Identifying synergies between adaptation and mitigation strategies

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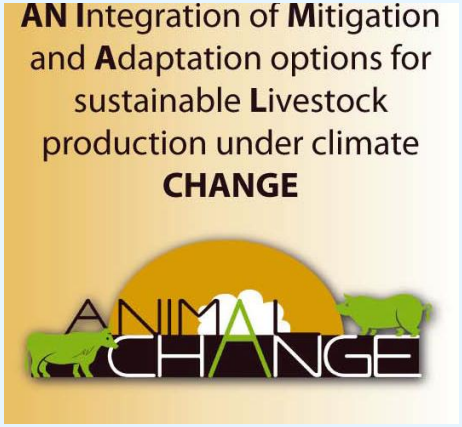

Outline

- Background
- Why consider adaptation and mitigation together?
- Challenges
- Existing literature
- Draft scoping matrix
- Further research

Background

- Historically mitigation was main focus of climate change action
- Still often takes precedence due to policy imperatives
- Mitigation and adaptation policies evolved very differently and separately

Why consider adaptation and mitigation together?

- ‘Effective climate policy…involves a portfolio of diverse adaptation and mitigation actions’ (Klein et al. in IPCC 2007)
- At a global scale, how much to invest in mitigation and much in adaptation?
- At the operational scale, trade-offs and synergies exist
- Addressing each separately may lead to trade-offs and undermining the other
- May miss opportunities for synergy
- May be more cost-effective to address together

Challenges

- Considerable differences

Key differences

	Mitigation	Adaptation
Timing of effect	Benefits are lagged	Benefits may be immediate
Certainty of effect	Uncertain – depend on global action	Some benefits are certain; others depend on future climate changes
Geographical pattern of effect – "who benefits?"	Global	Local
Decision making	Global and national (although implemented locally)	Local
Sectoral focus	GHG emitters and sinks	Sectors and activities sensitive to climate impacts
Costs and benefits	Reasonably straightforward to determine, compare and aggregate	Much more difficult (especially benefits)
Monitoring	Relatively straightforward to measure emissions and compare to targets	No defined 'goal' or indicators to measure adaptation
Liability	Emitters (historical) pay for mitigation	Those responsible not necessarily those who will be affected
Discipline area	Strategies formulated within scientific disciplines and embedded in sectoral policy domains	Strategies are transdisciplinary in nature. Flow between theoretical and applied

Challenges

- Considerable differences
- Benefits of considering together may not apply to all sectors or situations
- May be easier at an individual or private level than at policy level?

Synergies in agriculture

- Agriculture is a sector that will both need to reduce its emissions as well as adapt to changing climatic conditions
- Similarities between mitigative and adaptive capacity: economic wealth, technology, infrastructure, information, knowledge and skills, institutions etc.
- Decisions about adopting mitigation and adaptation strategies made at similar scale (often by individual farmer)
- Barriers to action may be similar

Existing approaches?

- Analytical frameworks for evaluating the links are inadequate (Klein et al. 2007)
- High level, no actual examples
- Quantitative evaluation of direct trade-offs is missing
- Existing agricultural literature piecemeal and descriptive

Our approach

- Initial focus on UK – may vary between regions
- Preliminary long list of adaptation and mitigation strategies for livestock
- Consolidate strategies into broader grouping
- Develop matrix
- Assess interactions
  - Synergy
  - Conflict
  - Uncertain
  - No relationship

Adaptation-Mitigation Matrix

	Mitigation Options →	**Effect on mitigation in general**	Reduce N fertiliser	Land drainage	Avoiding N excess	Nitrification inhibitors
Climate change impact	**Adaptation options ↓**					
	Effect on adaptation in general		uncertain	uncertain	uncertain	uncertain
Increased risk of drought and water scarcity	Shift pasture from drought-sensitive areas	no	uncertain	uncertain	uncertain	uncertain
	Improve field drainage and absorption capacity	no relationship	uncertain	synergy	no relationship	uncertain
	Reduce run-off through contoured hedgerows and buffers	no relationship	no relationship	synergy	no relationship	no relationship
	Introduce more drought-tolerant crops	uncertain	uncertain	uncertain	uncertain	uncertain
	Woodland planting	synergy	no relationship	uncertain	no relationship	no relationship
	Use of precision agriculture techniques	synergy	synergy	synergy	synergy	synergy
	Water management practices	no relationship	no relationship	no relationship	no relationship	no relationship
	Water charging/tradeable permits	no relationship	no relationship	no relationship	no relationship	no relationship
	Insurance	no relationship	no relationship	no relationship	no relationship	no relationship
	Technical improvements in irrigation equipment and ability to collect rainwater	uncertain	no relationship	no relationship	no relationship	no relationship
	Trickle irrigation	no	no	uncertain	no relationship	no relationship
	Irrigation during the night	no relationship	no relationship	uncertain	no relationship	no relationship
	Separation of clean and dirty water	no relationship	no relationship	no relationship	no relationship	no relationship
	Installation of small-scale water reservoirs on farmland	uncertain	no relationship	no relationship	no relationship	no relationship

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	Mitigation Options →	Effect on mitigation in general	Reduce N fertiliser	Improving ratio of methane emissions per unit product by increasing animal longevity	Increasing milk yield per cow
	Effect on adaptation in general		uncertain	uncertain	conflict
Deterioration of conditions for livestock production (due to increased heat stress; new pests and diseases; change of optimal crop areas; wetter winters)	Increase shelter for animals, including from heat	uncertain	no relationship	synergy	no relationship
	Supplemental feeding	uncertain	no relationship	no relationship	synergy
	Balance of grazing and cutting	uncertain	uncertain	no relationship	no relationship
	Changes in pasture varieties	uncertain	uncertain		no relationship
	Changing time of operations (e.g. breeding, shearing, transport)	no relationship	no relationship	no relationship	no relationship
	Adjust stocking density	uncertain	uncertain	synergy	synergy
	Improve ventilation in buildings	uncertain	no relationship	synergy	synergy
	Addition of cooling pads, fans systems, water sprays/misters to building and/or outdoor areas (e.g., collecting yards)	conflict	no relationship	synergy	synergy
	Bring animals indoors	uncertain	uncertain	uncertain	uncertain
	Plant trees for shade	synergy	no relationship	no relationship	no relationship
	Ensure adequate access to water (indoors and outdoors) to aid thermoregulation	no relationship	no relationship	synergy	synergy
	Assess building and transport regulations to accommodate new temperatures	no relationship	no relationship	synergy	synergy
	Breeding for heat tolerance (against heat stress and/or breed substitution) and 'hardiness'	conflict	no relationship	synergy	conflict
	Adjust diet to ensure sufficient dealing with the hot weather (e.g., energy requirements are being met if heat is reducing total feed intake, overfeeding protein should be avoided as energy required for excretion, certain minerals required)	uncertain	no relationship	synergy	no relationship
	Manage health and disease implications of hot weather (e.g., fly strike, acidosis increases during heat stress)	synergy	no relationship	synergy	synergy
	House animals	uncertain	no relationship	uncertain	uncertain

- Large number of interactions
- Direction of relationship?
  - A→M
  - M →A
- Many are “uncertain”
  - May vary depending on situation
  - Researcher uncertainty
  - Change over different scales/time
- Provides comprehensive way of assessing interactions between actions
- Can then focus on synergies

Possible Risks

- Synergistic measures may not achieve necessary levels of mitigation and adaptation required
- Synergistic measures may not necessarily represent a wise investment

Next steps

- Actions refined for regional conditions and production types
- Account for adaptation synergies in marginal abatement cost curves
- Develop adaptation cost curves accounting for mitigation synergies

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