Knowledge intensification: a new frontier

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Policies for knowledge intensification: an EU agricultural perspective, Agriregioni Europa, Ancona
Knowledge intensification: a new frontier (?)

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?

- **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
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

- **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

- **Intensity** is always a ratio, for SI land is the denominator.
  \[ \text{inputs/ha and outputs/ha} \]
- 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

• **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)

The food - environment production possibilities frontier (a-b-c-d-e-f)
2 How much EU agriculture is unsustainable?

- 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 & NH₃, 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

- **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

• 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

• **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

• **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, high 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?

- 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

- 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.
Agriculture and Land Management

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

- 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

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

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Reference