



Institute for  
European  
Environmental  
Policy

# Knowledge intensification: a new frontier

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**Policies for knowledge intensification: an EU  
agricultural perspective, Agriregionieuropa, Ancona**

# Knowledge intensification: a new frontier (?)

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- 1 Start with Sustainable Intensification (SI):
  - i. why
  - ii. and what it means for Europe.
  
- 2 The multiple pathways of sustainable intensification:
  - i. for commercial agriculture
  - ii. for the marginal agricultural areas.
  
- 3 Two foci for knowledge intensification:
  - i. Research on environmental limits for agriculture
  - ii. Benchmarking farm-level environmental performance.



# 1 (i) Why sustainable intensification?

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- **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, including UK.
- 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 **sustainable intensification**: more food and conservation outputs from the existing agricultural area, via improved resource efficiency



# I (i) From food security to SI

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Starting from **global food security**, this requires strong action on both:

**A. Consumption** challenges: waste, diets, health

- *Policy instruments*: targets, information, economic, regulation
- *Policy subjects*: food chain, food service, consumers

**and**

**B. Production** challenges: productivity, water, soil, biodiversity, climate and cultural landscape

- *Instruments*: agricultural, environmental & research policy
- *Subjects*: farmers, upstream & downstream industries, researchers/advisers and educators

**SI inherently refers to production** , but this word should embrace all eco-system services not just the provisioning services of food & energy



# 1 (ii) What role for EU agriculture under Sustainable Intensification?



- Most of the 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 beverages

The developments of the last 50 years in the EU have been based on intensification of agriculture: forest, wetlands and grassland areas are **increasing** and agricultural area is **decreasing**.

This intensification has created serious environmental damage

Therefore SI in the EU implies

*emphasis on sustainability whilst maintaining agricultural productivity growth*



# 1(ii) Definition of Sustainable Intensification of agriculture

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- *Sustainable Intensification means finding a development path which simultaneously improves the productivity & environmental management of agricultural land.*
- It is a goal or aspiration requiring more knowledge intensive and integrated land management



# 1 (ii) Deconstructing SI: intensification

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- **Intensity** is always a ratio, for SI land is the denominator  
∴ inputs/ha and outputs/ha
- well defined & measurable but popularly denigrated!
- It should apply to conservation outputs/ha as well as agricultural outputs/ha
- **Knowledge per hectare** is the key – this will be embodied in capital, labour and management
- Task is to detoxify or destigmatise “intensive”



# 1 (ii) Deconstructing SI: sustainable

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- **Sustainable:** not precisely 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”*
- Unsustainable systems undermine their own indefinite continuation
- 3 dimensions: economic, environmental and social; none pre-eminent, each multi-dimensional & location specific
- It implies the existence of limits – thresholds – tipping points – irreversibilities, yet practically no evidence on these

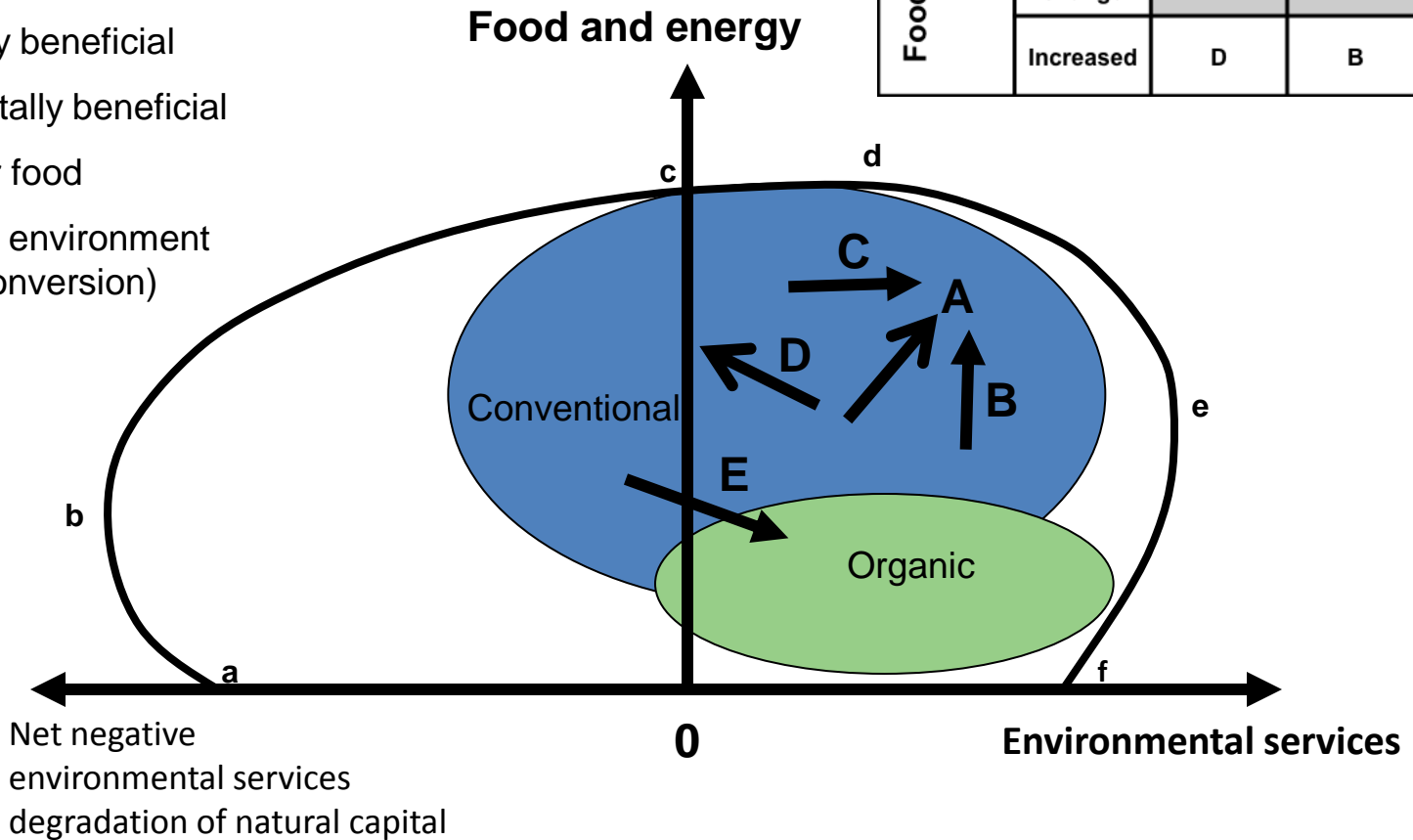




## 2 Multiple pathways for SI, examples

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



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

## 2 How much EU agriculture is unsustainable?

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- Is it none? All? Some? In what ways?
- Simplified hypotheses – allegations of
  - Environmental unsustainability of **commercial agriculture**
    - Soil erosion and declining fertility; water pollution, air pollution by GHG & NH<sub>3</sub>, biodiversity & landscape degradation.
  - Economic & social unsustainability of **marginal farming**
    - Non-viable holdings, high dependence on subsidy, land and village abandonment.
  - Perhaps significant intermediate areas with any/all of these challenges



# Identifying environmental unsustainability

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- **Thresholds?**
  - Too hot, dry, salt, acid to grow crops & tend livestock
  - Complete soil erosion (OM oxidation, water, wind, sea)
- **Warning indicators:**
  - Depleting soil fertility, e.g. soil organic matter
  - Yield / productivity decline (despite efforts)
  - Biodiversity loss? Pollination failure, what else?
- Are there identifiable thresholds here? Why haven't they been identified? Blum's work on soils.



# Identifying economic unsustainability

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- **Thresholds?**
  - Not individual business failure, assets pass to others
  - $\therefore$  it is asset/ land abandonment
  - or land farmed to destruction (US dustbowl, Kazakh cotton)?
- **Warning indicators?**
  - More than just low incomes
  - Non-viable, loss-making holdings, hi dependence on subsidy
- What did we do for traditional industries facing this?
- Is land management different? Why?
  - Environmental provision, open managed landscape
  - Village depopulation if diversification opportunities insufficient
- This tells us the nature (and scale) of the required intervention



# Identifying social unsustainability

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- **Thresholds?**
  - Village depopulation, abandonment
- **Warning indicators?**
  - Aging village population, lacking services
  - Insufficiently diversified economic base, lack of jobs
  - Outflow of young people



## 2 (i) SI development paths for commercial agriculture

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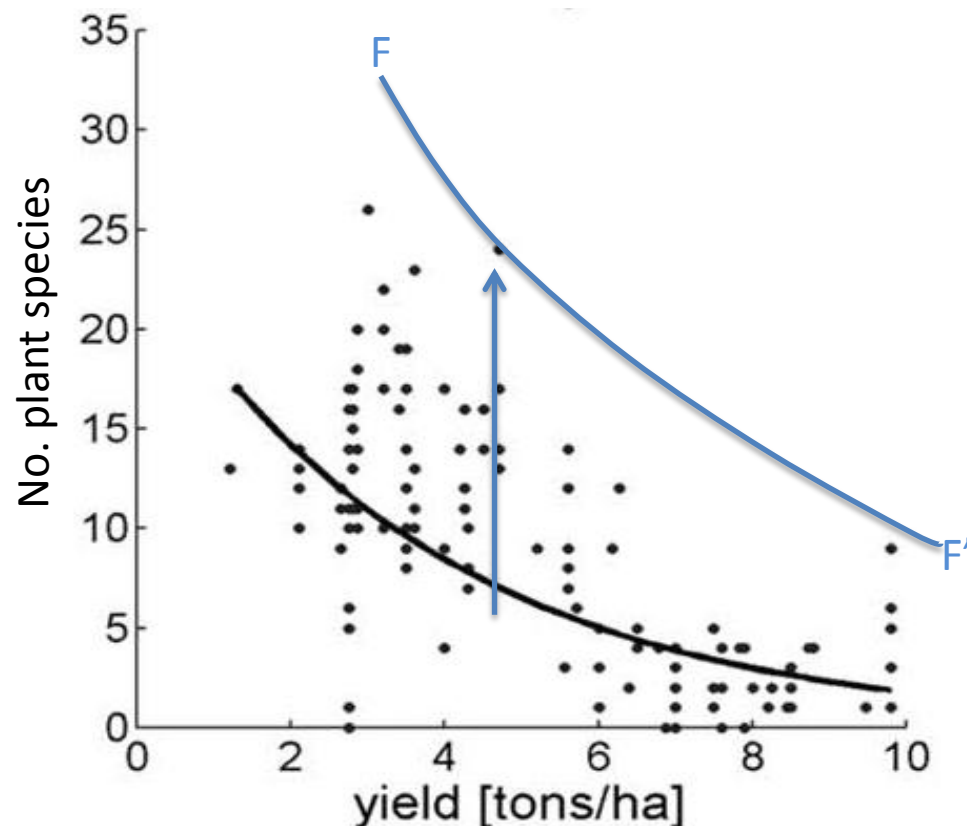
- **For some** areas/farming systems, must reduce intensity of agricultural output: to reduce intensity of negative impacts, and perhaps increase ratios such as SOM/ha or biodiversity (path E)
  - Examples farming in chronic nutrient surplus areas, these are mapped, are farmers aware they live in them?
  - How to sell this message? What policy mechanisms? We have regulation AND payment for compliance, yet not working (?)
- **For most** or all, this is a matter of reducing negative externalities & increasing positive externalities whilst maintaining agricultural productivity growth (paths A, B and C)
  - The CAP debate of the last decade has been about how to do this: current tools XC, Greening and AES.



## 2 (ii) Wide scope for SI given variability of farm environmental performance



- E.g. 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)



## 2 (ii) Development paths for marginal agriculture



- This is mostly the challenge of finding ways of incentivising and rewarding the provision of public environmental services
  - Much possible via the local, traditional, slow, organic, hi quality products (and other rural services)
  - But the heavy lifting may have to be done by publicly paid supports for the non-marketed ecosystem services:
    - Carbon sequestration
    - Flood protection, water infiltration, filtration & storage
    - Biodiversity, habitat and cultural landscape
    - Plus payments for ‘being there’ re-named Less Favoured Area payments





# 3 Why are we struggling with SI?

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- Environmentalists misinterpret intensity
- Farmers not convinced their farming is unsustainable
  - There is very little convincing evidence to say they are wrong, almost no attention to specifying and identifying environmental limits and evidencing our proximity to them



# 3 (i) KI research challenge: environmental limits

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- Time to test real meaning of the word sustainable
- If limits have been reached or are being approached then the land owners and managers really should know about this.
- Conceptualisation of and identification of environmental limits – preferably at farm and field level
  - At what, if any, point in soil erosion, soil OM decline, P concentration, temperature rise, precipitation fall, loss of pollinators or other biodiversity threaten productivity?
  - The nearest to ‘limits’ we have are the regulatory thresholds, and these are widely not observed.



## 3 (ii) Knowledge exchange challenge; farm level enviro benchmarking

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- Farm management economics has established widely available and used concepts, measurements and benchmarks for farm economic performance.
- Policy has changed in the last 20 years to emphasise the environmental market failures, yet the collection and analysis of farm environmental performance and data has hardly started
- Energy efficiency, water use efficiency and GHG emissions now beginning, but nothing on soil and water quality or biodiversity.
- What is not measured will rarely be managed
- There is every reason to expect at least as much variability in environmental performance as economic performance.
- One remedy: systematic inclusion of environmental measures in FADN



# Tentative conclusions

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- Sustainable Intensification *is* a useful, globally based, concept for a better balance between food production and environment.
- EU emphasis: maintain agricultural productivity growth + **step change in environmental performance**
- If we stick to the S word, then more research effort is required to identify and communicate existence & location of **thresholds at farm level – this is missing knowledge**
- Aside from ‘limits’ we will not get farmers to better manage environmental media/natural capital unless we **measure and benchmark** it more systematically. This is the priority task for knowledge intensification in my view.





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**If you have been . . .  
thanks for listening!**

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Reference

[http://www.risefoundation.eu/images/pdf/si%202014 %20full%20report.pdf](http://www.risefoundation.eu/images/pdf/si%202014_%20full%20report.pdf)

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