

SIP



SUSTAINABLE INTENSIFICATION
RESEARCH PLATFORM

SIPSCENE

The newsletter of the Sustainable Intensification Research Platform
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Editorial: Building a Resilient Future

The Sustainable Intensification Research Platform is focused on farming in England and Wales, but exists in a global setting of concerns over food security, global nutrition, climate change, economic instability, increasing technology, volatile food prices and threats to sustainability.

This autumn farmers in the UK will be dealing with concerns over farm gate prices, bovine TB, blackgrass, the weather, maintaining household incomes and investing in the business for the future, and getting more out of the land with less inputs – all issues related to the global themes described above.

This is why SIP is here. It is a national response to global issues. We need to establish national priorities to improve the lives of farmers and the rural community – that bring resilience to the sector and workable solutions to real issues that farmers and land owners face. This, in turn, will help alleviate some of those challenging global concerns.

As I reflect on the concept of sustainable intensification in my role as project manager for the Platform, SI seems to me all about resilience. Intensifying the outputs from the land (not just food production, but what it can do for people and nature), means resilience in the face of current local and global issues. Doing this sustainably means resilience in the face of future challenges.

In this issue, Caroline Drummond of LEAF in *SIPs* writes about the recently agreed UN Sustainable Development Goals, positioning SIP firmly in this global context and describing SIP's potential as an important vehicle to driving change on the ground. Caroline also highlights the important role of knowledge exchange in the Platform. If it is to succeed, the programme must establish a two-way dialogue with farmers, politicians and society, to help inform the research and translate it into something of greatest benefit to all.

One of the key challenges in the work of SIP is how we know whether we have been successful? Stephen Ramsden describes work being led by the University of Nottingham on developing ways of measuring farm performance in terms of SI.

In order to solve some of the local and regional challenges we need to think bigger than individual farms. Carol Morris of the University of Nottingham summarises for us the findings of a literature review looking at farming collaboration as a potential means to bring about SI across an area.

A key part of SIP is its physical research platform, distributed across seven case study areas and five study farms in England and Wales and encompassing a variety of farming systems. In the first of our *Landscape in Focus* and *Farm in Focus* sections, Bangor University's Prysor Williams talks about the Conwy study catchment and the exciting research happening at the Henfaes Research Centre – a unique study farm that includes both lowland and upland farming.

We also hear from two researchers – John Hyland of Bangor University and John Lynch of the University of Nottingham who describe their experiences on the frontline of SIP and what makes it so interesting to them. Finally, Sam Durham from the NFU challenges SIP to provide the practical tools that are required to meet the farming industry's challenges ahead.

I hope you enjoy this latest issue of *SIPScene* and discover more about the work which is helping to build a resilient future for agriculture in England and Wales.



Gavin Huggett is Project Manager for SIP Project 2 and is based at the University of Exeter.

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SIP Says

Views from in and around the Platform

We Will Always Need Food:



Caroline Drummond, Chief Executive of LEAF, explains how the work on SIP support can support the UN Sustainable Development Goals

by 193 countries (United Nations 27th September 2015). There are 17 global goals that will provide the blueprint for the world's focus over the next 15 years. They are different from the Millennium Development Goals (MDG) in that they bring together two frontiers, development and climate, and which apply to all countries rich and poor. This is different from the focus of the MDG which primarily focused on developing countries. So potentially they will be much more complex to describe, implement, and monitor.



'We will always need food'. I can remember a friend's mother saying this to me as I announced I was off to agricultural college & how true she was. The undeniable challenge of growing more food, indeed more of the right food, whilst managing and enhancing the environment, lies at the heart of the SIP projects.

The great opportunity the SIP partnership offers is the bringing together of so many, with a common aim to challenge the norm and progress practical, achievable and innovative approaches in delivering the next phase of Integrated Farm Management, and extend the opportunity of working out new business models and partnerships across a landscape level.

This work is set against a background of ambitious global targets for change and it is essential that the SIP findings do go some way to progressing the application of 'sustainable intensification' in practice.

Indeed the work coincides well with the development of the Sustainable Development Goals signed off this year



Importantly, agriculture has a strong role to play in their delivery, especially Goal Number 2, 'zero hunger', which aims to end hunger, achieve food security and improved nutrition, and promote sustainable agriculture. So the work of the SIP projects has the potential to play a valuable role in supporting new approaches for testing farming and moving towards providing the evidence for identifying what does 'good' and 'best' farming practice look like.

For LEAF (Linking Environment And Farming) the partnership of the SIP projects are critical. For nearly 25 years LEAF has been championing Integrated Farm Management and we welcome the opportunity of the SIP partnership to progress new thinking and ways of moving forward toward more sustainable farming practices. For us, the development of the farm platforms builds on our work with the forward looking LEAF Demonstration Farmers and LEAF Innovation Centres and progresses it to another level, providing a real focus on those areas where we need to uncover the evidence to bring about change.

LEAF's role in the project is important too, and our focus is to help support the Knowledge Exchange element of the work. In particular, helping 'ground truth' some of the findings and proposals and supporting the extension of the messages from the work to other farmers.

We hope that the SIP work will spark questions and opportunities for farmers to progress their businesses and provide more evidence to support a way of farming that is economically viable, environmentally responsible and engages local communities. Furthermore, there is a tremendous opportunity for this work to feed into the ambition of the Sustainable Development Goals and provide proof in helping define the future that we want – and need.

Caroline Drummond is the Chief Executive of LEAF (Linking Environment and Farming) and has been running the farming and environmental charity since it started in 1991.

SIP in Focus

The what, how and who of SIP

Landscape in Focus: Conwy



Prysor Williams of Bangor University describes the characteristics of the Conwy area being studied as part of SIP and introduces the Henfaes Research Centre.

The county of Conwy is in north-west Wales, approximately 25 minutes from Bangor. The eastern side of Snowdonia penetrates into the county, and the rest of the catchment comprised of hills, cymoedd ('hanging valleys'), and the valley floor. The Afon Conwy (river) originates from the biggest blanket bog in Wales, Y Migneint, and then meanders its way down the valley to meet the sea in the castle town of Conwy.

The drainage of the Conwy catchment is dominated by two large river systems fed by a number of smaller sub-catchments. In general, water quality in the region is good, but a number of water bodies are potentially at risk from diffuse pollution. The estuary area of the river is important for the commercial harvesting of shellfish and has several public beaches with designated EU bathing waters, and these have been affected by contamination in the past.

Over the years, Bangor University and the Centre for Ecology and Hydrology (CEH) have researched a wide variety of issues in the area, including how farmers manage their nutrients, the prevalence of faecal-derived micro-organisms in water bodies, agricultural diversification, the loss of carbon from peat soils, flooding, soil quality, farm carbon footprints, macro-nutrient cycling, farmers views on the environment, and grassland management. Collectively, they mean that the Conwy is probably one of the best-studied river catchments in the UK.

Conwy is typical of many northern and western parts of the UK, with land types ranging from relatively unproductive, waterlogged mineral and organic peat soil moorland in upland areas, supporting extensive sheep farming and commercial forestry; to fertile lowland areas that support a greater variety of livestock systems (suckler cows, beef, dairy, as well as sheep). Farms are overwhelmingly grass-based, though crops such as swedes and kale are increasingly grown as winter feed.



The small farms sizes are typical of those in Wales, often having been in the same families for multiple generations. Upland livestock farms are often very reliant on the Single Farm Payment to keep afloat. A considerable proportion of them will also be part of the Welsh Government agri-environment scheme, Glastir, and will have undertaken work such as hedge planting, stone-walling, or growing of forage crops.

Farms are central to the social fabric of the catchment – their families support the local schools, shops and other businesses, and help sustain vibrant rural communities, traditions, and heritage. The overwhelming majority of farming families will be first-language Welsh. For many farms in the upland areas, agricultural diversification options are limited– the climate and topography make it largely unsuitable to grow crops. A number have sought to capitalise on tourism; whilst others have invested in renewable energy projects or biomass. Most of the 'next generation' of farmers supplement their income from off-farm employment.

In real terms, land prices are as high in North Wales as any other region in the UK, such is the demand from smaller farms to grow. This makes SI a particularly interesting and appealing concept, since it would allow farms in Conwy to optimise production from the land that they already have. Most farms are not reaching their full potential due to below-optimal management of grass, soils and nutrients. Consequently, they are overly reliant on buying in expensive concentrates to feed their stock. Beef and sheep farmers in Conwy are now paying greater attention to the virtues of good grassland management to reduce costs and boost production efficiencies. For some, SI may also mean that they could focus on intensifying on more productive areas of their farm, whilst attracting agri-environment payments on the more marginal land. A good proportion of farmers in the region attend discussion groups to share ideas. Many are also aware of the virtues of collaboration, but may not be realising its full potential due to reticence about ownership and fair-play.

SIP has direct relevance to farmers in Conwy, since it looks at optimising grassland management and how to facilitate collaboration, both of which have potential to enhance the resilience of farmers in Conwy and those in other similar regions across the UK.



Henfaes transects from amongst the highest altitude agricultural land in Wales, down to sea level; offering a unique study site for both upland and lowland systems

Farm in Focus – Henfaes Research Centre

Henfaes Research Centre is just outside Bangor, and represents the Upland study farm in the Defra SIP. Henfaes is comprised of 49 ha of lowland, and 209 ha of upland, and managed as part of the Centre for Hill and Upland Management (CHUM). It has grazing rights on the Carneddau mountain range. The 1600 Welsh Mountain ewes are managed as a commercial flock, and are often drawn upon for various studies, such as SIP. The farm has many attributes that make it an invaluable resource for both teaching and research at Bangor University. Extending from sea level to amongst the highest mountain ranges in Wales, it represents a huge transect of climate, soils, vegetation and land use. It is also supported by extensive lab and field-apparatus, technical staff, offices and meeting rooms. Industry open days are frequently held at the site. Current research activities at Henfaes focus on agroforestry; greenhouse gas emissions from livestock systems; soil and grass resilience to extreme weather events; and breeding of novel and disease-resistant crops.

Within SIP, the overarching aim is to assess how ewe carrying capacity can be increased on the enclosed hill-land (ffridd), with the resulting greater number of lambs that can be finished more quickly and more efficiently on the lowland. This will be achieved through a combination of improved soil, nutrient and grazing management of grassland on the ffridd and in the associated lowland area. The study design will allow us to determine the cost-benefits of both a low- and high-input approach to sustainable intensification of upland and lowland pasture systems.

Researcher in Focus – John Hyland



I was raised on a beef and sheep farm in County Mayo, Ireland. Having completed a degree in Physics at the National University of Ireland, Galway, I proceeded to take a Masters in Environmental Economics at the same university. Following a short stint working in the

world of finance, I then commenced a PhD at Bangor University in Wales. My PhD concerns reducing the environmental impact of the red meat sector and particularly focuses on greenhouse gas emissions and climate change.

My research is multidisciplinary in nature and incorporates environmental science, environmental economics, sociology, and even some psychology. I obtained the findings from field trials, modelling, and through quantitative and qualitative interviews with Welsh farmers over many cups of tea! The findings offer insight as to how the industry can reduce its carbon footprint over multiple scales without reducing production; thereby, embracing the concepts of sustainable intensification. This is why I find the SIP project so interesting and valuable – delivering more from less is obviously in the interest of farmers, policy-makers, and wider society.

On SIP, I was involved in a baseline survey in the Conwy and Eden case study areas, investigating the level of farmer-to-farmer cooperation present within the industry and what they understand by the concept of SI and SI practices. Once analysed, this will provide an insight into the barriers and opportunities for farmer collective action.

John Hyland is a researcher whose interests lie in the sustainability of food systems. Having grown up on a farm, he appreciates and understands the variety of farmer discourses on issues relating to the environment.



Measuring SI Performance



Stephen Ramsden of the University of Nottingham talks us through some of the exciting work being carried out on developing indicators of SI performance.

One of the aims of SIP Project 1 is to develop improved methods and indicators for farmers, managers and their advisers to measure their performance in

relation to the three pillars of sustainable intensification (SI): increased farm output (economic), enhanced environment and benefits to society (social). Economic metrics can be provided through the existing Farm Business Survey (FBS), which collects detailed data on farm outputs, costs of production and resulting profitability. It is worth considering for a moment how difficult this is to do: farms have multiple inputs and outputs, spread over more than one year (think of a more extensive type of beef production system, spanning 24 months or longer). Moreover, the financial year is typically different to the farming year. FBS staff are experts in management accountancy, making changes to account for debtors, creditors, valuation changes among other adjustments to make comparable results which is no mean feat! The benefit of this approach is the production of a useful set of figures that give an indication of financial and business performance.

Work carried out by postdoctoral researcher John Lynch, is built upon the economic indicators available in the FBS through a range of approaches, including the use of models to calculate environmental indicator by attempting to simulate different environmental processes – for example nitrate loss or greenhouse gas emissions. His initial aim was to capture the full range

of environmental ‘outputs’ associated with agriculture, covering water and air quality, resource use efficiency, greenhouse gas emissions, biodiversity and soil quality. He also used information relating to farmers’ use of environmental advisory services and longer term land use changes.

A good question to raise at this point is to what extent does this approach generate true ‘indicators’? Ideally, if we are interested in, for example, reducing greenhouse gases (GHGs) while maintaining or improving the level of output from farm resources (which is one form of sustainable intensification), a simpler ‘rule of thumb’ indicator or metric for GHGs is needed. Unfortunately, the reality is that simple metrics are not always available, but this is not always the case. John has conducted research on associating environmental outputs from models with simple metrics, for example stocking rate per hectare and greenhouse gas emissions. This has shown interesting results suggesting that in some situations, these metrics can serve as good approximations for more complex (e.g. modelling) approaches.

When combined with the social indicators, a fascinating overall picture of farm SI performance is being constructed using FBS data. Project 1 is also currently collecting actual farm data, which will allow this approach to be tested on real farms. There are also plans to feed into benchmarking approaches and tools being developed by SIP Project 2. Some exploratory benchmarking analysis has already been conducted with a team at the University of Reading. The initial results suggest that there may be a trend for the high performing farms in terms of SI to be more profitable, have lower levels of family labour input and produce lower amounts of ammonia and greenhouse gases.

Stephen Ramsden is an Associate Professor at School of Biosciences, University of Nottingham and Director of University of Nottingham farm.



Cows feeding on a Total Mixed Ration (TMR) at the University of Nottingham Dairy Centre. To be effective, indicators need to capture how different systems and interventions affect environmental outputs such as methane emissions.

Researcher in Focus – John Lynch



In my previous position, I studied the evolution of herbicide resistance in black-grass, one of many significant challenges currently facing agriculture. While I initially focussed on the underlying biology, I recognised that to deal with the problem, like many others encountered by farmers, requires a combination of different

measures, which must be considered alongside wider management decisions and farm economics. This perspective led me to become interested in SIP due to its exceptional breadth and comprehensive aims.

To fully engage with the concept of SI, we must consider farm productivity together with any environmental

impacts, the role of farming within the local community, and how agriculture is viewed by society at large. Designing indicators to cover these factors in sufficient depth is difficult, but essential in order to assess whether different management practices are successful, or highlight where farms may be able to improve.

Despite the scale of the challenge, working on these indicators has been a stimulating and informative experience. One element of the work has been to look at the Farm Business Survey (FBS) and identify where these indicators are already available. Beyond this, we have worked with partners across SIP to develop a comprehensive but streamlined way of capturing these indicators in detail. Together, these approaches can demonstrate where SI is already underway, providing detail on what practices work and why they are successful.

John Lynch is a Postdoctoral Research Fellow at the University of Nottingham

Thinking at a landscape scale – Farmer Collaboration



We invite Carol Morris to introduce some of the work on Landscape Scale SI with a description of some of the findings from a literature review on farmer collaboration.

SIP Project 2 is investigating how sustainable intensification (SI) might be achieved across an area containing multiple farms or a river catchment. This is sometimes known as the landscape scale. By implication, if SI is to be achieved at a landscape scale, it is likely that individual farms will need to work together. In the UK the majority of farmers are accustomed to working with others with respect to some economic aspects of their business, but working together for the benefit of the environment is less common. To better understand some of the challenges and opportunities involved, SIP 2 Project team members have undertaken a review of the research literature on farmer collaboration. This article presents some of the findings from the review.

Although a vast amount of social science research has been published on the joint working of farmers both in the UK and internationally, this does not always pay attention to the benefits (or not) this brings across a geographic area. Studies of economic forms of farmer collaboration (e.g. of agricultural cooperatives) in particular tend to have little if anything to say about the scale at which this activity is most meaningful. Part of the challenge of the SIP 2 literature review has been to begin to make connections between the social science literature questions of landscape and scale.

The review has helped to clarify the meaning of some key terms. Collaboration means working together towards the same end and usually refers to a 'bottom-up' approach where farmers organise themselves. This is sometimes also called cooperation. Coordination is typically taken to mean a 'top-down' approach to joint working where land managers are organised or directed by a third party, such as a project officer, to achieve a shared aim. Complementarity describes a situation where the activities of two parties compensate for each other's weaknesses. Straw and manure are waste by-products created by arable farmers and livestock farmers respectively. Each has a use for the other's waste product and so straw-for-manure swaps is an example of complementarity.



Collaborative or farmer-led approaches towards environmental aims have been shown to have better environmental benefits and be a more positive experience for the farmers involved. But this begs one question: what triggers the collaboration in the first place? Economic factors are typically the most important in prompting the development of business oriented forms of collaboration (e.g. machinery sharing) but in relation to the environment, sometimes national level policy has been shown to prompt farmers to work together to develop their own ways of tackling environmental challenges. Charismatic individuals within the local farming community also initiate joint working. Some situations are better suited to a coordinated approach in which non-farmers play an important role in helping farmers to work together to achieve environmental benefits. Facilitators are shown to be vital to the success of both coordinated and collaborative forms of environmental action and this, of course, has funding implications.

It is often assumed that collective action takes place between neighboring farms. However, studies of environmental cooperatives in the Netherlands demonstrate that these work best when members share values and beliefs. Farmers may not always be inclined therefore to collaborate with their immediate neighbours. This presents a particular challenge to landscape ecology which often requires ecological connections between adjacent farms.

The research has also tried to understand what makes successful collective action. The existence of strong social networks within the farming community is important in both business and environmental cooperation with trust also highlighted in the former. Effective facilitators and leadership are other crucial factors.

The review has also raised a series of questions that are being investigated in the next phase of the research which involves case studies of collaborative initiatives in UK agriculture.

Carol Morris is Associate Professor in rural environmental geography in the School of Geography, University of Nottingham





Viewpoint

Sustainable Intensification must be The Goal



Finally in this issue, Sam Durham of the NFU challenges SIP to provide the practical tools that are required to meet the farming industry's challenges ahead

the goal. Competitiveness, resilience and profitability are critical, both for a viable industry and for management of the land and wider environment.

Therefore no one who works in the food and farming industry can avoid the need to intensify sustainably. It is easy to get drawn into a discussion on defining the terms, but the NFU is clear that sustainability is a balance of economic development, social progress and environmental responsibility. For a farmer to intensify their business sustainably, they will be looking at profitability, as well as managing social and environmental impacts. We are used to measuring our economy in financial terms, but the original definition of economy was 'careful management of available resources' so perhaps we are just talking about 'farming economically'?

The UK agri-food sector is an important part of our economy; in fact it contributes more than car manufacturing and aerospace combined. But it is also unlike any other industry covering a range of sectors, a variety of business sizes, a social investment from the farmer who lives and works in a business that has often been in the family for generations, and a direct environmental responsibility. The challenge for the food and farming industry is that we have a responsibility to feed 9 billion by 2050 as part of the global food supply chain, but also to do this in a way which doesn't degrade the environment. That is why initiatives like the SIP should be major pieces in the toolkit to help us tackle the challenges ahead.

The NFU exists for our members, but it is not our job to tell them how to farm. We provide the information they need and we will influence policy to help them run their business well and competitively. To help farmers farm, they need to keep in touch with the latest innovations in farm practices and technology. Hence NFU also works on science and technology, with a particular focus on trying to ensure that there is real farmer involvement. This is why the NFU supports initiatives such as SIP, but we will also challenge SIP to make itself relevant to farming and ensure farmers are involved in the process. We would encourage everyone involved with the SIP to get out talk to farmers and find out what they see as the barriers to intensifying their business sustainably.

Currently, UK farmers are part of a competitive and complex global system for food, feed and fibre, and face major challenges including pressures on resources, rising costs, extreme weather, supply chain expectations, price volatility, recession and regulation. Productivity is currently stagnant in the UK and there is a significant yield gap between theoretical production and what is routinely achieved commercially. Sustainable intensification must be



Farmers have a desire and an ability to adapt to future sustainability challenges, but they need access to the tools and knowledge to help them take the next step. Engaging with farmers gives a real sense of perspective for researchers on the issues that have to be dealt with on a day-to-day basis. As an example, the development of new digital technology for agriculture may not get traction at farm level, if the business has poor mobile coverage or broadband speed. A recent NFU survey of members showed only 15% had a reliable signal across the farm and 63% said their broadband speed was insufficient for business transactions.

This is why applied research and knowledge exchange activities are important so that the science can have

genuine impact on the ground. More sustainable, efficient, productive and competitive farming systems need access to the best knowledge and tools. It is not just innovative technology that is needed but also farm practices. Farmers need the right skills to access all these and the long-term security to apply them to their businesses. This is where the NFU hopes that the SIP can play a unique role in providing real practical tools that can be taken up by farmers and implemented within their farm businesses.

Sam is NFU Chief Land Management Adviser, leading on sustainable intensification, knowledge exchange and government funded advice. He also manages teams working on the Basic Payment Scheme, land agency issues and the agricultural industry environment initiatives.

SIP Partners

SIP 1

NIAB (lead) with:
 Aberystwyth University
 ADAS
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 University of Cambridge
 Centre for Ecology and Hydrology (NERC)
 Duchy College
 University of East Anglia
 East Malling Research
 University of Exeter
 Fera
 Game and Wildlife Conservation Trust
 Harper Adams University
 University of Hertfordshire
 LEAF (Linking Environment And Farming)
 University of Leeds
 Newcastle University
 University of Nottingham
 Organic Research Centre
 University of Reading
 Rothamsted Research
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 SRUC
 Velcourt

SIP 2

University of Exeter (lead) with:
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 BioSS
 University of Bristol
 BTO
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 Eden Rivers Trust
 Fera
 Game and Wildlife Conservation Trust
 Glasgow Caledonian University
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**Or Join the debate at the BBSRC SI Discussion Forum
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