Institute for European Environmental Policy

What is Sustainable Intensification – does organic farming fit the bill?

26th November 2014

Emeritus Professor **Allan Buckwell**

Organic Producers Conference,Solihull

Motivation for sustainable intensification

- **Global food security** in context of continuing population and economic growth and harmful climate change
- Much world agriculture is economically weak and environmentally damaging, including EU.
- To avoid unacceptable further destruction of ecosystems the next increment in output must come mostly from existing agricultural land rather than bringing more land into agriculture
- Hence this land use must be **sustainably intensified:** more output from the existing agricultural area, but through improved resource efficiency as well as additional other inputs.

Food security to sustainability of agriculture

Food security requires strong action on both:

A. **Consumption** challenges: waste, diets, health
   - *Policy subjects*: food chain, food service, consumers
   - *Policy instruments*: targets, information, economic, regulation

and

B. **Production** challenges: productivity, water, soil, biodiversity, climate and cultural landscape
   - *Subjects*: farmers, upstream & downstream industries, researchers/advisers and educators
   - *Instruments*: agricultural, environmental & research policy

What role for EU agriculture under Sustainable Intensification?

- Most additional global demand will be outside Europe
- EU agriculture is amongst the most intensive in the world
- EU has a high global footprint as it imports feeds and beverage
- EU (and UK) development since 1960 was based on intensification :
  - agricultural area is ***de***creasing
  - forest, wetlands and grassland areas ***in***creasing.
- But this has been associated with serious environmental damage

Therefore SI in the EU implies

emphasis on sustainability whilst maintaining agricultural productivity growth

Definition of Sustainable Intensification of agriculture

- *Sustainable Intensification means simultaneously improving the productivity & environmental management of agricultural land*.

- Sustainable intensification is a goal or aspiration requiring more knowledge intensive and integrated land management

- Highly system and place specific

Deconstructing sustainable intensification:

- **Intensity** is always a ratio. For SI, land is the denominator
- It is well defined & measurable but popularly denigrated!
  - **Inputs intensity:** input per hectare
    - Inputs with damaging external effects vs the rest
  - **Outputs intensity:** output per hectare -
    - Simple single crop and animal yields, tonnes per hectare, Outputs of environmental services/ ha, e.g. lapwings / ha
    - Compound, indices e.g. total factor productivity
- The goal is higher productivity/ resource efficiency
- **Knowledge per hectare** is key – embodied in capital and labour
- Task is to detoxify the word intensive

Deconstructing sustainable intensification:

- **Sustainable**: not well defined or measured but universally loved!
- Brundtland (1987) *"meeting the needs of the present generation without compromising the ability of future generations to meet their own needs"*
- An unsustainable system undermines its own indefinite continuation
- Usual to stress 3 dimensions: economic, environmental and social; is one of these pre-eminent?
- Each in turn is multi-dimensional
- **Sustainability is always multi-factorial & location specific**
- Are trade-offs acceptable between elements of sustainability?
  Yes – weak S; No – strong S.

Sustainability or environmental performance?

- Can we identify tipping points, thresholds, limits and irreversibilities?
- ***If* there are detectable limits for one (or more) aspects**; then
  - It is **vital** for land managers and policy to identify them
  - There can be **no trade-offs** with other aspects
  - It will be **factor specific** (soil, water, temperature, salinity, pollination)
  - Average and **composite indices** are **little use**
- ***If not*** then 'sustainability' is essentially desired 'economic, environmental and social ***performance'***, targets set within limits
  - important because performance is below legislative standards

Agricultural intensity & sustainability literature

- **49 papers reviewed**: 119 indicators of intensity, 500 indicators of sustainability (95 econ, 198 enviro, 202 social)
- **Intensity**: the most freq indicator is ferts per Ha, used by 5 studies,
- **Sustainability:** Most freq in 9 is soil erosion,
- Increasing sophistication in constructing composite or **overall index of sustainability :** with what results?
- There is **no convergence** on how to measure these things: **little attempt to identify thresholds**. No consistent referencing 'official' indicator sets (e.g. EEA)

Collective actions to steer EU agriculture to paths of Sustainable Intensification

- Assembling **indicators** of environmental performance:
  - farm level
  - national and international comparators
- appropriate **policies**:
  - R&D, education, advisory services
  - Environmental policy
  - Agriculture – the CAP and its development
    - Incentives – eg Greening payment, Agri-environment
    - Disincentives – XC conditions and enforcement

Individual actions to steer EU agriculture towards paths of Sustainable Intensification

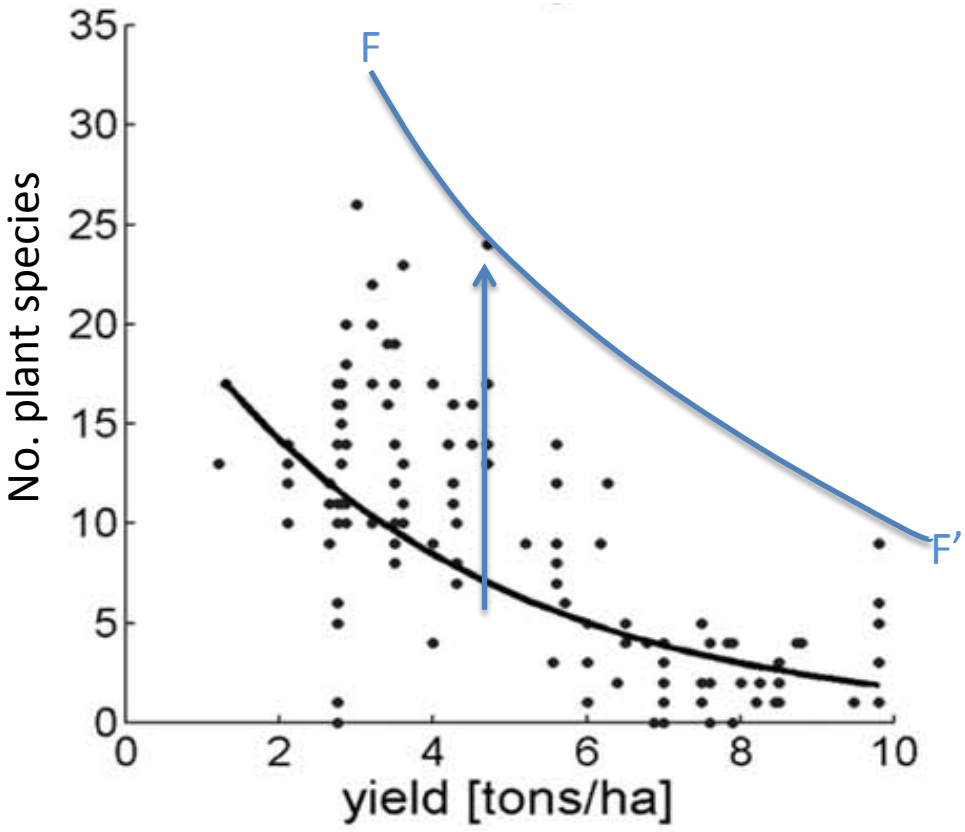
- Adopt sustainable farming **system, eg**:
  - Agro-ecology
  - Biodynamic farming
  - Organic farming
  - Integrated farming
  - Conservation agriculture
  - Precision farming
- Adopt sustainable farming **practices**: pp49-50
- Work collaboratively on environmental delivery
- Engage in upgraded private certification schemes: p53
- Embody environmental value in products and services
  - Organic label
  - GIs, PDOs
  - Leaf Marque
  - Commercial examples

Sustainability metrics at the farm level - 1

- Huge resources are devoted to collection of farm-level productivity and economic performance data, and compilation of benchmarks – high variability observed.
- There are intrinsic, economic, mechanisms to ensure such information guides farm management
- Few resources are devoted to collecting farm-level environmental performance, & establishing benchmarks
- Equal variability likely and there are weaker grounds to suppose such data would be acted upon spontaneously – unless credible evidence shows proximity to a threshold.

Variability in farm environmental performance

- Wide variability in biodiversity vs crop intensity
- Implies large scope to improve environmental performance at each level of productivity if each farm could approach the frontier F-F’



From Data on Germany from Geiger *et al* (2010)

Sustainability metrics at the farm level - 2

- The **spatial level** to assemble sustainability or environmental performance indicators? Farm, region, river basin, farm type?
- The role of **private standards**:
  - organic, integrated farming, conservation agriculture
  - Commercial actions: assurance, retailer standards, input supplier sustainability schemes. What monitoring in these schemes?
- Which metrics are in place/could be in place? Soil organic matter, GHG emissions, farmland bird, butterfly, worm counts.
- Which are likely to be instinctively on a farmer's radar – e.g. water shortage, erosion threat? Is self interest sufficient?
- Are there **'big data'** opportunities for collecting, collating and processing: weather, soil data, yield mapping, disease vector spotting?

The key challenge

Farmers do not believe what they are doing is unsustainable

(even if they admit it falls below legislative standards)

If it is unsustainable then it is very important to show the evidence of this to motivate changes in practice.

The research priority is therefore to identify proximity to environmental limits – what and where, and the actions to stay within them.

Is sustainable Intensification a good phrase to try to show the required behaviour change?

- It is the most recent of a series of phrases to try and get farmers to see their joint food + environmental management role:
  - The organic movement
  - Integrating environment and farming (e.g. LEAF)
  - Multifunctional agriculture
  - Public goods from private land
  - CAP greening
- Is there a progression going on here, or are we treading water?

Does organic farming fit the bill?

- Of course it has a role to play
- No one thinks all food production should be organic – do they?
- Conversion to organic which may or may not involve some output sacrifice but offers an increase in other ecosystem services can be optimal for society.
- ie it's a route to supplying other eco-system services
- A problem is the apparently limited market growth when consumers have a choice to pay more and contribute to the environmental services.
- Another problem is the high degree of dependence on public payments – in the age of austerity. (the domination of livestock issue)

Sustainable intensification development paths, examples

A Highly virtuous

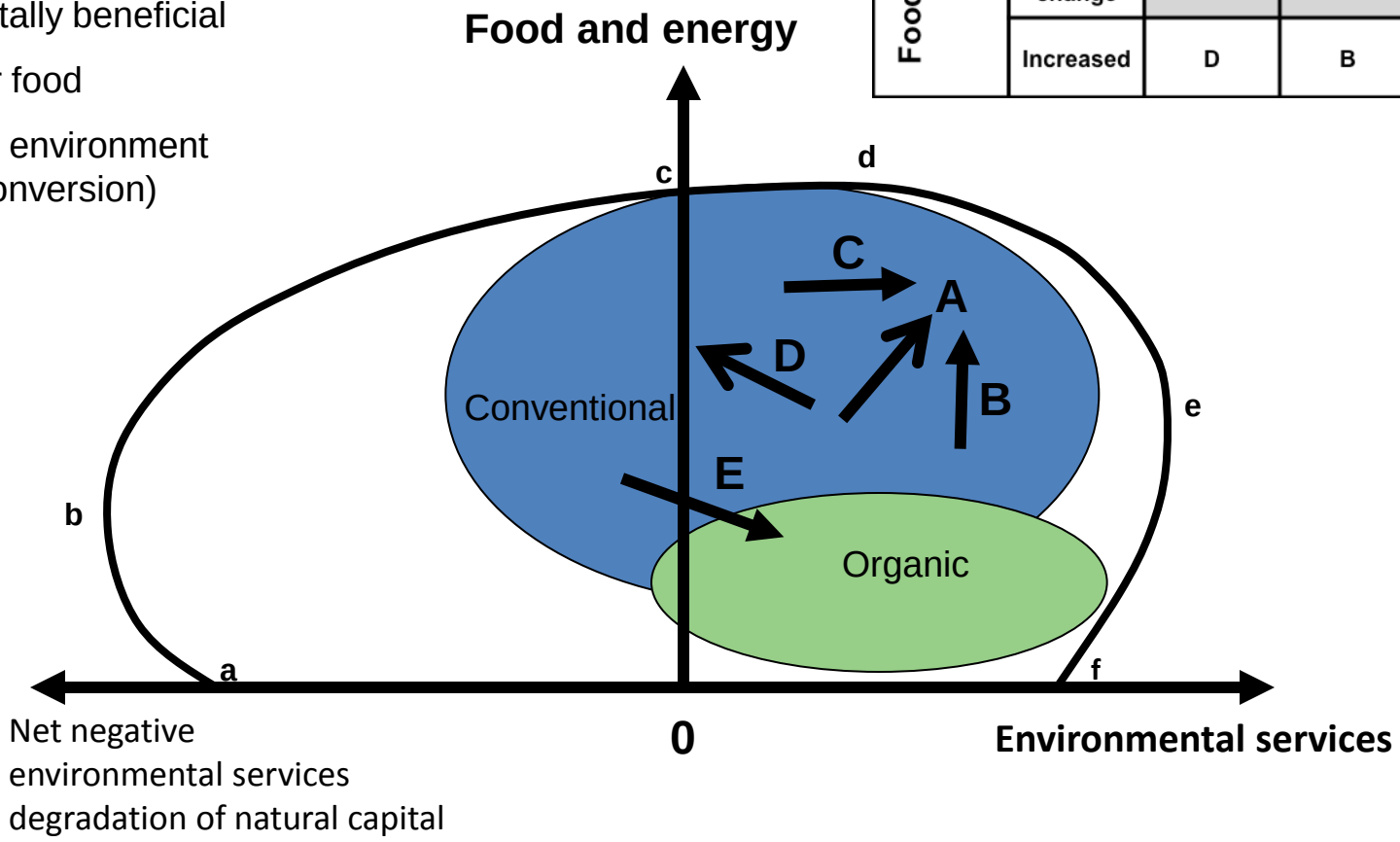
B Agriculturally beneficial

C Environmentally beneficial

D Trade-off for food

E Trade-off for environment (e.g. organic conversion)

	Environmental service output		
Food and energy output	Reduced	No change	Increased
Reduced			E
No change			C
Increased	D	B	A



The food - environment production possibilities frontier (a-b-c-d-e-f)

Six conclusions

1. Sustainable Intensification ***is*** a useful, globally-based, concept for better balance between food production & environment. **It means**

2. maintaining agricultural productivity growth + **step change in environmental performance.** The precise prescription depends on **location and farming system**

3. more effort required to identify and communicate existence, nature & location of approaching **environmental thresholds**

4. more effort to measure **farm level environmental indicators**

5. Better enforcement of environmental regulation + improved CAP delivery + greater use of farming/agribusiness sustainability schemes

6. As a well-established farming system organic farming has a role to play in this