Institute for European Environmental Policy

Sustainable Intensification

of EU Agriculture

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Motivation for interest in SI

- Global food security in context of continuing population and economic growth and harmful climate change
  - Most growth in food demand will be in developing countries
- 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.

Focus of this study – is EU Agriculture

Food security requires strong action on both:

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

B. **Production** challenges: productivity, water, soil, biodiversity, climate and cultural landscape
   - Instruments: agricultural, environmental & research policy
   - Subjects: farmers, upstream suppliers & RD+KT

- This study focuses on B. What does SI mean for EU Agriculture?

What is the role for EU agriculture in Sustainable Intensification?

- Most of the additional global demand will be outside Europe:
  - EU population peaks in 2030s, already declining in 8 MS
  - EU relatively low GDP growth
- EU agriculture is amongst the most intensive in the world; the EU agricultural area is declining slowly; EU farming is associated with not achieving many environmental targets.
- EU has a high global footprint as it imports feeds and beverages
- For SI in the EU these imply:

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*.
  - The static concepts are intensity and sustainability.
  - The corresponding dynamic concepts are intensification and sustainable development.
- Sustainable intensification is a goal or aspiration requiring more knowledge intensive and integrated land management

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 (ferts, CPC, mechanisation)
    - Inputs with beneficial effects: suitable knowledge, advice, precision
  - **Outputs intensity:** output per hectare -
    - Simple single crop and animal yields, tonnes per hectare, litres/cow
    - Outputs of environmental services/ ha, e.g. lapwings fledged / ha
    - Compound, indices e.g. total factor productivity
    - Thus output intensity gets close to productivity
- The goal is higher productivity/ resource efficiency
- Intensity/intensification is not a goal, but a likely consequence
- **Knowledge per hectare** is key – embodied in capital and labour

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 underminines 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
- SI is concerned with improving the productivity and environmental performance of agriculture, a twin track process

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 (ferts per Ha) used by 5 studies, next 5 most freq were in only 4 studies, 3 in 3, 12 in 2 studies each, 98 in one study each.
- **Sustainability:** Most freq in 9 (soil erosion), 3 more in 7, 3 in 6, 4 in 5, 5 in 4, 15 in 3 each, 38 in 2 studies.
- 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)

Actions to steer EU agriculture to paths of Sustainable Intensification

- **Collective, public actions**
  - Assembling indicators of environmental performance:
    - farm level
    - international comparators
  - appropriate policies:
    - R&D, education, advisory services
    - Environmental
    - Agriculture – the CAP and its development

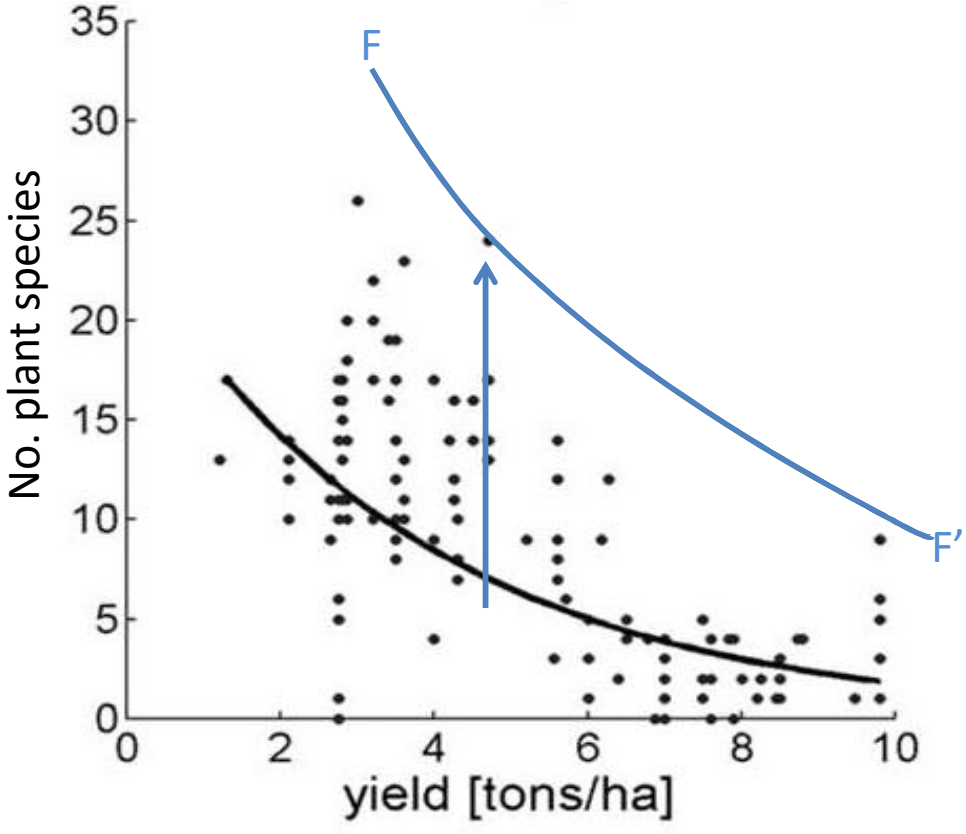
- **Individual actions:**
  - Adopt sustainable farming system
  - Adopt sustainable farming practices
  - Measure farm environmental performance
  - Work collaboratively on environmental delivery
  - Engage in upgraded private certification schemes

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?

Policies to guide farming to a SI path

- R&D, Advisory, KT, EIP efforts
- Environmental policy – regulations and directives. Gaps? e.g. soils?
- Common agricultural policy:
  - cross compliance and P1 greening
  - agri-environment and other climate measures
  - How effective will be the 2014-20, €118bn greening?
  - Where does CAP go post-2020?
- New market based instruments
- Classify by:
  - Degree of reliance on public expenditure
  - Likely trust and voluntary engagement of farmers
  - Likely effectiveness

Exemplifying the search for SI paths: three case studies

- Soil resilience and performance - Vienna group, Blum
- Nutrient recovery and recycling – Munich group, Heissenhuber
- Managing biodiversity – Munich group, Heissenhuber

Ten research actions to stimulate SI for EU agriculture

1. Internationally indicators of environmental impacts of agricultural production
2. Proximity of environmental thresholds and boundaries for safe operation
3. How much EU agriculture should be classed as currently unsustainable?
4. Reviewing the choices confronting the next reform of the CAP
5. Assessing the potential contribution to farm-based public good provision through actions beyond CAP-based and other public payments
6. Estimate the current levels of land farmed and output produced by 'sustainable farming systems'
7. Establish and benchmark practicable farm-level indicators of environmental performance
8. Assess scope & impediments to collaborative provision of environmental management by farmers in a naturally defined areas
9. Evaluate the contribution to improved environmental land management of commercial certification and sustainability schemes.
10. Developing the soil case to conduct an analysis of sustainability of land areas or farms in terms of water quality, GHG emissions and biodiversity

In summary

The language of sustainable intensification *is* a useful, globally based, concept to guide EU farmers to land management which has a better balance between food production and environment.

Contributors

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