

SIP



SUSTAINABLE INTENSIFICATION
RESEARCH PLATFORM

SIPSCENE

The newsletter of the Sustainable Intensification Research Platform
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Editorial: Out in the fields: sharing ideas for SI



Building a community of practice for Sustainable Intensification and the exchange of knowledge are core values for the SIP. This issue of SIPScene highlights a number of opportunities to meet the researchers working on the SIP Projects – to share your ideas and input, as well as seeing the research we have been doing.

The Farm in Focus this issue is the only all-arable SIP Study Farm, Morley Farm, in Norfolk. Ron Stobart outlines some of the research being undertaken at the farm, and offers the opportunity to visit the farm and meet the researchers on the 22nd of June. In SIPPETS, Prysor Williams reports back on some of the events that have taken place recently at Henfaes Study Farm. For opportunities to visit Henfaes, or any of the SIP Study Farms, keep an eye on the SIP web pages (www.siplatform.org.uk/events) or email me at Jennifer.preston@niab.com. Cereals 2017 will be back at Boothby Graffoe, Lincolnshire on the 14th and 15th of June. This event offers a unique opportunity to catch up with a range of SIP Partners and ask them about their research. SIP

Partners at Cereals include NIAB, GWCT, Rothamsted Research, LEAF, AFBI and the University of Nottingham.

Following on with the arable theme, this issue features researcher profiles from Felicity Crotty (GWCT) and Amelia Magistrali (Newcastle University), who are both involved in SIP research on arable systems, and also in wider research. In other research news, Les Firbank gives an update on the progress of the commercial farm surveys, and Paul Wilson introduces the SIP Benchmarking Tool – both of which are vital in setting the SI context around individual farms and linking to wider farming systems. We also have a researcher profile from one of the developers of the Benchmarking Tool, Ben Lang. We bookend the issue with pieces from the SIP's own Matt Lobley and we are very happy to have guest author Professor Tim Benton, both offering views on the wider context of SI, collaboration and the actions needed to make progress in agriculture and beyond.

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SIP Says

Views from in and around the Platform

Joint working to deliver SI at the landscape scale

A key challenge facing SIP social scientists has been to understand the barriers and opportunities for farmers working together in order to deliver landscape scale Sustainable Intensification (SI) impacts. Leaving aside, for now, farmer understanding of and/or acceptance of the term SI, the question quickly becomes “what do we know about why farmers do and do not collaborate with each other”? The equally quick off-the-cuff response is that “British farmers don’t do collaboration”. Actually, SIP has provided strong evidence to the contrary but, as ever in social science, it’s complicated! This isn’t helped by the interchangeable use of similar words in the literature such as ‘cooperation’ and ‘collaboration’. Both tend to be seen as grass-roots, farmer-instigated means of joint working, but are very different from ‘coordination’ which is more of a top down approach (although it can be a light touch means of orchestrating the actions of multiple farmers). This isn’t just a question of academic semantics; employing appropriate vocabulary is important. For instance, approaching a farmer to ask if they would be interested in taking part in a coordinated activity (implying that they will be coordinated, that something will be done to them) might yield a different response from a fiercely

independent British farmer than an enquiry about their willingness to take part in a cooperative activity, working with other farmers. We will be working closely with farmers in the SIP case study areas to ensure that guidance on collaborative interventions is framed in a way that is not just acceptable and attractive to farmers but that it is co-designed with farmers.

Back to what we have learned through SIP about farmers working together. Firstly, the baseline farm survey conducted in all seven case study areas revealed high levels of farmer joint working, challenging the stereotypical image of the independent and uncooperative British farmer. Buying groups, producer groups, and labour and/or machinery sharing all emerged as common forms of joint working and were identified by farmers as important. Farm size and farm type often exert a significant influence over decisions to work with other farmers, as do a range of financial and social factors, and organisational and governance issues. For example, financial opportunities or financial threats can act as a trigger to joint working. Equally, the unexpected costs of participating in initiatives (such as direct costs or additional work for those involved) can act as a barrier to joint working. Additional workload costs are particularly high for those running or managing initiatives.



In all of this, the relationships between the people involved play a central role. Throughout the survey, literature review, farmer discussion groups and case study analysis, the importance of trust and good relationships emerges as underpinning successful joint working, although it must be acknowledged that the very process of collaboration can strain relationships. Building trust takes time, so working with existing social networks may offer an advantage when seeking to establish new forms of joint working. Informal, trust-based arrangements between friends, neighbours, family and those with shared interests are the preferred way of working for many farmers.

The challenge now is to take what we have learned to date and use it, working with SIP farmers, to develop guidelines for implementing joint working initiatives at the landscape scale. As ever, the role of the farmers themselves

is central to the likely success of such initiatives. It's not just a question of making a few tweaks to an initiative to improve uptake. It's about another form of joint working, this time between SIP researchers and farmers to develop guidance for actions that are meaningful and acceptable to farmers and something they actually want to do and can see the benefit of.



Matt Lobley is Associate Professor in Rural Resource Management at the University of Exeter, is Assistant Director of SIP Project 2 and has lead responsibility for SIP 2 work on socio-economic barriers to collaboration between farmers and mechanisms to encourage collaboration.



Farm in Focus

Morley, Norfolk – The SIP all-arable Study Farm

The Morley site is located near in Norfolk, around 15 miles south of Norwich, and consists of about 800 ha of mainly arable cropping.

The site is owned by The Morley Agricultural Foundation (TMAF), farmed commercially by Morley Farms and hosts a range of research. Morley soils are sandy loam or sandy clay loam over clay, and crop rotations involve wheat, barley, oilseed rape, sugar beet and pulses; this is typical of many farms in the region. For around 50 years Morley has hosted a substantial area of small plot field trials and larger-scale or longer-term field research for NIAB TAG and other organisations, and has a strong legacy of knowledge exchange activities.

Within SIP the platform at Morley, field activities are evaluating and comparing three approaches.

- IFM system A: a deep (ca. 20cm) non-inversion cultivation system with over-winter cover crops and other modified management practices.
- IFM system B: a low intensity (<10 cm depth) soil disturbance cultivation system with over-winter cover crops and other modified management practices.
- Conventional (C): the control treatment will be based on a 'farm standard' cultivation approach (typically plough-based) and management practices, with no use of cover crops.

The evaluation of these system spans scales and utilises three main approaches. The first is using the long term New Farming Systems (NFS) experiments based at Morley Farm. These are large scale, replicated field plots where the above practices (and components thereof) are represented. The second is evaluation at the field level. Working mainly on the Morley Farm, elements of the intervention systems are being evaluated within working farm practice on a field and split field level. Finally, at the landscape level with the Wensum Demonstration Test Catchment (DTC) project, sub-catchment scale blocks within the University of East Anglia-led DTC area deliver field groupings with common practice representing the systems. There is an ongoing interaction between the DTC and SIP platforms around this work.

In addition the Morley arable farm SIP work has cross linkages and commonality of assessment with the SIP mixed farming site at Loddington.

Findings from the long-term replicated plot work have not only demonstrated clear differences in performance, yield and margin with respect to tillage practice but also interaction between brassica cover crop use and primary tillage. Findings suggest brassica cover crop use in conjunction with shallow non-inversion tillage is more likely to give a positive yield response (as compared to plough-based tillage) in this study. The findings have also highlighted interactions between cover crop choice and crop rotation: suggesting that repeated use of a brassica crop, while having overall mean yield benefit across the whole rotation, had a detrimental impact on the yield of oilseed rape.

Moving to the farm level, recent results from the large-scale SIP split field areas at Morley have examined sugar beet performance following cover crop use (comparing a tillage radish area to a fallow treatment). Findings, from this single season split field study, did not suggest any specific agronomic problems in the sugar beet crop following the cover crop, but did show a 7 t/ha improvement in adjusted yield (with similar beet quality characteristics for sugar and amino N content). Assessment within the season demonstrated improvements in soil moisture retention and increased green area index of beet plants in the field areas following the cover crop.

A range of farmer and advisor-focussed events have been held in the Morley and Wensum areas, including farm walks hosted in conjunction with Morley Farms and NIAB TAG summer Open Days. Morley has also had wider, regional, landscape-scale focussed events; such as those

delivered by Catchment Sensitive Farming, the Rivers Trust and Broads Authority; often collaborating with the DTC project in the Wensum area. The visits feature field-based technical interactions (such as demonstrations of practical soil assessment techniques) in conjunction with workshops and discussions (for example, around the perception, use and value of soil assessment tests). This year's NIAB TAG Morley open day is on the 20th of June and features a SIP demonstration 'bus stop'. Attendance is free and open to anyone; booking can be made through the NIAB website (<https://www.niab.com/shop/page/open-events>).



Ron Stobart is the Head of Farming Systems Research for NIAB TAG and looks after the SIP arable farm platform at Morley.

Henfaes Research Centre update

The uncertainties due to Brexit have reiterated the need for upland farms to utilise grass to its maximum. This can bring with it economic benefits through reducing costs of bought-in feed, and could lessen the environmental impact of livestock production systems due to reducing the use of imported protein such as soya. Recent visitors to Henfaes Research Centre, Bangor University's research farm, were shown the upland and lowland trials within the SIP project that aim to increase the efficiency of lamb production through better management of soils, nutrients, and grass.

The National Farmers Union Cymru, held their Less Favoured Areas committee meeting at Henfaes in October. The committee thoroughly enjoyed the tour of the facilities and the chance to see the numerous relevant projects

conducted. This was followed by a broad discussion about land use policy, the role of the uplands in the food production chain, and ways to integrate production with delivery of broader societal and environmental goods.

Later on in the winter, Henfaes welcomed a group of farmers and staff from the Yorkshire Dales National Park. Much of the discussion revolved around agri-environment schemes, the role of trees on livestock farms to provide shelter, improve drainage and retain carbon, and the value of attention to detail on grassland management. Helen Keep, Senior Farm Conservation Officer at the Yorkshire Dales National Park, said, "The farmers got a lot out of the afternoon spent at Henfaes, as did my team. The work you are undertaking, not just on the SI platform, is really interesting and makes you look at things slightly differently.



Farm Scale SI - Understanding the factors that contribute to farm performance

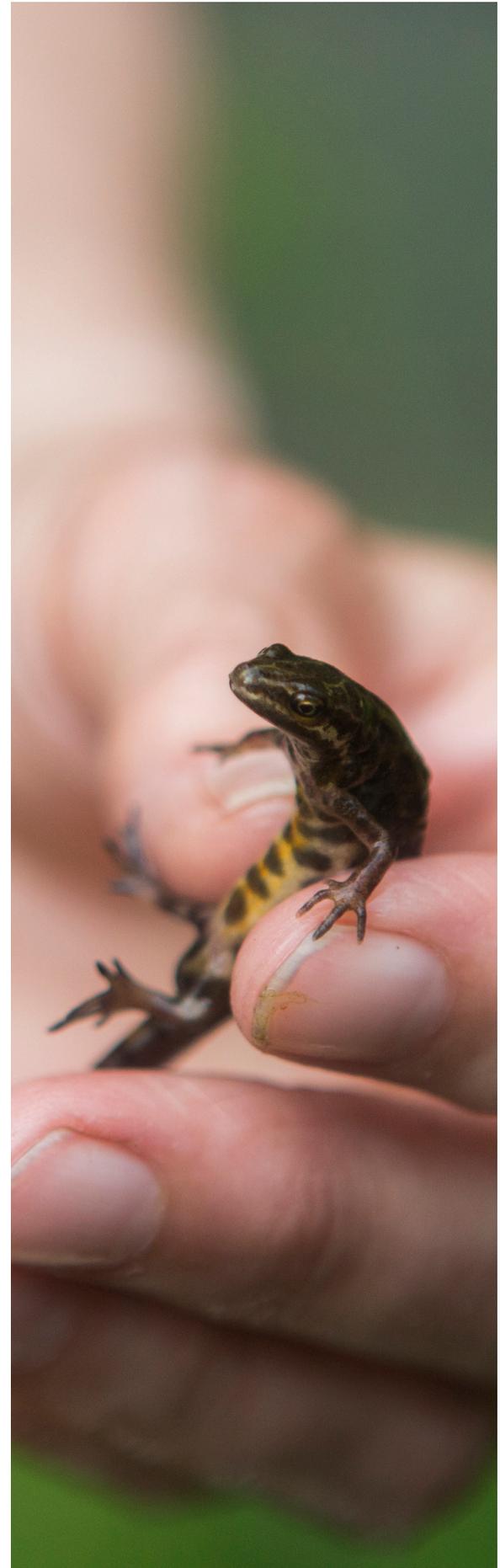
Understanding the factors that contribute to farm performance is vital for exploring the differences that can be seen both across individual farms and across and between farming systems. One of the key aspects of SIP research is to examine how commercial farms are currently performing in terms of the three pillars of sustainable intensification: economic (including financial and production), social, and environmental.

A team led by the University of Leeds and RSK ADAS has been exploring farm performance and undertook a survey of commercial farms around the SIP Study Areas, aimed at augmenting the information gathered by the Farm Business Survey. The results are still being finalised, but some points are becoming apparent. Not surprisingly, patterns of food production, profitability and levels of potential pollution differ between farm types. Getting the biodiversity indicator right is far from easy, without direct observations of plants and animals. Therefore, we're working closely with the RSPB to get a valid biodiversity score based on habitat features and management. Actual performance scores don't appear to correlate well with social variables, whether these variables relate to the farmer themselves (such as farmer age) or to the contribution by the farm to the community (such as in terms of footpath access and open land). Finally, we are working with data from LEAF and Defra to see if there are patterns in the take-up of SI measures that might be influenced by outside factors, such as prices or policy changes.

One consideration, evident in the data collected, is that the levels of food energy produced per hectare varies between farm types, reflecting the capability of the land: cereal farms produce more than upland livestock, for example. Yet while food energy is easy to estimate from farm-scale production data, it does not capture the nutritional quality of the food, which is being explored elsewhere in the SIP. We need better tools to capture the quality of the food as well as its quantity.



Les Firbank is Professor of Sustainable Agriculture in the School of Biology at the University of Leeds.



Thinking at a landscape scale – Designing and developing a sustainable intensification benchmarking system

At its most straightforward, benchmarking is a means of comparing performance or outcomes with a view to improving or changing something. Farmers have been informally benchmarking for centuries – such as comparing yields of crops, milk yields or lambing percentages. Data from the highly respected Farm Business Survey (FBS) has been used for over 80 years by farmers for business comparison. For over a decade, Rural Business Research (RBR) – the consortium that undertakes the Defra-FBS - has hosted and improved a Farm Business Benchmarking service (www.farmbusinesssurvey.co.uk) that provides a free to use, interactive way to undertake farm business benchmarking. Such has been the success of this benchmarking site, hosted by RBR at Cambridge, that it now receives well over 100,000 hits per annum, and offers a range of benchmarking tools, including EU benchmarking and a Projection Calculator tool. Of course, farm businesses do not operate in isolation from their local and global environment, and achieving sustainable intensification requires development across economic, environmental and social areas.

A key part of the SIP is therefore to extend the FBS Business Benchmarking site to develop a sister “Sustainable Intensification Benchmarking Tool”. Led by colleagues at Cambridge and Nottingham Universities, this SIP work has been developing methodologies and protocols to allow farmers to benchmark their SI performance across a range of environmental metrics and social indicators, in addition to their economic performance. The new benchmarking tool that is currently in the final stage of development (www.benchmarkmyfarm.co.uk) focuses specifically on the key areas of: i) Greenhouse Gas (GHG) Emissions; ii) Nutrient Balances; iii) Land Use Diversity, and; iv) Social Indicators. Each of these four components has either local or global landscape implications that are of importance in achieving SI. GHG emissions are of global importance, while nutrient balances and land use diversity typically have greater impacts within the local landscape. Social factors impact across different scales, from the farm business to local and national levels.

The Sustainable Intensification Benchmarking Tool will allow farmers to compare their SI performance with a unique set of comparative farms that are very similar to their own – both geographically and in respect to the activities and enterprises on their farm. This is achieved via a behind-the-scenes algorithm that searches the FBS data set to find the best matched farms with which to provide comparative data. Users can then compare either part of their SI performance (e.g. GHG emissions), or a wider range of SI performance. By providing this flexibility, the entry barriers to using the tool are reduced and users start to receive comparative data back as soon as they start entering information into the tool. Like many things in life, the more users put into the system the more they get out of it.

Currently in the final stages of development, the SI benchmarking site will be launched shortly and we hope that farmers and advisers will make full use of this exciting new tool.

The site will enable farmers to identify areas of current good practice within their business, as well as areas where further investigation may be needed to help them achieve key sustainable intensification outcomes.



Paul Wilson is Professor of Agricultural Economics and Director of the Rural Business Research Unit in the Faculty of Science at the University of Nottingham.



Mark Reader is Research Assistant in the Rural Business Unit, Department of Land Economy, at the University of Cambridge.

The www.benchmarkmyfarm.co.uk tool has been developed by Mark Reader, Ben Lang, Rachel Lawrence and Ian Hodge at University of Cambridge and Stephen Ramsden and Paul Wilson at the University of Nottingham.



Researcher in Focus – Ben Lang

I am a Principle Research Associate and Manager of the Rural Business Unit, at the University of Cambridge. I manage the Farm Business Survey (FBS) in the East of England and I am a member of Rural Business Research Management Group, which has responsibility for the FBS in England. I am also a Principle Investigator for research projects into the economics of crop production and measurement of business performance in the UK. This work continues internationally through the agri benchmark Cash Crop Network.

I found that our work to develop the SIP benchmarking tool, to be offered at www.benchmarkmyfarm.co.uk provided a valuable opportunity to look again at the extensive FBS database to explore a wealth of environment and social data. Our challenge was to draw out variables that describe social and environmental activity, that farmers and their advisors can use in their own farm comparisons. Then we structured the web interface to simplify data entry and recall. We used experience gained through the publication of farm business benchmarking at www.farmbusinesssurvey.co.uk, as well as feedback from SIP 2 participants, to shape the design of the finished application.



Dr Ben Lang is a Principle Research Associate and Manager of the Rural Business Unit in the Department of Land Economy, University of Cambridge

Researcher in Focus – Amelia Magistrali

Originally from the United States with an undergraduate degree in Environmental Studies and Anthropology, I came to Newcastle University in 2013 to complete an MSc in Organic Farming and Food Production Systems and joined the Nafferton Ecological Farming Group (NEFG) as a post-graduate researcher in 2015. While my current focus is in agronomic management of alternative cereal crops, my Masters research focussed on farm-based education and I continue to work in outreach as the unofficial dissemination officer for the NEFG.

I am currently a PhD student at Newcastle University, and am researching the effects of different fertilisation regimes on productivity and quality of minor grain cereals. My work falls within the arable SIP trials taking place at Nafferton Farm (featured in the third issue of SIPScene) and focuses on using recycled-waste based fertilisers to produce spelt and rye.

Through my involvement in SIP research and my role in the NEFG, I have organised a series of information sessions at Nafferton to promote the spelt and rye field trials and share relevant results with farmers, bakers and millers in the Northeast. The next of these events will take place this summer in collaboration with Gilchesters Organic Farm.



Amelia Magistrali is a Doctoral Researcher at Newcastle University.



Researcher in Focus – Felicity Crotty

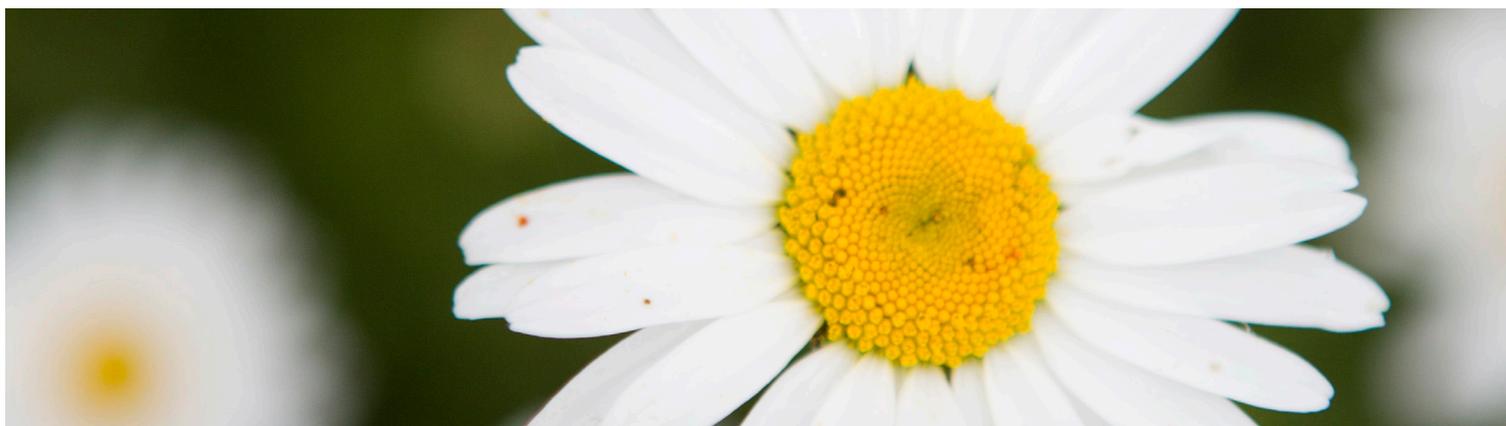
I have been researching soil biology and soil health for the last ten years. Firstly, through my PhD at Rothamsted Research (North Wyke) where I was investigating the soil food web and subsequently as a post-doc at Aberystwyth University focusing on the PROSOIL project and maintaining healthy soil in agricultural grassland in Wales. I joined the Allerton Project in October 2015 and have been working mainly on the SIP.

Through my research on SIP I have been focusing on the effect of cover crops on soil health and sustainability. Cover crops are advertised as the answer to everything –soil erosion, water retention, soil structure, increasing soil organic matter and reducing weeds; but are they? I have been investigating the effects of cover crops on soil biology (earthworms, mesofauna, nematodes), chemistry (N, P, K, and other nutrients) and physics (compaction and water infiltration). Through combining my expertise in all three fields of soil science, I am starting to disentangle the real potential benefits of cover crops on the soil and future crop yields.

Earthworms are often referred to as ecosystem engineers, because they change the soil structure effecting all other organisms and plants residing within the system. A good soil is thought to be one which has a healthy earthworm population. But which species of earthworm? Are all earthworms equal? I will be displaying the effects of earthworms on soil structure and discussing my cover crop results at the NIAB soil tunnel stand at Cereal's this year.

Dr Felicity Crotty is Soil Scientist at the GWCT Allerton Project





Viewpoint

Where are we with “sustainable intensification”?

If, on a global basis, demand for food is growing and the world is also getting richer, then, in a freely-trading world, market forces will inevitably lead to supply-side growth. Therefore, if we want to grow more without expanding the land area that is under agriculture then we need to grow more per unit area. Growing more per unit area is one definition of ‘intensification’. But, any yield growth should be sustainable and not have negative impacts on environment or livelihoods, as well as being sustainable economically. This basic conceptual definition of SI [1] has been present in the literature for many years but the term itself has had a rapid uptake in the last decade or so, as the challenge of food security has gained prominence.

An early populariser of the term was Jules Pretty. His nuanced 1997 definition[2], effectively pointed out that by raising the yields in some places it takes the pressure off converting land in other places, is the essence of the ‘land sparing vs. land sharing’ debate [3].

The term ‘sustainable intensification’ gained significant political capital following its use in The Royal Society’s Reaping the Benefits report [4]. This concludes “that we must aim for sustainable intensification — the production of more food on a sustainable basis with minimal use of additional land. Here, we define intensive agriculture as being knowledge-, technology-, natural capital- and land-intensive.” (p46). In this sense intensification is not a

synonym of “industrial” agriculture, and therefore, does not necessarily imply that the whole world should adopt Westernized, large-scale, input- and capital-intensive farming systems [5]. This definition presents SI as the middle ground between unsustainable and ‘sustainable but extensive’ systems – an environmentally benign agriculture that simultaneously increases yields.

The limits of SI

As Pretty pointed out, there is plenty of scope for improving yields in existing agricultural lands without degrading the environment and without taking in more land to agriculture. This includes both low-yielding and high-yielding agriculture. The prime route is “doing more with less”, meaning an increase in technical efficiency. Typically this is thought to come about by “precision agriculture” – precision of application of inputs in space and time.

‘Doing more with less’ implicitly defines sustainability as synonymous with efficiency. This is problematic as, in simple terms, if an activity is eroding a finite resource (like soil), eroding it more efficiently is still creating a negative impact, albeit smaller. Concentrating on efficiency can also neglect other aspects, such as biodiversity, as well as social, ethical and welfare dimensions. Delivering SI will therefore require balancing yield (and optimizing inevitable trade-offs) with maintenance of the natural capital necessary for the provision of other ecosystem services – as distinct from increasing yield more efficiently per se.



Two things are certain

Firstly, that context matters – there is no recipe that applies across the board to “do” SI. The right thing to do to reduce environmental impacts will depend on the place. Secondly, the sustainable intensification of farming will not produce a sustainable food system. Increasing technical efficiency may make production very efficient but it also maintains the “cheap food” ideology that externalises costs to reduce food prices. This drives, through comparative advantage, concentration of food production into fewer products, produced at scale in breadbasket regions and highly intensive and efficient livestock units, producing cheap, processed, highly caloric, but low-nutrient foods that are sufficiently cheap to waste, leading to global malnourishment, increasingly driven by access to too many calories. The produce lost, wasted, fed to livestock or over-consumed beyond nutritional needs amounts to nearly 60% of calories grown. Without tackling the demand side and changing diets, sustainable intensification alone is unsustainable.



Professor Tim Benton is UK Champion for Global Food Security, acting as ambassador and spokesperson for matters to do with food and food security, and coordinating work across this area between research councils and government departments. Among other roles he is also currently Dean for Strategic Research Initiatives at Leeds

and a Distinguished Visiting Fellow at the Royal Institute of International Affairs, Chatham House.

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3. Green, R.E., et al., Farming and the fate of wild nature. *Science*, 2005. 307(5709): p. 550-555.
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5. Tittonell, P. and K.E. Giller, When yield gaps are poverty traps: The paradigm of ecological intensification in African smallholder agriculture. *Field Crops Research*, 2013. 143: p. 76-90.

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