenerative functioning. A resilient system is stable, homeostatic, and self-regulating. It is therefore able to withstand sudden changes such as disasters, droughts, floods, heat waves, fire, cold, wind, pollution, diseases, plagues and pests, conflicts, social disturbances, etc.



Since the productivity of MFCs would be much higher than that of industrial agriculture, the pressure on natural environments to feed the new billions of unborn human beings would be kept to a minimum. Such a reorientation of agriculture would be very beneficial to wildlife, as it would respect the areas that are essential to wild fauna and flora.

When we apply these principles to our agricultural systems, we will usher in a new era of abundance for all through the power, incredible diversity, and generosity of life.

16) It will help to promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable, and inclusive institutions at all levels (SDG #16). The positive action of the OMF will be a major contribution to restoring people's confidence in the international institutions. The universal sharing of a common value, the crocus, will materialize human-to-human cooperation and seal the alliance between our species and nature (especially if the OMF's action is extended to living forest biomass). When this latter is finally respected, we will be able to speak of a true Harmony with Nature, as advocated by the United Nations General Assembly in its eponymous resolution (Harmony With Nature, A/RES/64/196) adopted on 21 December 2009.

17) It will revitalize the Global Partnership for Sustainable Development (SDG #17) and help to strengthen the means of its implementation. The proposed new governance system, which is cross-cutting in nature since it affects all the SDGs, would be a decisive contribution to the achievement of the "The 2030 Agenda for Sustainable Development - Transforming our World." It would even be a very relevant indicator—since the crocus money supply is by definition quantifiable—to materialize and make tangible the common good of the Earth's inhabitants, which is healthy living biomass.

Who will take these actions and which types of actors are involved?

Stakeholders in the OMF / crocus process

To favour a paradigm shift toward regenerative agriculture, the United Nations General Assembly solemnly requests the International Monetary Fund to set up a division called the Organic Monetary Fund (OMF).

The drafting and observance of its statutes are ensured by a group of eminent personalities, the Statutory Council.

Each participating country has one vote in the OMF Decision-making Assembly (DMA).

An elected Executive Committee, in charge of managing the tasks to be accomplished and the functioning of the Fund, reports bi-annually to the DMA.

Its primary mission is to organize the Observation Network, a task force made up of world scientists who:

- draw up the specifications with which a multi-farm cluster (MFC) will have to comply in order to be awarded the OMF label;

- establish the baseline (amount of living biomass in each MFC at time t=0) in order to observe its evolution;

- produce scales indicating the weighting coefficients to be applied in terms of the geographical location of any MFC: latitude, altitude, orientation, nature of the substratum, etc.;

- publish annual figures of the healthy living biomass generated in each labelled MFC;

- make proposals to reassess the crocus endowment of MFCs in countries already heavily impacted by climate change.

Based on this data, the OMF's DMA will decide to grant a significant number of crocuses per year to the various countries participating in the scheme.

A share of the crocuses received by a country are allocated by its government to each MFC, equal to the share of the living biomass it produced the previous year.

An MFC may comprise:

- several farmers wishing to share their know-how and acquire new practices aimed at soil and biodiversity (natural and agricultural) conservation;

- a group of unemployed persons with a collective and viable project; land would be made available to them either by the central government or by a local authority under a 99-year lease;

- one or more private investors, companies, non-profit organizations, foundations, NGOs, landowners, patrons, etc. wishing to encourage the conversion of farmland impoverished by intensive monoculture; they would benefit from a favourable tax regime by supporting the establishment of one or more MFCs.

Each MFC, formed under a cooperative statute, distributes the crocuses to each of its members (farmer or agricultural worker), all of them natural persons.

Cooperative members are the only ones authorized to exchange crocuses, only for the local complementary currency (LCC) of their place of residence, which is at parity with the national currency, at 1 crocus = 1 LCC equivalent to 1 national currency unit.

The LCC collective is accredited by the state to include in its books of accounts the crocuses received, legally considered as units of the collateral account to which the LCC is attached. Crocuses are repayable as a last resort from the IMF in the relevant national currency.

Stakeholders in the OMF crocus process

United Nations General Assembly

Solemnly requests the IMF to institute the OMF

International Monetary Fund

Oversees the OMF

Decision-making Assembly

Statutary Council

Organic Monetary Fund

Executive Comittee

Scientific Council

Allocates the amount of crocuses due to OMF member countries

As many crocuses as...

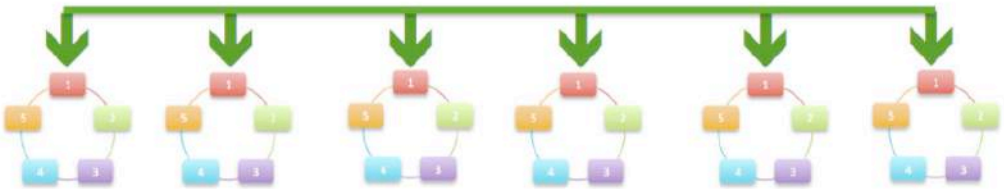
...healthy living biomass is grown

Country A | Country B | Country C | Country D | Country E | Country F

Promote the implementation of multiple micro-farm labelled clusters

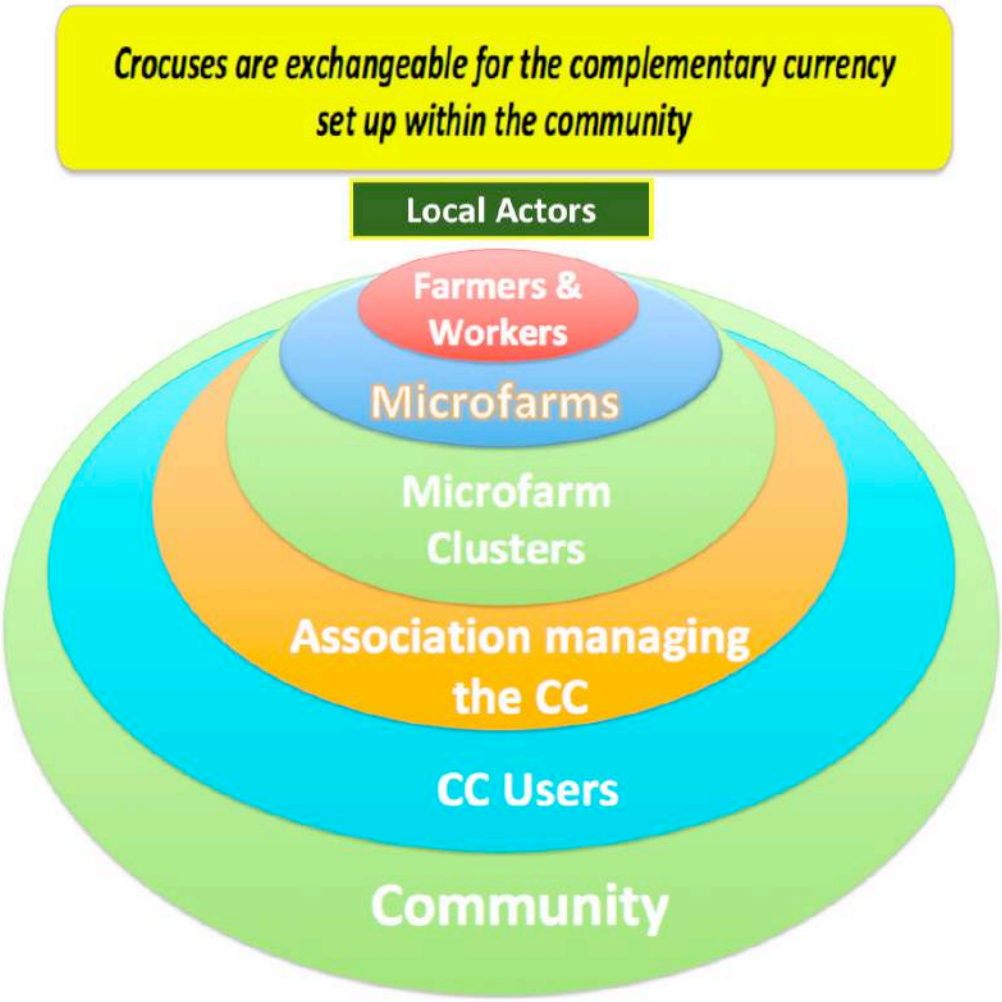
Government of each country

Distributes its share of crocuses to each cooperative representing a micro-farm cluster



The cooperative distributes the crocuses among its members

Every farmer and every farm worker gets crocuses



Where will these actions be taken and how could they scale?

Worsening climate change requires a rapid response that engages all of the world's countries.

The strength of the OMF-crocus scheme lies in its simplicity and ease of implementation. It doesn't require the mobilization of substantial funds, which is why it will be of interest to most countries.

Moreover, its cross-cutting nature makes possible:

- the extension to all the cultivated lands of the planet, respecting local values;

- the commitment of all levels of society, from the small farmer in any country to the consumers we all are, to the General Assembly of the United Nations;

- the convergence of economics with scientific ecology (systemic vision);

- the simultaneous achievement of adaptation to global warming and climate change mitigation.

The solutions are actions that work. They address the causes, lessen the impacts, raise general awareness and open new opportunities to achieve the SDGs. The OMF-crocus scheme is the solution we need.

A mitigation-only strategy will not work because many changes are already underway and are now unavoidable.

An adaptation-only strategy will not work as with time, most adaptation measures will become increasingly costly and less effective, in some cases ineffective, as the magnitude of climate change escalates.

Numerous studies suggest that the regeneration of soils that have been degraded by poor practices, particularly industrial agriculture, along with the reduction of fossil fuel use, is key to combating climate change.

Climate change mitigation through soil carbon sequestration can bring co-benefits in terms of adaptation. This is particularly important in developing countries, which are vulnerable to climate change and where mitigation is not perceived as a priority.

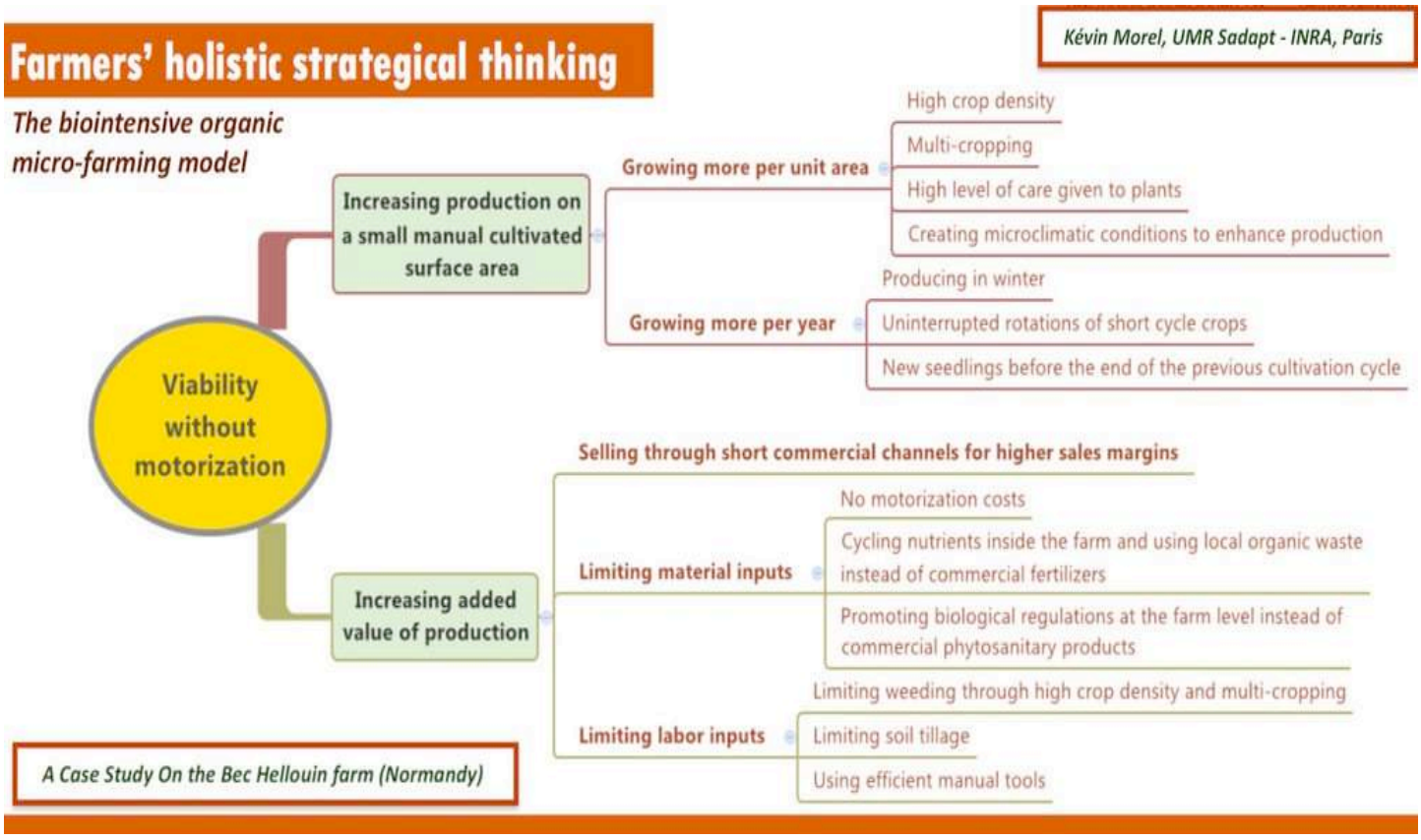
To foster synergy between mitigation and adaptation, innovative agricultural practices are required that either have positive feedback of mitigation on adaptation or vice-versa.

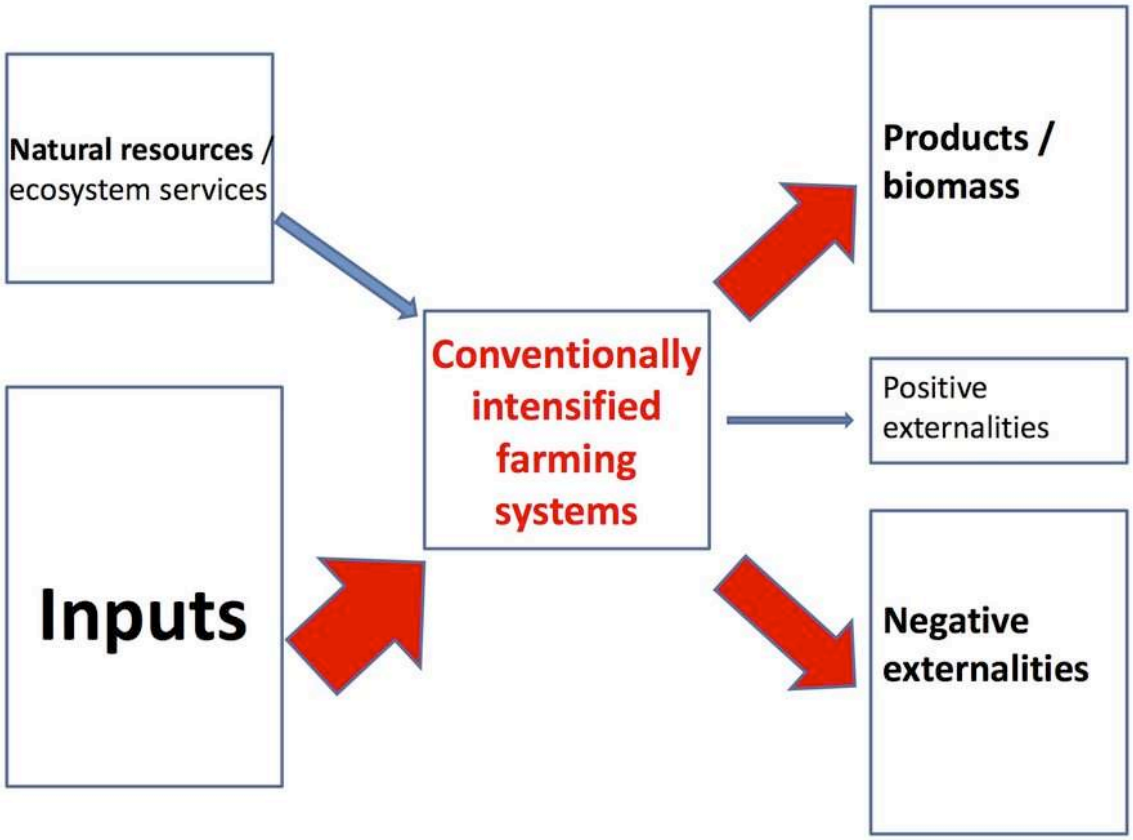
Feedback of adaptation on mitigation

Innovative practices for soil fertility management lead to increased soil organic carbon and a reduction in N2O emissions resulting from less use of fertilizers.

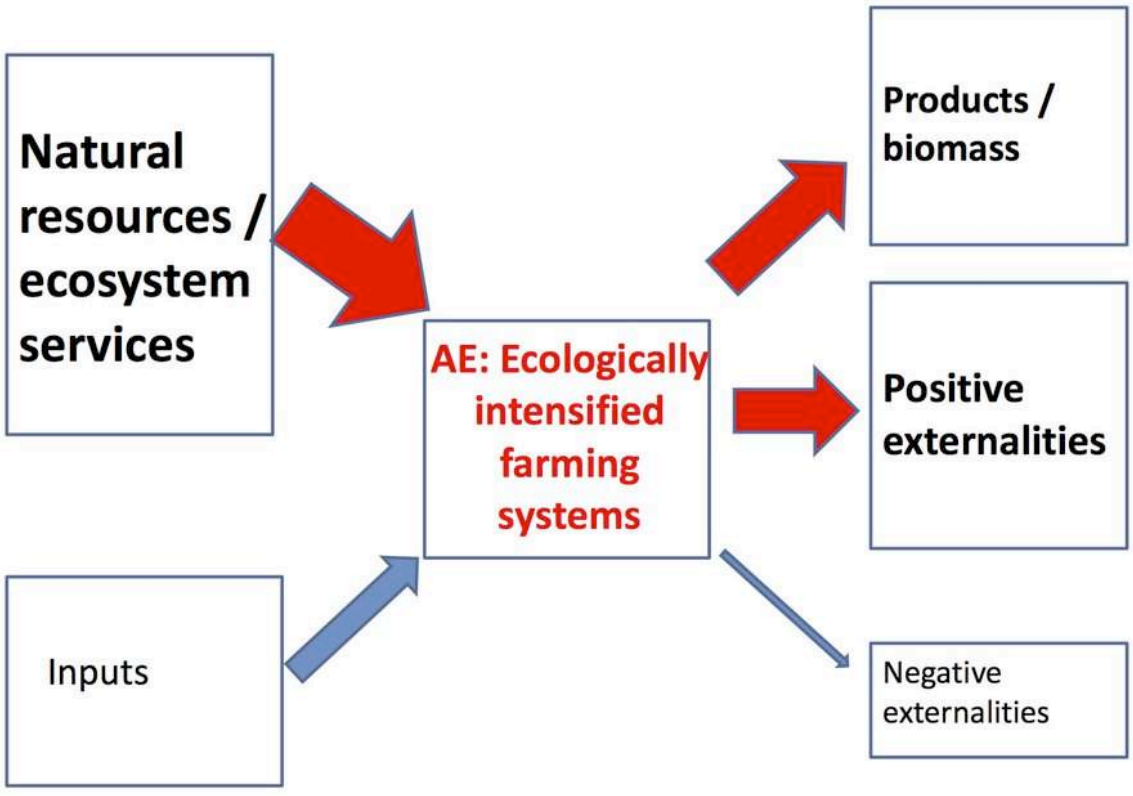
Feedback of mitigation on adaptation

Soil carbon sequestration leads to benefits in terms of soil properties and greater resilience to climatic stress, resulting in improved livelihood for farmers.





Compared intensitivity of cropping systems (adapted from M. Griffon 2013)



Compared intensitivity of cropping systems (adapted from M. Griffon 2013)

This should be the global challenge of our century. The effort can be shared by all societies that practice agriculture. Because it shall bring, on top of everything: improvement of the quality of life, employment, harmony with Nature and among the peoples of the Earth.

The increasing support and attention permaculture and regenerative practices are getting in science, the media and education shows that it has begun to be part of the mainstream conversation.

People no longer tolerate today's globalisation but there's a way towards globalisation that is responsible.

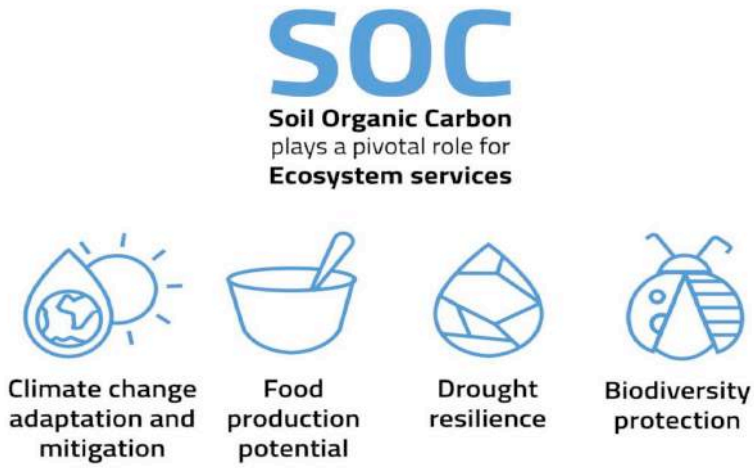
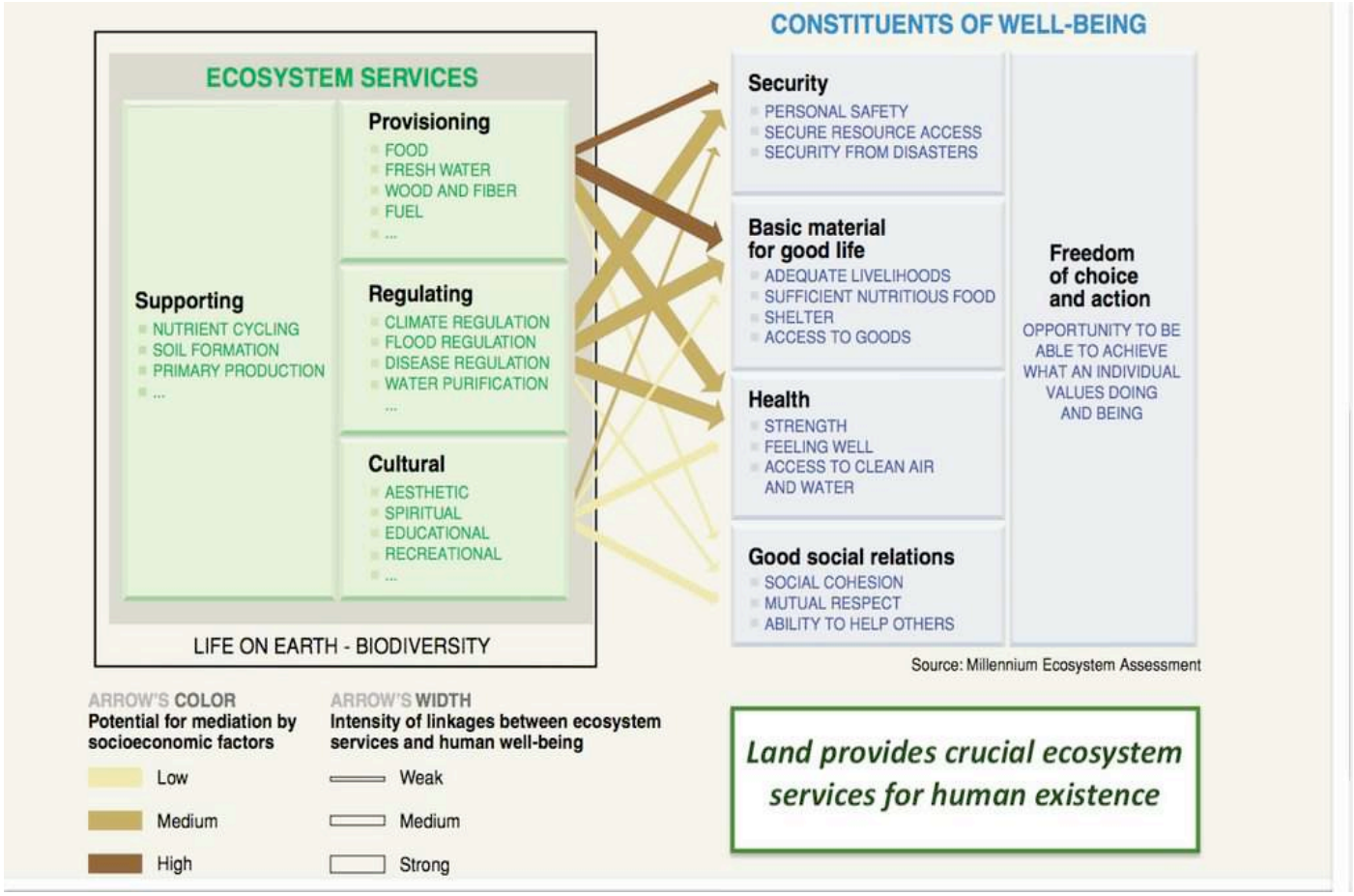


Figure 3: The pivotal role of soil organic carbon for crucial ecosystem services
UNITED NATIONS CONVENTION TO COMBAT DESERTIFICATION



In addition, specify the 5 countries where these actions will be taken.

The following five countries have the largest population and the largest area.

United States

European Union

China

Brazil

India

Impact/Benefits:

What impact will these actions have on reducing greenhouse gas emissions and/or adapting to climate change?

The Farming Systems Trial conducted by the Rodale Institute Kutztown, PA (USA), showed that CO2 was sequestered into the soil at the rate of 3,596.6 kg of CO2/ha/yr

Aguilera et al. 2013: found that the organic systems sequestered 3,559.9 kg of CO2/ha/yr

When extrapolated globally, would sequester 17.5 Gt of CO2/yr

3,596.6 kg CO2/ha/yr x 4,883,697,000 ha (Total Agricultural Land*) = 17.5 Gt of CO2/yr

CO2 was sequestered into the soil at the rate of 8,220.8 kg/ha/yr in the Rodale Compost Utilization Trial.

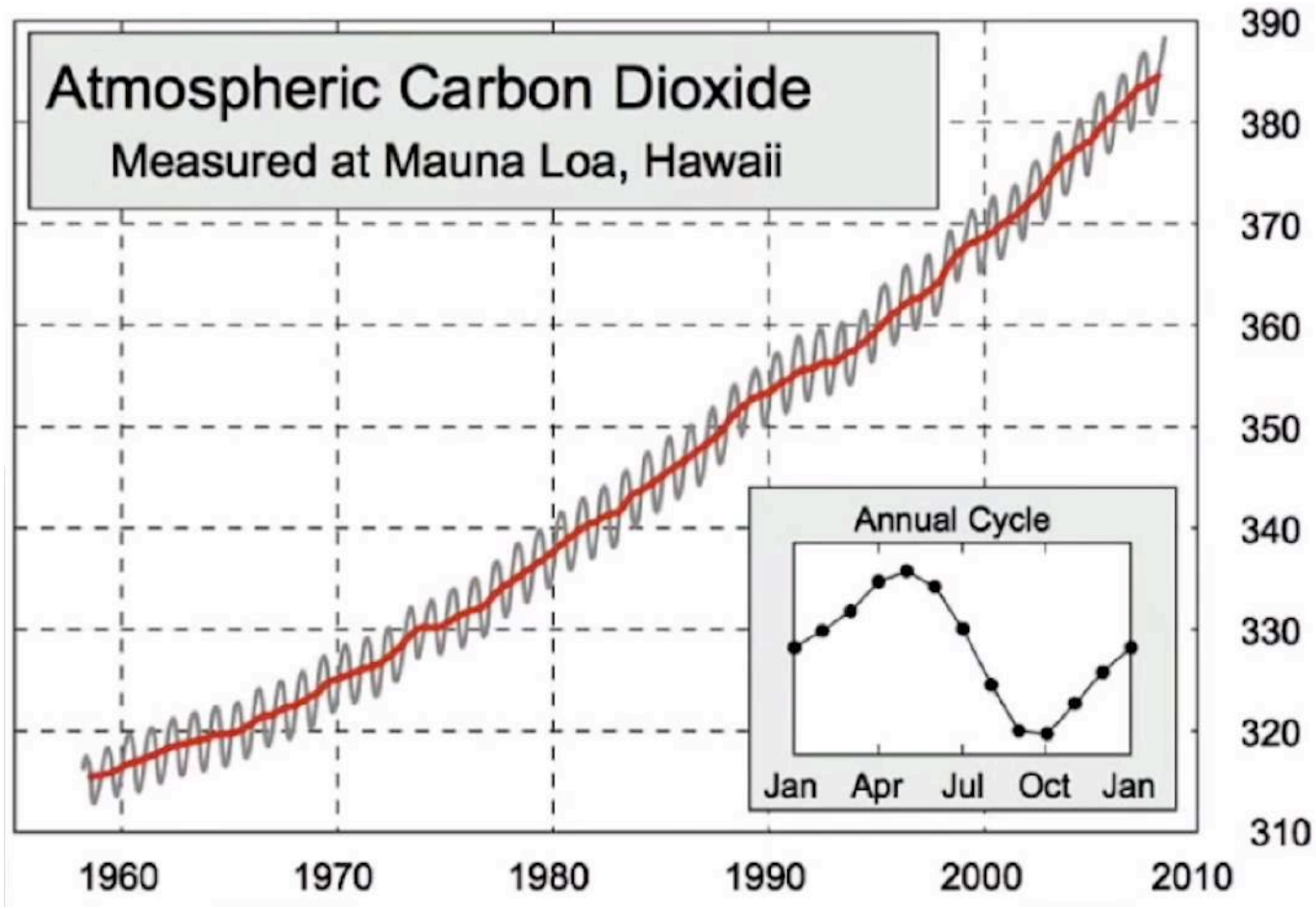
When extrapolated globally, would sequester 40 Gt of CO2/yr

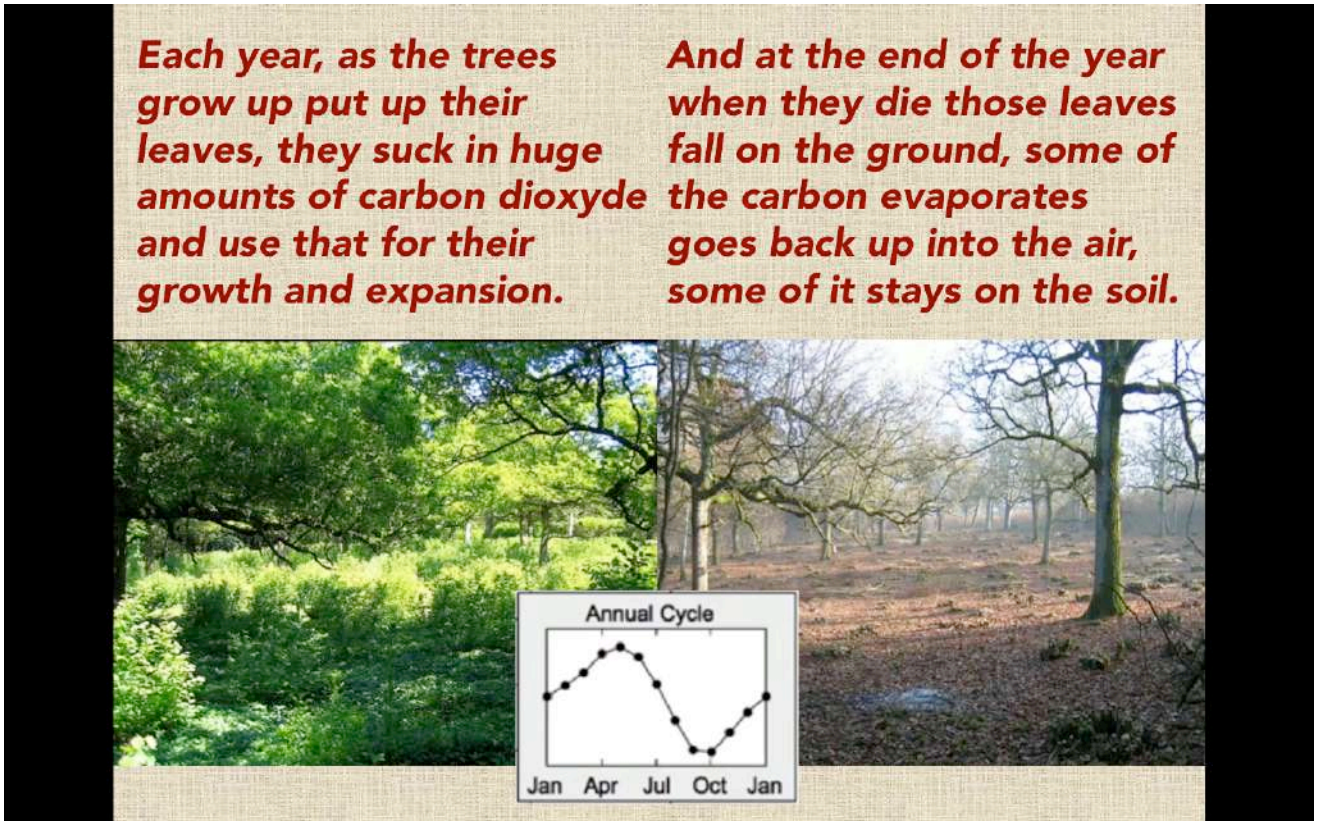
Machmuller et al. 2015: reported an increase of 29,360 kg of CO2/ha/yr in three farms converted to management intensive grazing. If these regenerative practices were implemented on the world's grazing lands they would sequester 98.5 Gt CO2/yr

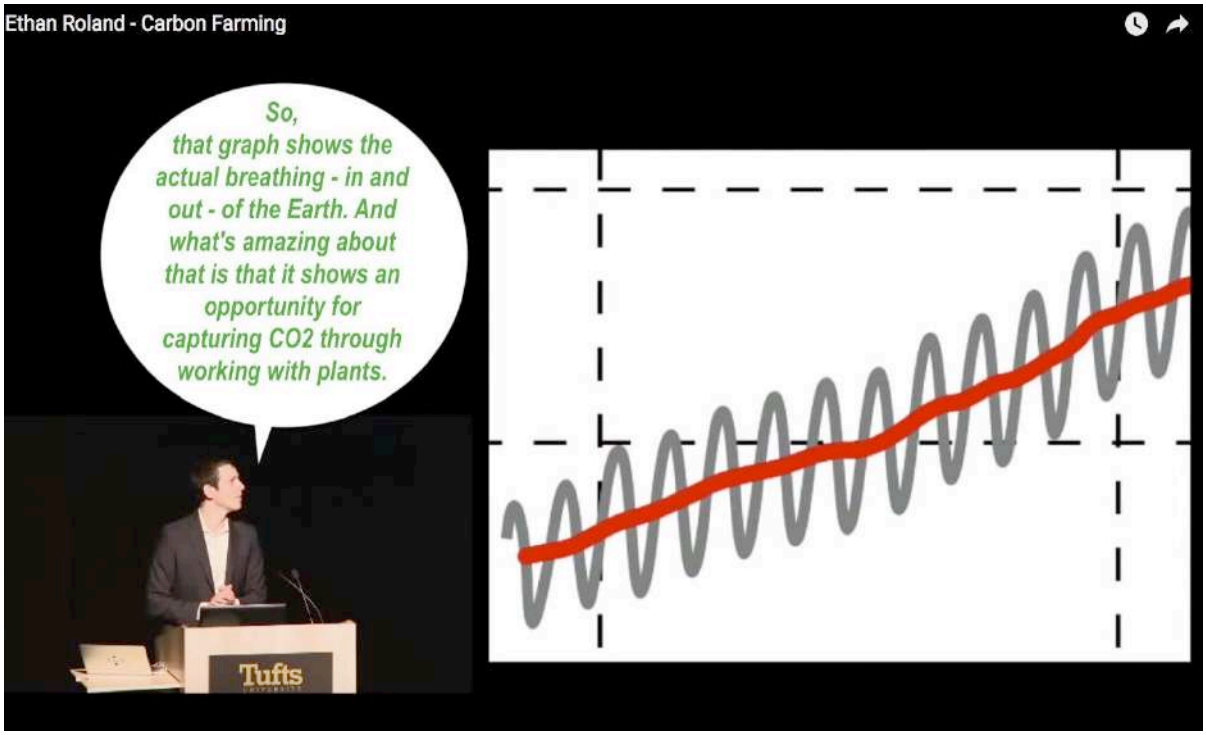
29.36 kg CO2/ha/yr x 3,356,940,000 ha (Grasslands*) = 98.5 Gt CO2/yr

* *Source:* FAO, 2010

(From: 4 per 1000 and Soil Carbon - Andre Leu, IFOAM and Regeneration Internationalhttp://bit.ly/2lnFFoW


Atmospheric Carbon Dioxide
Measured at Mauna Loa, Hawaii
390
380
370
360
350
340
330
320
310
1960
1970
1980
1990
2000
2010
Annual Cycle
Jan
Apr
Jul
Oct
Jan


Each year, as the trees grow up put up their leaves, they suck in huge amounts of carbon dioxyde and use that for their growth and expansion.
And at the end of the year when they die those leaves fall on the ground, some of the carbon evaporates goes back up into the air, some of it stays on the soil.
Annual Cycle
Jan
Apr
Jul
Oct
Jan

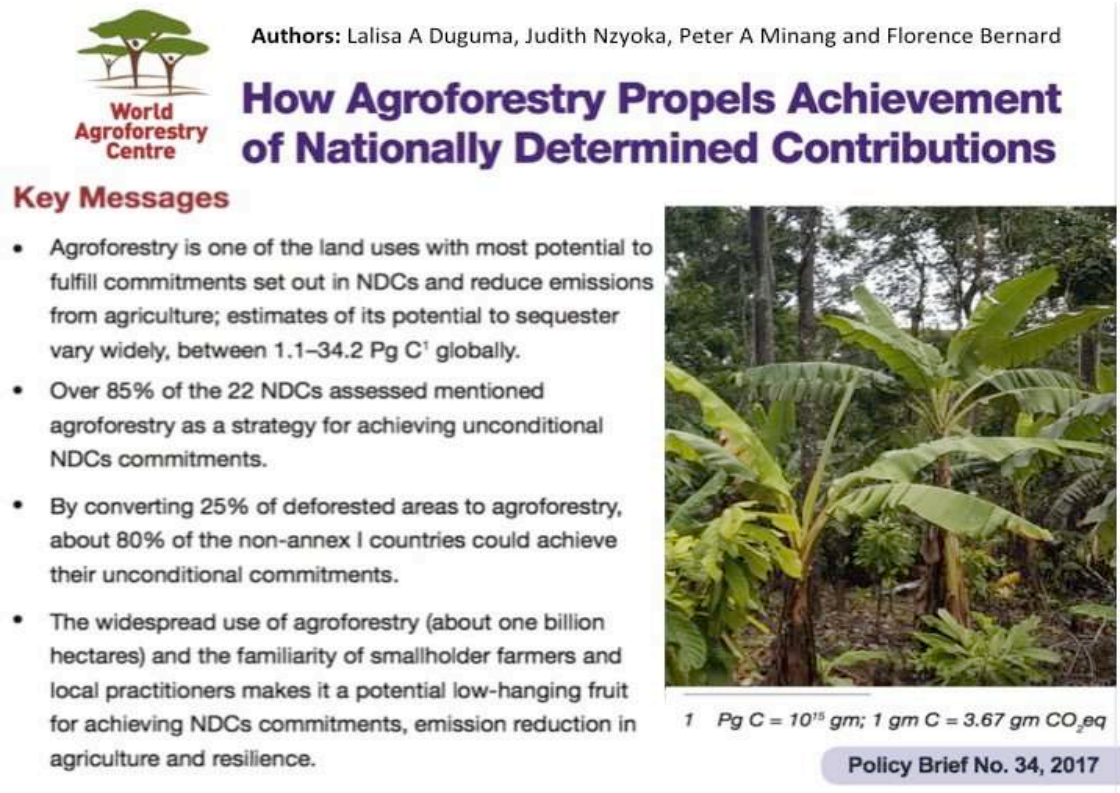


What are the most innovative aspects and main strengths of this approach?

The OMF crocus scheme is at the crossroads of many conventions and is THE tool that is needed to help countries and the international community meet their fundamental commitments:

- to live in Harmony with Nature as expressed in the eponymous UN General Assembly Declaration;

- to apply the "Paris Agreement" reached by the UNFCCC COP 21 by implementing the Intended Nationally Determined Contributions (INDCs);



World Agroforestry Centre

Authors: Lalisa A Duguma, Judith Nzyoka, Peter A Minang and Florence Bernard

How Agroforestry Propels Achievement of Nationally Determined Contributions

Key Messages

- Agroforestry is one of the land uses with most potential to fulfill commitments set out in NDCs and reduce emissions from agriculture; estimates of its potential to sequester vary widely, between 1.1–34.2 Pg C[1] globally.
- Over 85% of the 22 NDCs assessed mentioned agroforestry as a strategy for achieving unconditional NDCs commitments.
- By converting 25% of deforested areas to agroforestry, about 80% of the non-annex I countries could achieve their unconditional commitments.
- The widespread use of agroforestry (about one billion hectares) and the familiarity of smallholder farmers and local practitioners makes it a potential low-hanging fruit for achieving NDCs commitments, emission reduction in agriculture and resilience.

1 *Pg C = 10^{15} gm; 1 gm C = 3.67 gm CO_2eq*

Policy Brief No. 34, 2017

AFOLU = Agriculture, Forest and Other Land Uses

Why AFOLU should be included in INDCs?

- For its magnitude, as ¼ of global emissions
- 1st sector of emissions in many countries

INDCs = Intended Nationally Determined Contributions

- Projected to increase because of population growth and diet change
- Potential sink can compensate other emissions and is fundamental to achieve a net zero or negative balance of anthropogenic emissions by 2100
- Because of linkages (and leakages) with mitigation measures in other sector e.g. wood energy

Why AFOLU should be included in INDCs?

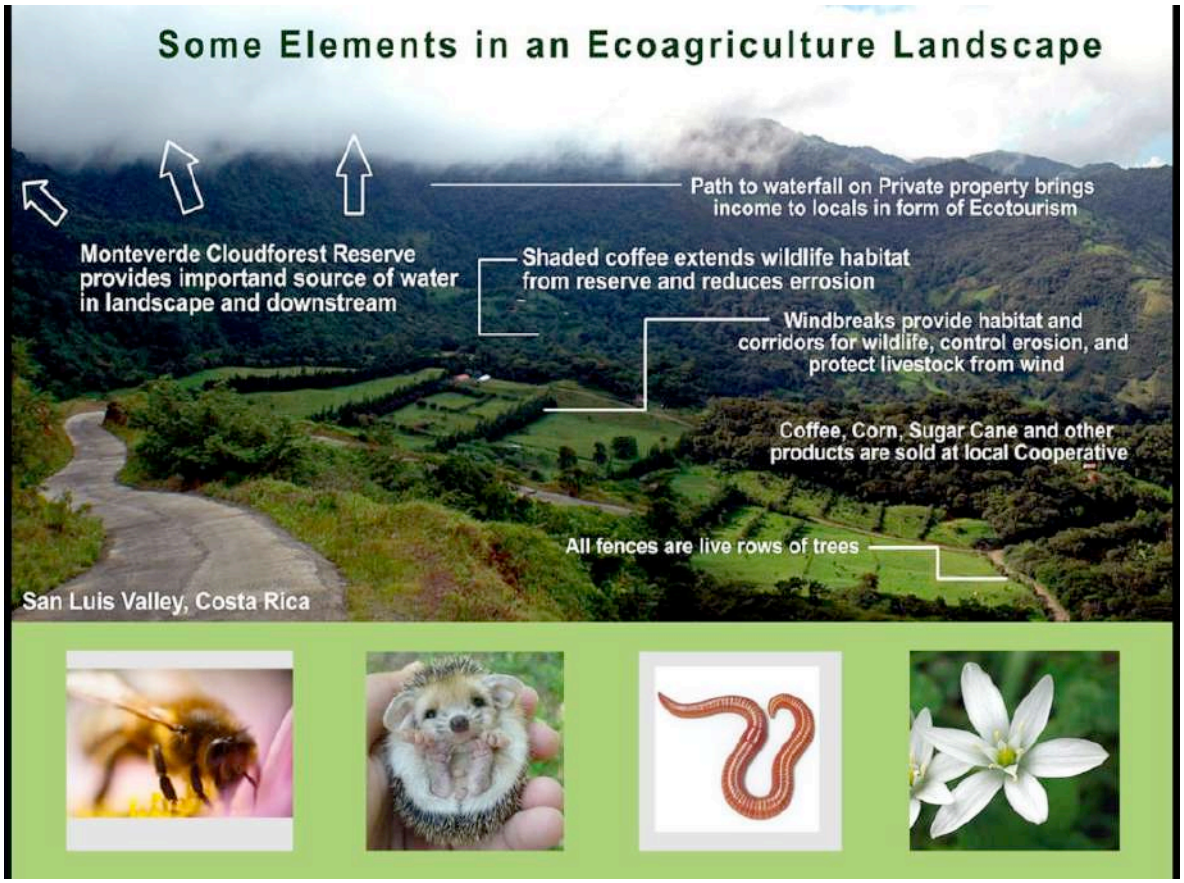
- Opportunities exist to decrease emissions intensity while increasing productivity and efficiency
- Synergies with adaptation (90% of priority measures of NAPAs)

NAPAs = National adaptation programmes of action

- To valorize ongoing or planned environmental actions e.g. forest conservation
- To tap into financing opportunities (REDD+, CCAC, GCF, NF, GEF, IKI, etc.)

- to enforce the New York Declaration on Forests (NYDF);

- to intensify the implementation of the Aichi Biodiversity Targets of the Convention on Biological Diversity;



- to achieve the UNCCD Land Degradation Neutrality target that specifically addresses the regeneration of the drylands, where some of the most vulnerable ecosystems and peoples can be found;

- to achieve the 17 goals of Agenda 2030 (Transforming Our World: 2030 Agenda for Sustainable Development) which provides the world with a roadmap towards prosperity for all citizens on a regenerated Earth.

Costs/Challenges:

What are the proposal's projected costs?

The OMF/crocus scheme is ingenious because it is designed as simply complementary to the current financial system and will not interfere with it.

Assessing the cost of such an ambitious instrument will require a preliminary study, but it can already be said that the sum is small compared to the benefits brought on Earth. It will help to solve, and "connect the dots" among the burning issues:

- climate breakdown

- ocean acidification and eutrophication

- collapsing biodiversity

- the depletion of arable land

- the scarcity of drinking water

- hunger

- unemployment

- climate-induced disasters, wars, and population displacements

- retreat into nationalism and selfishness

- hopelessness.

The OMF-crocus instrument is itself a measure of its own effectiveness, as the number of crocuses issued will be:

- a faithful reflection of the growth of healthy living agricultural biomass, thus of the gradual reorientation of agriculture;

- a real-time measure of our ability to allow Mother Nature help us draw down a significant part of the carbon released in the atmosphere as a result of our « energy-related inebriation », which has considerably increased the entropy of the Earth system and caused the climate to spin out of control;

SECTIONS

Common Dreams

Published on Tuesday, January 02, 2018 by Common Dreams

Scientists Warn of Permanent Drought for 25% of Earth By 2050 If Paris Goals Not Reached

"Reducing greenhouse gas emissions into the atmosphere in order to keep global warming under 1.5°C or 2°C could reduce the likelihood" of widespread drought, researchers concluded

by Jake Johnson, staff writer

12 Comments

"Our research predicts that aridification would emerge over about 20-30 percent of the world's land surface by the time the global mean temperature change reaches 2°C," said Manoj Joshi, one of lead researchers of the study. (Photo: Joshua Tree National Park/Flickr/cc)

- a good indicator of how we harmonize economy and ecology and of the increase in dynamism and wealth of local communities;

- the measure of our ability to find a better thermodynamic and ecological balance;

- a good indicator of humans' capacity to act in harmony with Nature and all living beings, from bacteria to plants to whales, in a mutually enriching way.

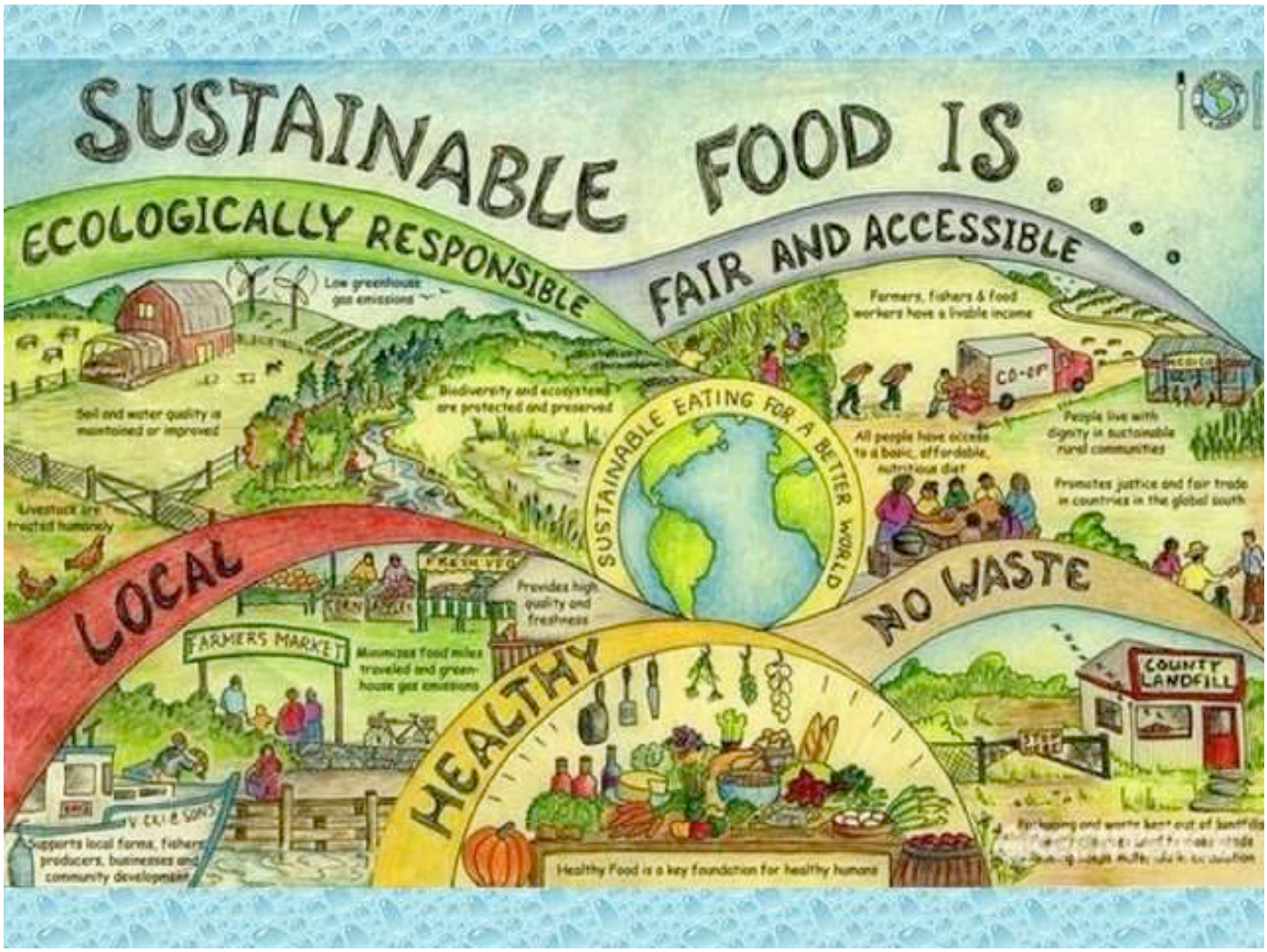
The crocus currency can be traced from one end of the chain to the other and cannot give rise to corruption. It is not an energy chasm like the bitcoin cryptocurrency because it doesn't require the use of energy-intensive blockchain technology. It is "THE" Anti-Bitcoin par excellence as it will foster enormous progress for humanity, whilst the bitcoin does no more than reflect a few individuals' opportunism, degrades the social bond and is ultimately a parasite dangerously drifting towards the annihilation of human civilization.

From the purists' point of view, the crocus is more like an incentive than actual currency. The "currency" designation should however be used because it will make it more desirable.

The crocus allows Nature to buy money instead of being bought by money. In other words, ecological vitality, not the commodification of nature, is what generates money here.

This tool is therefore a means of giving nature added value without destroying it. It is synonymous with growth and abundance because living biomass is spontaneously inflationary. It strives towards real social and environmental sustainability.

It is a new paradigm, a "TRUE" Green Revolution acting from the global to the local (« Think globally, act locally »). It is humanity's next great step towards peace and wisdom. Finally!



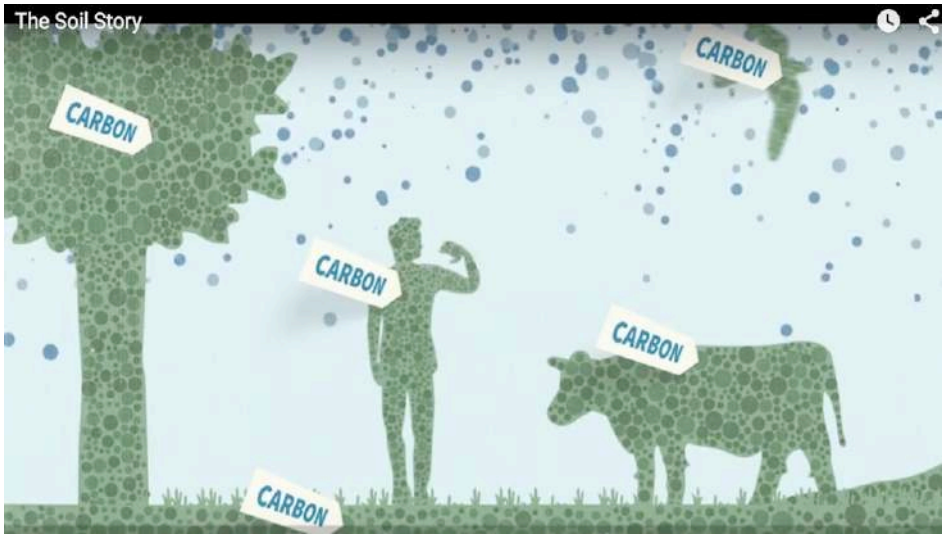
About the Authors

Hélène Nivoix, biographical elements

Born 19 January 1961, native of Besançon in France, the Franche-Comté region near Switzerland. Still lives there.

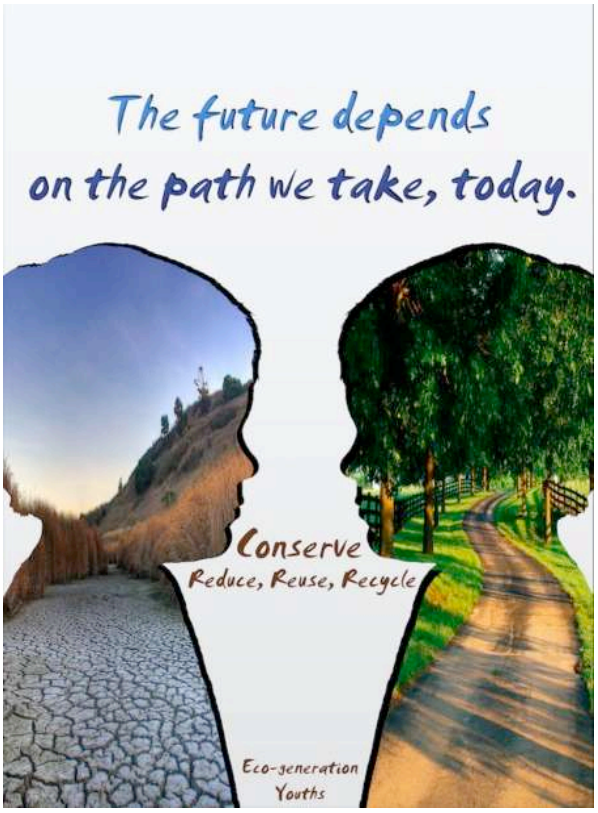
Ecologist since the age of 11 (following the *Club of Rome's* warning in 1972)!

Holds a degree in natural sciences.



Civil servant currently retired for reasons of disability.

Two children. Sensitive to the future of every child in the world.



Member of « Friends of the Earth » in her youth, then member of the Green Party from its beginning in 1984 (and employed by the party for a while).

Passionate about environmental issues, particularly agriculture.

Donor to multiple movements including Greenpeace, and supporter of a number of media organizations that campaign for the ecology.

Philosophy:

- Live for the moment, with eyes wide open.

- The Internet is an open window upon the world and gives us some power, depending on what we do with it, much like when we choose what to put on our plate.

- It is important to spread ideas. A simple thought born somewhere in the galaxy, even if not voiced, can truly transform the universe. This is probably why often inventions are born almost simultaneously in different parts of the world, without the respective inventors having consulted one another. The Internet, in that it is the biggest brainstorming tool, is even more powerful.

- This is why it is so important to observe our own thoughts and emotions, especially negative ones, and find ways to improve.

- In fact, we are all connected. In addition to being all “in the same boat”, we are not separate. Besides, there is no need to worry: everything will occur at the right time.

My favourite quotes about Regeneration:

"With the right support and incentives, land dependent communities could help turn degraded land into a productive asset in as little as two years. The approach is the essence of sustainable development. It offers millions of people real opportunity. It delivers the basis for food, energy and water security. It helps build resilience in the face of climate change. It reduces carbon emissions AND sequesters carbon in the soil.

And worldwide, there are huge opportunities. There are 2 billion hectares of degraded-land worldwide with the potential for restoration. 75% of that is in working landscapes. The restoration of just 500 million hectares could store up to 30% of global carbon emissions - buying us valuable time for energy transition. And with the costs of restoration in the range of a 150 dollars a hectare, it is cost-effective. It makes policy and business sense." (1)

"Though the problems of the world are increasingly complex, the solutions remain embarrassingly simple." (2)

"You sow one grain, you harvest a hundred. What could be better than that??!" (3)

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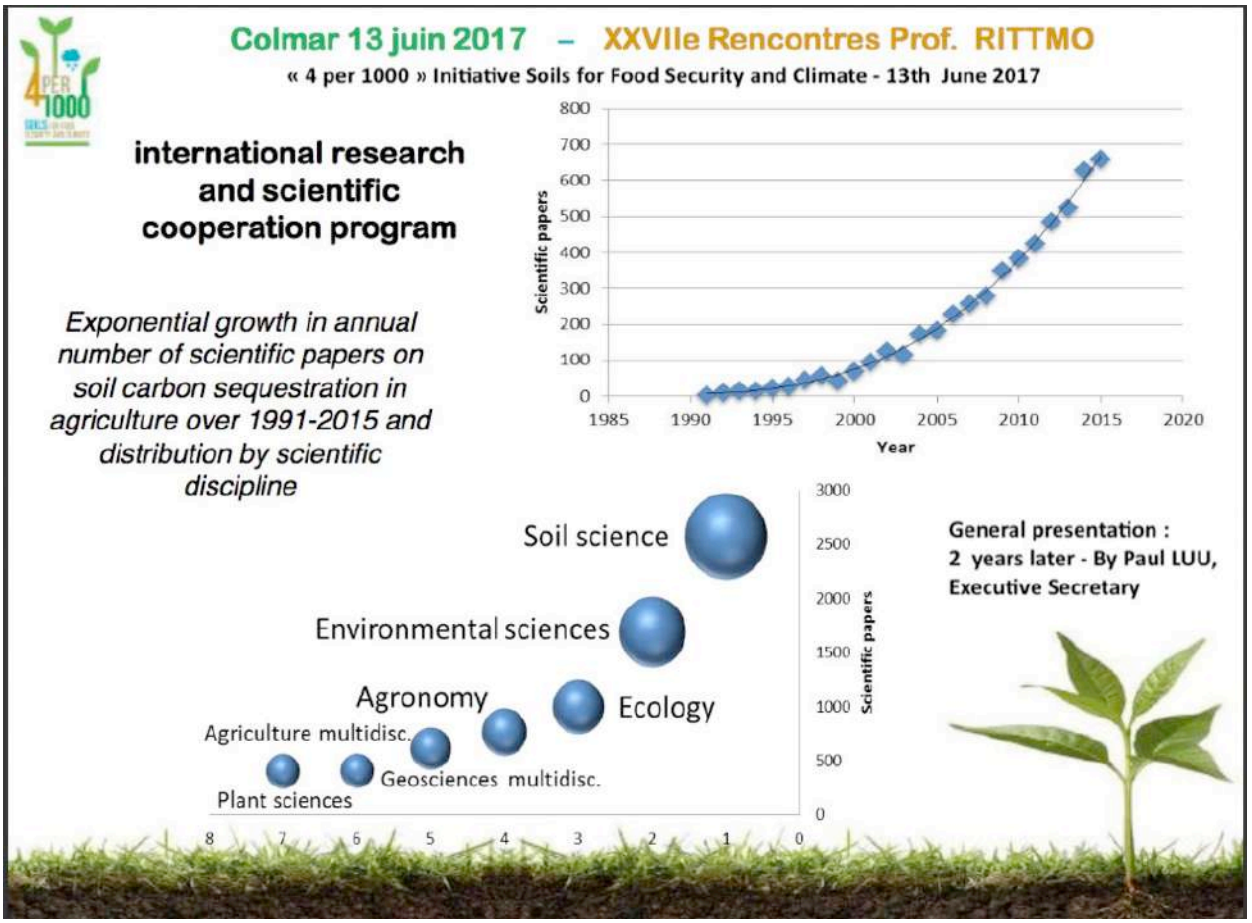
(1) Monique Barbut, Executive Secretary, United Nations Convention to Combat Desertification (UNCCD)

(2) Bill Mollison (1928-2016), co-founder of permaculture with David Holmgren

(3) Claude Bourguignon, French agronomist

References



Aguilera E, Lassalettab L, Gattinger A and Gimenoe S, (2013), **Managing soil carbon for climate change mitigation and adaptation in Mediterranean cropping systems: a meta-analysis**, Agriculture, Ecosystems & Environment.

Fliessbach A, Imhof D, Brunner T & Wüthrich C, (1999). **Tiefenverteilung und zeitliche Dynamik der mikrobiellen Biomasse in biologisch und konventionell bewirtschafteten Böden**. Regio Basiliensis 3, 253–263.

IPCC, (2014). **Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change**. IPCC, Geneva, Switzerland.

Koopmans CJ, Bos M M and Luske B (2010). **Resilience to a changing climate: carbon stocks in two organic farming systems in Africa**. **Organic is Life – Knowledge for Tomorrow**. Proceedings of the Third Scientific Conference of the International Society of Organic Agriculture Research (ISOFAR). 28 September - 1. October 2011. Vol. 2 Socio-Economy, Livestock, Food Quality, Agro-Ecology and Knowledge Dissemination. Namyangju, Korea.

Lal R (2014), **Global Potential of Soil Carbon Sequestration to Mitigate the Greenhouse Effect**, Critical Reviews in Plant Sciences, Volume 22, 2003 - Issue 2, Pages 151-184 | Published online: 24 Jun 2010

LaSalle T and Hepperly P (2008). **Regenerative organic farming: A solution to global warming**. The Rodale Institute, Kutztown, PA, USA.

Machmuller MB, Kramer MG, Cyle TK, Hill N, Hancock D & Thompson A (2014). **Emerging land use practices rapidly increase soil organic matter**, Nature Communications 6, Article number: 6995 doi:10.1038/ncomms7995, Received 21 June 2014 Accepted 20 March 2015 Published 30 April 2015

NOAS (2017). National Oceanic and Atmospheric Administration (US)https://www.climate.gov/news-features/climate-qa/how-much-will-earth-warm-if-carbon-dioxidedoubles-pre-industrial-levels, Accessed Jan 30 2017

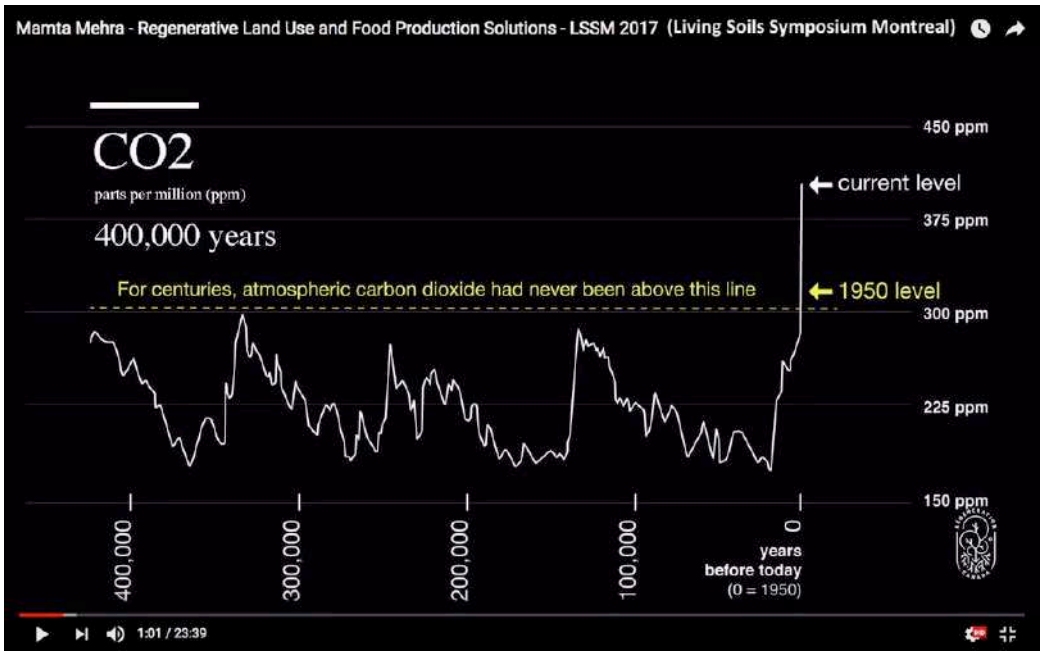
Paustian K, Johannes Lehmann, Stephen Ogle, David Reay, G. Philip Robertson & Pete Smith. **Climate-smart soils**. Nature 532, 49–57 (07 April 2016) Biogeochemistry Environmental sciences

Scharlemann J PW, Tanner EVJ, Hiederer R & Kapos V (2014). **Global soil carbon: understanding and managing the largest terrestrial carbon pool**, Carbon Management, 5:1, 81-91, DOI: 10.4155/cmt.13.77 Tong W, Teague W R, Park C S and Bevers S, 2015, GHG Mitigation Potential of Different Grazing

Strategies in the United States Southern Great Plains, Sustainability 2015, 7, 13500-13521;www.mdpi.com/journal/sustainability

Cropland restoration as an essential component to the forest landscape restoration approach - Global effects of widescale adoption | IFPRI discussion paper - 2017 (www.ifpri.org/publication/)

Borrelli P, Robinson D A, Fleischer L R, Lugato E, Ballabio C, Alewell C, Meusburger K, Modugno S, Schütt B, Ferro V, Bagarello V, Van Oost K, Montanarella L, Panagos P. **An assessment of the global impact of 21st century land use change on soil erosion**. *Nature Communications*, 2017; 8 (1) DOI: 10.1038/s41467-017-02142-7



PERSPECTIVE

Human domination of the biosphere: Rapid discharge of the earth-space battery foretells the future of humankind

John R. Schramski[a,1], David K. Gattie[a], and James H. Brown[b,1]

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Edited by B. L. Turner, Arizona State University, Tempe, AZ, and approved June 8, 2015 (received for review May 4, 2015)

Earth is a chemical battery where, over evolutionary time with a trickle-charge of photosynthesis using solar energy, billions of tons of living biomass were stored in forests and other ecosystems and in vast reserves of fossil fuels. In just the last few hundred years, humans extracted exploitable energy from these living and fossilized biomass fuels to build the modern industrial-technological-informational economy, to grow our population to more than 7 billion, and to transform the biogeochemical cycles and biodiversity of the earth. This rapid discharge of the earth's store of organic energy fuels the human domination of the biosphere, including conversion of natural habitats to agricultural fields and the resulting loss of native species, emission of carbon dioxide and the resulting climate and sea level change, and use of supplemental nuclear, hydro, wind, and solar energy sources. The laws of thermodynamics governing the trickle-charge and rapid discharge of the earth's battery are universal and absolute; the earth is only temporarily poised a quantifiable distance from the thermodynamic equilibrium of outer space. Although this distance from equilibrium is comprised of all energy types, most critical for humans is the store of living biomass. With the rapid depletion of this chemical energy, the earth is shifting back toward the inhospitable equilibrium of outer space with fundamental ramifications for the biosphere and humanity. Because there is no substitute or replacement energy for living biomass, the remaining distance from equilibrium that will be required to support human life is unknown.

energy | evolutionary biology | earth-space battery | sustainability | thermodynamics

As depicted in Fig. 1, earth is a battery of stored chemical energy where the planet is the cathode (stored organic chemical energy) and space is the anode (equilibrium). We call this the earth-space battery. It took hundreds of millions of years for photosynthetic plants to trickle-charge the battery, gradually converting diffuse low-quality solar energy to high-quality chemical energy stored temporarily in the form of living biomass and more lastingly in the form of fossil fuels: oil, gas, and coal. In just the last few centuries—an evolutionary blink of an eye—human energy use to fuel the rise of civilization and the modern industrial-technological-informational society has discharged the earth-space battery, inducing flow between the terminals, degrading the high quality biomass energy to do the work of transforming the earth for human benefit, and radiating the resulting low-quality heat energy to deep space.

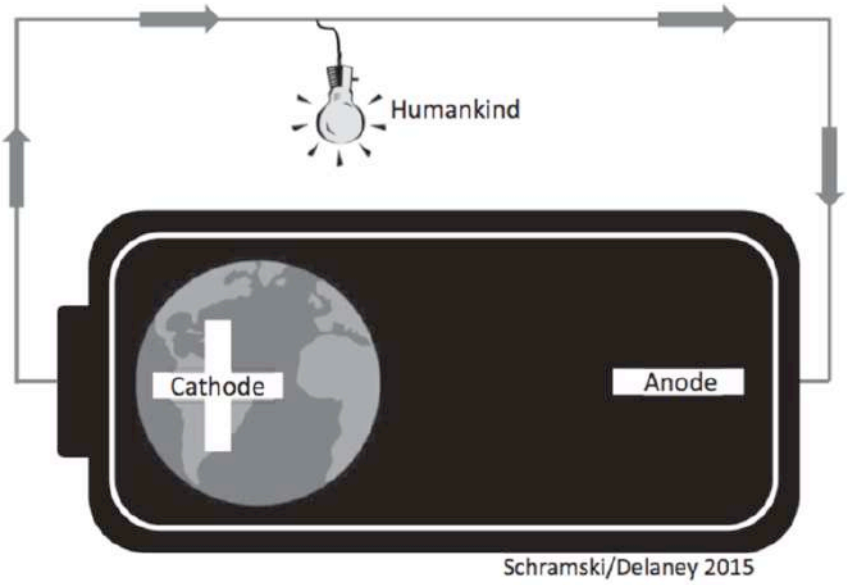

Fig. 1. Earth-space battery. The planet is a positive charge of stored organic chemical energy (cathode) in the form of biomass and fossil fuels. As this energy is dissipated by humans, it eventually radiates as heat toward the chemical equilibrium of deep space (anode). The battery is rapidly discharging without replenishment.

The laws of thermodynamics dictate that the difference in rate and timescale between the slow trickle-charge and rapid depletion is unsustainable. The current massive discharge is rapidly driving the earth from a biosphere teeming with life and supporting a highly developed human civilization toward a barren moonscape. Consider as an example that the energy state of the earth is akin to the energy state of a house powered by a once-charged battery supplying all energy for lights, heating,

Author contributions: J.R.S. and D.K.G. designed research; J.R.S. and J.H.B. performed research; J.R.S. and J.H.B. contributed new reagents/analytic tools; J.R.S., D.K.G., and J.H.B. analyzed data; and J.R.S., D.K.G., and J.H.B. wrote the paper.

The authors declare no conflict of interest.

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Human domination of the biosphere: Rapid discharge of the earth-space battery foretells the future of humankind

Energy in Physics and Biology

The laws of thermodynamics are incontrovertible; they have inescapable ramifications for the future of the biosphere and humankind. We begin by explaining the thermodynamic concepts necessary to understand the energetics of the biosphere and humans within the earth-space system. The laws of thermodynamics and the many forms of energy can be difficult for nonexperts. However, the earth's flows and stores of energy can be explained in straightforward terms to understand why the biosphere and human civilization are in energy imbalance. These physical laws are universal and absolute, they apply to all human activities, and they are the universal key to sustainability.

www.pnas.org/cgi/doi/10.1073/pnas.1508353112

The Paradigm of the Earth-Space Battery

By definition, the quantity of chemical energy concentrated in the carbon stores of planet Earth (positive cathode) represents the distance from the harsh thermodynamic equilibrium of nearby outer space (negative anode). This energy gradient sustains the biosphere and human life. It can be modeled as a once-charged battery. This earth-space chemical battery (Fig. 1) trickle charged very slowly over 4.5 billion years of solar influx and accumulation of living biomass and fossil fuels. It is now discharging rapidly due to human activities. As we burn organic chemical energy, we generate work to grow our population and economy. In the process, the high-quality chemical energy is transformed into heat and lost from the planet by radiation into outer space. The flow of energy from cathode to anode is moving the planet rapidly and irrevocably closer to the sterile chemical equilibrium of space.

Living Biomass Is Depleting Rapidly

At the time of the Roman Empire and the birth of Christ, the earth contained ~1,000 billion tons of carbon in living biomass (10), equivalent to 35 ZJ of chemical energy, mostly in the form of trees in forests. In just the last 2,000 y, humans have reduced this by about 45% to ~550 billion tons of carbon in biomass, equivalent to 19.2 ZJ. The loss has accelerated over time, with 11% depleted just since 1900 (Fig. 3) (11, 12). Over recent years, on average, we are harvesting—and releasing as heat and carbon dioxide—the remaining 550 billion tons of carbon in living biomass at a net rate of ~1.5 billion tons carbon per year (13, 14). The cause and measurement of biomass depletion are complicated issues, and the numbers are almost constantly being reevaluated (14). The depletion is due primarily to changes in land use, including deforestation, desertification, and conversion of vegetated landscapes into barren surfaces, but also secondarily to other causes such as pollution and unsustainable forestry and fisheries. Although the above quantitative estimates have considerable uncertainty, the overall trend and magnitude are inescapable facts with dire thermodynamic consequences.

CONCLUSION

Our path to ongoing food diversity, quality, and security must begin with widespread adoption of organic and agroecological agriculture methods as *the foundation* of food and agricultural production systems.

A FUTURE OF food insecurity and climate chaos is not inevitable. We have choices and can employ agricultural methods that will ensure an abundant and resilient food supply. But, we must act quickly before this narrow window of opportunity closes.

CENTER FOR FOOD SAFETY