



Global Forum on Food Security and Nutrition

• FSN Forum •

Summary of the online discussion no.123 • 30.11.2015 – 31.12.2015

Harnessing the benefits of ecosystem services for effective ecological intensification in agriculture

About this online discussion

This document summarizes the online discussion *Harnessing the benefits of ecosystem services for effective ecological intensification in agriculture* held on FAO's Global Forum on Food Security and Nutrition (FSN Forum) from 30 November to 31 December 2015 and organized in collaboration with the project LIBERATION.

Over the four weeks of discussion, 37 contributions were shared by participants from 15 countries.

The topic introduction and questions proposed as well as all contributions received are available on the discussion page: www.fao.org/fsnforum/forum/discussions/liberation

The discussion was facilitated by **Danielle Nierenberg** from Food Tank – The Food Think Tank and **Artur Getz Escudero** from Cardiff University.

Overview

The next few decades will witness a rapidly increasing demand for agricultural products. This growing demand needs to be met largely through intensification (produce more from the same land surface) because there is little scope for an increase in agricultural area. Ecological intensification is the optimization of all provisioning, regulating and supporting ecosystem services in the agricultural production process and has been proposed as a promising solution.

The LIBERATION Project, funded by the EU, aims to provide the evidence-base for the potential of ecological intensification to sustainably enhance food security with minimal negative impacts on the environment.

During the discussion, most participants supported ecological intensification practices, wishing to see these techniques adopted more widely. They emphasized the negative impacts brought about by a globally dysfunctional conventional green revolution. We depend on the quality and condition of soils for the vast majority of our food, still half of all farmland soils worldwide are already degraded, largely due to inappropriate conventional farming methods dependent on agro chemicals. In other words, increasingly intensive industrial farming systems, coupled with massive food waste, are simply unsustainable.

“Our future farming systems will need to involve more sustainable use of resources and greater integration with

other land uses. This will not only help diversify the inputs and income sources on those farms but will also serve to increase their resilience to future climatic, economic and resource supply changes". (Davy McCracken)

Many participants also identified the root causes of the dysfunctions in the agriculture sector: if a system of accounting that includes the costs for pollution and negative impacts of agriculture and a market that remunerates the positive externalities produced by farmers practicing more ecological forms of agriculture were in place, transition to sustainable agriculture would be more effective. (Barbara

Gemmill-Herren) Specifically, civil society organizations are discussing the use of full accounting measures to calculate the real cost of food, which would help counteract the current trends. (Jeff Buderer)

However, "The problem is not simply a lack of ecological intensification and the solution, therefore, is not simply an increase in provision. It is about the growth in understanding, in cooperation, in active collaboration and in real, lasting development. What we lack is a widely regarded and much supported perception of true value of the food production process". (Steven Jacobs)

How to maximise the efficiency and cost-effectiveness of field and landscape interventions

Developing efficiency without sacrificing ecological or human health is the great challenge. High efficiency sustainable farming models reduce costs, inputs and steps to farming and maximise the ecosystem services.

It has to be noted that farming systems have a great variability and management options tend to be geographically differentiated; focus should be placed on the key issues of national land management (soil quality improvement, percentage of forest coverage, how much space for biodiversity and agri-food policy). Each farm should decide on field and landscape interventions that are most efficient and cost-effective. (John Kazer)

Interventions suggested by participants that can help improve the ecological impact of farming practices included:

- **No till**, which reduces the time to clear the fields, thus reducing both energy and labor inputs. (Margaret Zeigler)
- **Climate control greenhouses** can be very sophisticated and use recycled biomass nutrients and renewables. They can bring major gains in sustainable agriculture intensity and competitiveness, if the costs of production can be brought down through improved processes and technology. (Margaret Zeigler)
- **Spatial planning** might be a key to sustainable agriculture. It matches agricultural production techniques with the right natural resource management practices for a given landscape – not just the individual farm. (Margaret Zeigler)
- **Plant breeding** can be considered as a (the) starting point for an effective (sustainable) ecological intensification in agriculture. (Gerhard Flachowsky)

- **Agricultural diversification**, e.g. incorporating aromatic crops to improve soil functions and support livelihoods and ecological services. (E.V.S. Prakasa Rao)
- **Agroforestry offers a set of localized**, knowledge and labour intensive techniques –to increase efficiency and cost-effectiveness of field and landscape interventions in both small-scale (UN-UNCDAT, 2013) and mid-scale farming. (Zoltan Brys)
- **Mixed-farming systems**, which reconnect livestock and crop production can potentially achieve high level of production, conserve natural and non-renewable resources, attenuate the greenhouse effect, produce ecosystem services, and halt biodiversity loss. (Florence Macherez) However, researchers and policy makers need to focus on the landscape level instead of the farm level to be able to integrate agriculture and livestock. (Rogerio Mauricio)
- **Animal husbandry**, by using by-products from farming and agribusiness operations as well as dated food from distributors, smallholder farmers can reduce conventional feed costs. (Jeff Buderer)
- **Agroecological approaches** have shown how an agricultural transformation respectful of the farmers and their environment can yield immense economic, social, and food security benefits while fighting climate change and restoring soils and the environment. (Frederic Mousseau, Subhash Mehta)
- **A change in consumption patterns** towards more sustainable diets needs to be encouraged in order to facilitate the wide adoption of ecological farming techniques. (Zoltan Brys)



Payments for Environmental Services (PES) have gained prominence as a tool for achieving ecosystem conservation and, at the same time, improving the livelihoods of farmers as environmental service providers. However, a participant stressed that the PES concept does not consider the importance of including **local entrepreneurship and innovation**; landscape management and ecological intensification which take into account the interest of local people in business opportunities are probably more effective in improving environmental services in agriculture. (Philipp Aerni)

Another participant brought up the need for sound organizational and economic methods for the development of standards that applied in the **environmental certification** process. (Peter Skripchuk)

• • • **CASE STUDIES** • • •

Incorporating aromatic crops in India

In South India models where aromatic crops were incorporated to help landscapes provide agricultural intensification and ecological services have been developed. The findings of the project were that proper crop diversification, soil management and technology have contributed to the livelihoods. (E.V.S.Prakasa Rao)

Blueberry farmers in the Netherlands

A demonstration/research project with blueberry farmers has been carried out in the Netherlands to examine whether increasing floral resources on their farms can enhance productivity of their crops and perhaps also help them control spotted wing drosophila (*Drosophila suzukii*), a major novel pest. Apart from the research and the seeds, which are being contributed by us scientists, the farmers pay for all expenses of these measures (establishment, regular management, opportunity costs). (David Kleijn)

33 success cases of agroecology

The Oakland Institute released 33 case studies that shed light on the tremendous success of producer communities following their agro ecology in the face of climate change, hunger, malnutrition, suicides and poverty. The techniques and practices used were: plant diversification; inter cropping; the application of mulch, manure or compost for soil fertility; the natural management of pests and diseases; agroforestry; the construction of water management structures; and much more. (Subhash Mehta) These practices lead to affordable low risk and sustainable ways to optimise farm production, thus ensuring their access to own requirements of safe nutritious food and health through agriculture while increasing farmers' net income/ purchasing power, food security, resilience and in the long term. (Frederic Mousseau)

Systematic map of farming practices and soil carbon in Sweden

To review how different farming methods affect the amounts of organic carbon in arable soils in 2013, the Mistra Council for Evidence-based Environmental Management in Sweden designed a Systematic map of metadata on evidence on farming practices and soil carbon. Specifically, the project catalogued the evidence base by assembling a database of all studies investigating the impacts of arable farming practices on soil organic carbon and carried out individual systematic reviews that focus on targeted subsets of the evidence in the map, and include quantitative analysis of the overall findings. (Katarina Hedlund)

Policy measures to capture links between field and landscape management and the promotion of ecosystem services

A set of policy measures and incentives need to be put in place. However, at the same time, for farmers to adopt ecological intensification, they need to be involved in capacity building and demonstration projects that allow them to make informed decisions. (David Kleijin) Indeed, the participation of farmers is of paramount importance. A top down approach with recommendations coming from policymakers and researchers in laboratories will simply not be effective, as farmers need to be in the driver's seat at the beginning. (Danielle Nierenberg) Farmers need to participate and be aware of opportunities offered by ecosystem services. (Kien Nguyen Van)

■ *Our governments must now take decisive steps to actually support and fund the conversion of conventional green revolution agriculture to follow the low cost low risk agro ecological practices of the area, if we are to mitigate the effects of climate change and ensure our children a future in which they can feed themselves with nutritious food through agro ecology and in a healthy environment.* ■

Ibrahima Coulibaly, President of CNOP-Mali and Vice President of the ROPPA (Network of Farmers' and Agricultural Producers' Organisations of West Africa) quoted by Subhash Mehta.

Participants strongly felt the issue of coherence of agriculture policies, incentives and synergies with other sectors, and the role of development aid in driving decisions towards new technologies for sustainable agriculture intensification. Often, support and incentives are given in favour of conventional industrial models and big corporations instead of smallholders and small-scale agroforestry producers that tend to be more open about learning and experimenting with ecological methods and therefore can have a big role to play in the shift towards more sustainable and efficient farming practices. (Jeff Buderer, Zoltan Brys)

Policy recommendations to capture links between field and landscape management and the promotion of ecosystem services suggested by participants include:

- Very low tax on the agricultural income of farmers who practice ecological intensification.
- Introduction of subsidised loans, seeds, training, and support services such farmers need.
- Great care in providing 'development aid'.

- Labelling of products that are produced with ecological practices.
- A deterrent tax on the sale of agricultural products, whose production ignores those four conditions.
- Enforced controls on the use of agro-chemicals.
- Establishment of strategically deployed sound food storage facilities and environmentally more benign means of food transport.
- Enforcement of laws that prohibit the concealment of all potentially harmful non-dietary chemical compounds in foods. (Lal Manvado)
- Giving more recognition to the importance of public-private partnerships to develop further the landscape approach. (Philipp Aerni)
- Public and Private sector incentives to establish market value not only for crop production but also for carbon sequestration and water quality. (Margaret Zeigler)

A helpful tool for tracking progresses on managing the balance between the need for agricultural productivity and eco-system sustainability is the Total Factor Productivity (TFP). TFP is the ratio of agricultural outputs (gross crop and livestock output) to inputs (land, labor, fertilizer, feed, machinery, and livestock). It measures changes in the efficiency with which all inputs are transformed into outputs: as farmers use inputs more precisely and efficiently, use advanced genetics in crop and livestock, and adopt improved cultivation and livestock rearing practices, their output grows while using the same or even a reduced amount of inputs, helping to protect already stressed ecosystems. (Margaret Zeigler)

• • • CASE STUDY • • •

German Policies to raise awareness

Since a few years, the German Federal Environment Agency started to make farmers aware of how to avoid soil erosion and developed an optional payment for those farmers who adapt certain criteria's in their soil management. This instrument mainly promotes precautionary measures and its requirements constitute minimum standard of soil management including farming related measures. (Anique Hillbrand)

How aware are European farmers of the relevance of ecosystem services for agricultural production?

Few participants were able to respond to this question.

In general, it seems that big-scale farmers are less aware of the relevance of ecosystem services for agricultural production than mid-, and especially, small-scale farmers and so-called "new-farmers". (Zoltan Brys)

Some European countries do have a record of being leaders in environmental protection and promotion of sustainable technologies. The Netherlands, for instance is known for its innovative use of greenhouses, while Germany has done valuable work on biogas production by converting waste into energy. (Jeff Buderer)

Further recommendations and follow-up

A few recommendations for the **LIBERATION** Project shared by participants: It's clear that technologies and modelling systems exist to begin to target regions that have the highest level of sustainable farming investments and to start the research there. The outcome of this work would be to seek a comprehensive program to both aggregate compelling best practices of sustainable intensive farming practices globally, while also targeting prime regions for the holistic dissemination of those technologies. (Jeff Buderer)

- There is a lack of a perception of true value of agricultural products, which factors in the social and economic implications of the production process. Such an understanding can be encouraged through a better supply chain dialogue i.e. more interaction between food producers, processors and consumers. (Steven Jacobs)

To follow up on this discussion, a participant highlighted an upcoming two-day conference on **"What Future for our Farming Systems?: Environmental Challenges and Integrated Solutions"**. The conference will be held in Edinburgh on 1st and 2nd of March 2016, to address these issues and encourage debate on the benefits to be gained from more sustainable resource use and greater integration of different land uses on lowland and upland farming systems. The conference aims to present the best possible scientific understanding of the complexities associated with how best to achieve such an integration in practice. Finally, it will provide a forum to discuss how researchers, land managers and policy makers can help develop and support multi-functional agriculture and wider ecosystem services within a healthy and thriving rural economy. (Davy McCracken)



- Aerni, P.** 2015. *The Sustainable Provision of Environmental Services*. From Regulation to Innovation. Springer.
- Bribiescas R.G. & Hickey M.S.** 2006. *Population variation and differences in serum leptin independent of adiposity: a comparison of Ache Amerindian men of Paraguay and lean American male distance runners*. *Nutr Metab* (London), 3:34.
- Carrera-Bastos P., Fontes-Villalba M., O'Keefe J.H., Lindeberg S. & Cordain L.** 2011. *The Western diet and lifestyle and diseases of civilization*. *Research Reports in Clinical Cardiology*, 2:15-35.
- Ceballos, G., Ehrlich, P.R., Barnosky, A.D., García, A., Pringle, R.M. & Palmer, T.M.** 2015. *Accelerated modern human-induced species losses: Entering the sixth mass extinction*. *Science Advances*, 1.5.
- Chivers, D.J. & Hladik, C.M.** 1980. *Morphology of the gastrointestinal tract in primates: comparisons with other mammals in relation to diet*. *Journal of morphology*, 166:337-86.
- Coelho, N.** 2012. *Our Land Our Life - An educational programme for children in India* (available at http://www.peakoilindia.org/wp-content/uploads/2013/10/Our-Land-Our-Life_NC_2012.pdf).
- Coelho, N.** 2014. *Our Land Our Life and Tending a Schoolyard Garden* (available at <http://www.arvindguptatoys.com/arvindgupta/schoolyard-nyla.pdf>).
- FAO.** 2013. *Case Studies on Incentives for Ecosystem Services* (available at <http://www.fao.org/nr/aboutnr/incentives-for-ecosystem-services/case-studies/en>).
- FAO.** 2015. *Agroecology to reverse soil degradation and achieve food security* (available at <http://www.fao.org/soils-2015/news/news-detail/en/c/317402>).
- Flachowsky, G. & Meyer, U.** 2015. *Challenges for Plant Breeders from the View of Animal Nutrition* (available at <http://www.fao.org/fsnforum/sites/default/files/resources/agriculture-05-01252.pdf>).
- Gerwin, M.** 2011. *Food and democracy, Introduction to food sovereignty*. Polish Green Network.
- Giampietro, M. & Pimentel, D.** 1994. *The tightening conflict: Population, energy use, and the technology of agriculture*.
- GRAIN.** 2015. *UPOV 91 and other seed laws: a basic primer on how companies intend to control and monopolise seeds* (available at <https://www.grain.org/e/5314>).
- Gurven, M. & Kaplan, H.** 2007. *Longevity among hunter-gatherers: a cross-cultural examination*. *Popul Dev Rev*; 33: 321-65.
- Hedlund, K., Haddaway, N., Jackson, L. & Lugato, E.** 2013. *What are the effects of agricultural management on soil organic carbon in boreo-temperate systems?* (available at <http://environmentalevidencejournal.biomedcentral.com/articles/10.1186/s13750-015-0049-0>).
- Herren, H.R., Hilbeck A. & Hoffman U.** *Feeding the people: Agroecology for nourishing the world and transforming the agri-food system* (available at http://www.ifoam-eu.org/sites/default/files/ifoameu_policy_ffe_feedingthepeople.pdf).
- Herrero, M.** 2010. *Smart Investments in Sustainable Food Production: Revisiting Mixed Crop-Livestock Systems* (available at <http://www.fao.org/fsnforum/sites/default/files/resources/CropLivestock%20system.pdf>).
- Marahrens, S.** 2015. *Erosion* (available at <https://www.umweltbundesamt.de/en/topics/soil-agriculture/land-a-precious-resource/erosion>).
- Milton, K.** 1993. *Diet and primate evolution*. *Scientific American*; 269:86-93.
- Milton, K.** 2000. *Back to basics: why foods of wild primates have relevance for modern human health*. *Nutrition* 2000; 16:480-3.
- Nayak, A.** 2012. *Curriculum for Community Enterprise Systems (FPOs/POs/PCs)* (available at http://www.fao.org/fsnforum/sites/default/files/discussions/contributions/XIMB-Management@Grassroots-Curriculum_0_0.pdf).
- Nink, E.** 2015. *Harvesting the Research: Ecological Intensification Can Feed The World* (available at <http://foodtank.com/news/2015/08/harvesting-the-research-ecological-intensification-can-feed-the-world>).
- Peyraud, J., Taboada, M. & Delaby, L.** 2014. *Integrated crop and livestock systems in Western Europe and South America: A review* (available at http://www.fao.org/fsnforum/sites/default/files/resources/Integrated_corps_livestock_systems_article.pdf).
- Prakasa Rao, E.V.S.** 2015. *Improving Soil Functions for Sustainable Agriculture - a case study from South India* (available at http://www.fao.org/fsnforum/sites/default/files/resources/S12_4_E.V.S.Prakasa%20Rao.pdf).
- Renting H., Marsden T. & Banks J.** 2003. *Understanding alternative food networks: exploring the role of short food supply chains in rural development*. *Environment and Planning A*, Volume 35, pp. 393 – 411.
- Shibu Jose, H.E.** 2012. *Agroforestry Systems*. The Springer Journal.

Skripchuk, P. 2012. *Organizational and economic bases of environmental certification in environmental management system* (Организационно-экономические основы ЭКОЛОГИЧЕСКОЙ СЕРТИФИКАЦИИ В системы управления природопользованием) (available at http://www.fao.org/fsnforum/sites/default/files/discussions/contributions/aref_%28%D0%BD%D0%B0_%D1%80%D1%83%D1%81%D1%81%D0%BA%D0%BE%D0%BC%29.doc_%D0%A1%D0%BA%D1%80%D0%B8%D0%BF%D1%87%D1%83%D0%BA_1_03_12.doc).

Sustainable Food Trust. 2015. *Soil degradation: a major threat to humanity* (available at http://sustainablefoodtrust.org/wp-content/uploads/2013/04/Soil-degradation-Final-final.pdf?utm_source=SFT+Newsletter&utm_campaign=70483fb656-Newsletter_07_copy_01_8_2_2013&utm_medium=email&utm_term=0_bf20bccf24-70483fb656-105098697).

Todhunter, C. 2015a. *Poisoned Food, Poisoned Agriculture: Getting off the Chemical Treadmill* (available at <http://www.globalresearch.ca/poisoned-food-poisoned-agriculture-getting-off-the-chemical-treadmill/5485076>).

Todhunter, C. 2015b. *The Toxic Agriculture of Monsanto and Big Agribusiness vs Agroecology Rooted in Communities and Locally Owned* (available at <http://rinf.com/alt-news/editorials/the-toxic-agriculture-of-monsanto-and-big-agribusiness-vs-agroecology-rooted-in-communities-and-locally-owned>).

UEEC (Uttarakhand Environmental Education Centre). 2009. *Our Land, Our Life, 6-8 class* (available at http://www.sevanidhi.org/research_publications_education.html).

UNCTAD (United Nations Conference on Trade and Development). 2013. *Wake up before it is too late. Make agriculture truly sustainable now for food security and changing climate.* Trade and Environment Review 2013.

Wild, M. 2011. *Peak soil: it's like peak oil, only worse.* Energy Bulletin.

Womack, J.P. & Jones, D.T. 2003. *Lean Thinking.* Free Press.

Young, R. & Orsini, S. 2015. *Soil degradation: a major threat to humanity* (available at http://www.fao.org/fsnforum/sites/default/files/resources/Soil-degradation-Final-final_0.pdf).

WEBSITES

Oakland Institute, Agroecology case studies

<http://www.oaklandinstitute.org/agroecology-case-studies>

Sustainable Intensification

<http://www.siplatform.org.uk>

SR4 How does farming affect the organic carbon content of arable soils?

<http://www.eviem.se/en/projects/Soil-organic-carbon-stocks>

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