

OF&G Policy Paper

ofgorganic.org



An organic systems approach to the provision of public goods

This paper presents how a cyclical and regenerative systems approach to farming and land use can provide key environmental (and other) public goods and form a critical component in delivering a post-Brexit agriculture policy aligned to Defra's priorities to secure a healthy natural environment; a sustainable, low-carbon economy; a thriving farming sector and a sustainable, healthy and secure food supply.¹

Summary

The external costs of food and farming are placing an increasing burden on society and these costs arise from a failure to recognise and value the provision of social, economic and environmental public goods adequately. These must now be an integral part of any future food and farming policy within the UK, Europe and beyond.

The paper sets out an integrated definition of public goods, taking into account the need to measure and reward their delivery. We argue for the development of both Government policy and business practice that supports the increase in uptake of organic farming as it represents a coherent land use that ensures multi-functional environmental benefits, and has other benefits besides. The paper also highlights that organic food and farming systems do successfully internalise external costs, currently borne by the final consumer of organic food but which should, in the context of delivering public goods, be borne by society.

We urge Government to recognise the particular ability of organic production to deliver public goods in a systematic way within a highly regulated and verifiable framework.

Through the development of the England Organic Action Plan it will be possible to identify the distinct measures to encourage more organic food and farming, and evaluate the extent to which this contributes to living within sustainable limits.

Defra are currently undertaking in depth analysis of post-Brexit policy options through five work streams that can be considered from the point of view of the public goods

¹ <https://www.gov.uk/government/organisations/department-for-environment-food-rural-affairs>¹

and the current systemic failures discussed in this paper. The development of a 'pilot scheme' that effectively rewards organic production for the 'system level' benefits it provides would be a landmark initiative and be in line with developments in devolved nations, elsewhere in Europe and around the world.

Cyclical and regenerative systems for public goods

In their Prospectus for the newly established Food, Farming and Countryside Commission², the RSA asks "How could a systemic investment in ecosystem services boost the rural economy and relieve the cost and income pressure on farmers?". Our vision is for just such an approach, and while there are undoubtedly several available routes to a post-Brexit food and farming policy, the adoption of agro-ecological techniques and innovative practices is one credible alternative to more mainstream approaches.

Organic farming and food is an intrinsically agro-ecological system, where the production and processing standards are consistent with living within planetary boundaries. In terms of public goods, it already internalises some of the most important external costs associated with non-organic food and farming. Defra could benefit from exploiting an organic systems approach as one part of its domestic agriculture policy. Agriculture is a fully devolved issue, so although this paper is directed towards Defra, the arguments apply also to the devolved nations where there is an awakening of interest in organic and agro-ecological production.

Such a policy initiative would provide a space for new environmentally benign and innovative rural strategies to flourish, building on the untapped entrepreneurial vigour amongst agro-ecologically oriented farmers and meeting the needs of like-minded food consumers and citizens. It could, thereby, provide a viable approach to food and farming that works in partnership with an increasingly environmentally aware and ethically engaged population. It could be a test-bed for a more resilient food system that operates within a thriving countryside, with rich biodiversity and using animal welfare friendly production methods.

² RSA (2017) Food, Farming and Countryside Commission: Growing a mandate for change. Prospectus. Royal Society of Arts, London. <https://www.thersa.org/globalassets/pdfs/reports/rfa-ffc-commission-prospectus.pdf>



OF&G
Old Estate Yard
Shrewsbury Road | Albrighton
Shrewsbury | Shropshire
SY4 3AG

01939 291 800

@ofgorganic

info@ofgorganic.org

/organicfarmers

ofgorganic.org

It is noteworthy, in this context, that Defra is shortly to commission research to see what can be learnt from organic practices that could be exploited in conventional production. Though it is welcome that organic production methods are under Defra's spotlight, and that there is a recognition of the potential key role of organic systems in developing more agro-ecological approaches for UK agriculture overall, it is important to recognise that organic is fundamentally a systems approach and essentially derives much of its overall value from the multi-functional interaction between its key elements.

Characteristics of organic systems

Organic (and agro-ecological systems more generally) share the following characteristics:

- Cyclical
- Regenerative
- Diverse
- Interconnected
- Stable
- Resilient

The two key characteristics from the point of view of the delivery of public goods (benefits) are 'cyclical' and 'regenerative'.³ Organic farming is subject to legally enforced standards that the organic producer is obliged to follow that ensure cyclical and regenerative practices. Firstly, organic standards prohibit the use of external sources of manufactured nitrogen, and, secondly farm animals must be reared using extensive, welfare friendly husbandry, with a balance between crop and livestock production. Taken together, these have profound implications that directly influence the delivery of environmental public goods.

Nitrogen is the key driver in crop and livestock production so the organic prohibition of external sources of nitrogen reduces emission of climate changing gases (small molecules, primarily NO₂, NH₃, CO₂, CH₄), protects soil function and limits the pollution of water by nutrients. Furthermore, the requirement for the use of agro-chemicals is associated, to a significant degree, with the use of manufactured nitrogen. Housing and feeding of organic livestock means that the more intensive systems common on non-organic farms are not possible, and this places environment friendly limits to nutrient fluxes. It also delivers on the public good that the ethical treatment of animals represents, although this is obviously not an environmental outcome, it is an important 'public good' in the social sphere.

However, as is always the case, there are trade-offs between

3 Regenerative and cyclical systems are more sustainable because they have a tendency towards order (thus a decrease in entropy). Chaotic and linear systems have a tendency towards breaking down this order (thus an increase in entropy). As Adiscott has pointed out: "Entropy-increasing processes are those that degrade complex, ordered structures of large molecular weight to small molecules. Processes such as photosynthesis that build small molecules into larger ones lessen entropy." T M Adiscott (1995) Entropy and sustainability. European Journal of Soil Science Vol 46 Pages 161-168

different system attributes. Firstly, extensive and welfare friendly livestock husbandry means longer production cycles and consequently higher priced meat. Due to the longer life of the animal climate change emissions may (but not necessarily) be higher per kilo or litre. It is, of course, these very same features that go to meet the justifiable ethical demands from a portion of society. Secondly, organic crops tend to yield less (though this varies hugely according to crop type, soil and climate) and so may cost more in part as a result of the prohibition of manufactured nitrogen. Consequently, external costs are 'internalised' by organic farmers whilst consumers and citizens benefit from the provision of the resulting public goods.

There is no doubt that moving to better conventional production practices could reduce the negative impact of non-organic farming on the environment, and this is clearly a priority. Some progress has been made over the past three decades, such that it is now relatively normal for a non-organic farmer to use clover (a fertility building legume), cover crops to retain nutrients and crop rotation to build fertility and maintain soil function. All of these practices are essential in organic systems. By adopting some of the practices that organic farmers routinely use and by cutting back on applying nitrogen that is effectively lost from the system, better nitrogen use efficiency can be achieved. But this, though clearly welcome, does not reflect the systemic change that the adoption of organic production necessitates, the consequence of this change being the delivery of many well established beneficial outcomes – the public goods.

Opportunity for organic and the scope of mainstream proposals

We believe that there are inherent advantages that Government could exploit by investing in an organic systems approach to provide the public goods that both the environment and society urgently requires. With food and farming policy now being carefully scrutinised, many different visions and proposals have been published. Three are specifically considered: National Farmers Union (NFU)⁴, Wildlife & Countryside Link⁵, and the Sustain alliance⁶.

The NFU proposes solutions to the hard global problems it perceives are faced by agriculture in England on a global stage: Managing market and price volatility and the challenges of globalised commodity markets; Improving productivity to improve international competitiveness through high-tech intensification, and; Enhancing the farmed environment through specific measures to achieve specific outcomes. There is no good account of how public goods may be delivered, and there is a very clear demand that the current

4 NFU (2017) Delivering a bold and ambitious future for farming: Domestic agricultural policy – a framework for success. <https://www.nfuonline.com/assets/100873>

5 Wildlife & Countryside Link (2017) A future sustainable farming and land management policy for England. Wildlife & countryside link discussion paper. <https://www.wcl.org.uk/docs/Link%20farming%20and%20land%20use%20policy%20paper%20FINAL%20Sep%202017.pdf>

6 Sustain (2017) Briefing: Beyond 2020 new farm policy. https://www.sustainweb.org/publications/beyond_2020_new_farm_policy/

Helping organic business succeed

level of Government expenditure should continue, beyond the current commitment to 2020 already made. With the majority of non-organic farmers and the agro-chemical industry behind them, the NFU proposals carry weight and force.

The Wildlife & Countryside Link proposals recognise the need to value public goods in the context of the national accounts and proposes three top level objectives: Restoring our natural capital; Building resilience and managing risk, and; Promoting sustainable, innovative and humane production. The policy is based upon the existing regulatory minimum, supplemented by comprehensive and targeted Land Management Contracts and measures for promotion of production that is resilient, sustainable, innovative and humane. With 27 leading environment, nature and land management organisations supporting the Wildlife & Countryside Link proposal, it has the implicit support of the many millions of members represented by them.

The Sustain proposals are more comprehensive in that they put the delivery of public goods centre stage. They provide a focus on policy issues beyond the environment and located within the social and economic spheres, where there are clearly systemic failures, seen in poor health, poor diets and poorly-functioning rural economies. The Sustain alliance includes many organisations with a remit wider than the environment, so represents a more wide-ranging constituency.

The Sustain approach provides the immediate context for this paper, based as it is on the recognition of the linked need to better deliver public goods and find ways that allow us to live within 'planetary boundaries', whether environmental, social or economic. The problems we face are systemic in nature and thus a systems approach should form part of a new approach to Government policy, it should also enable new forms of business, farmer and citizen engagement.

Reducing the 'hidden cost' of UK food - true cost accounting in agriculture

The external costs of UK food and farming have been estimated by the Sustainable Food Trust⁷ to be roughly the same amount (£120 billion) as is spent on food by UK consumers, thus for every £1 spent on food, there are approximately £1 additional costs incurred elsewhere. Although the authors acknowledge the difficulty of making such estimates, this reveals a lamentable state of affairs. A high proportion of these extra costs are paid by UK consumers through general and local taxation, water charges, health care costs and lost income due to ill health. Other costs are paid over time to mitigate longer-term impacts such as global warming, ozone depletion, soil degradation and biodiversity loss. The report makes clear the widespread extent of the public 'bads' arising from the current approach. The priority for action arising from this analysis is also highlighted by the Natural Capital Committee.

Consumer expenditure on food (Table 1) and these hidden external costs of our food and farming system (Table 2) show that the greatest single contribution (around 30% of the total

⁷ Sustainable Food Trust (2017) *The hidden cost of UK food*. <http://sustainablefoodtrust.org/wp-content/uploads/2013/04/HCOF-Report-online-version.pdf>

hidden costs) is due to food consumption-related health costs (largely beyond the farmers' sphere of influence), with a similar amount being accounted for by natural capital degradation and biodiversity loss (both effectively within the farmers' sphere of influence).

Table 1: UK Consumer spend on food

| | £ Billion |
|---|-----------|
| Food | 86.08 |
| Fruit & vegetable juices & non-alcoholic drinks | 8.44 |
| Catering | 25.62 |
| TOTAL | 120.14 |

Table 2: Hidden external costs of UK food

| | £ Billion |
|---|-----------|
| Natural capital degradation | 30.93 |
| Biodiversity loss | 12.75 |
| Food consumption-related health costs | 44.91 |
| Food production-related health costs | 16.08 |
| Farm support payments and regulation | 6.36 |
| Net hidden costs of food imports ^a | 9.22 |
| TOTAL | 120.25 |

^a The cost of the environmental impacts of producing imported food and feed, less the pro-rata costs of producing food we export, which are already included within the natural capital and biodiversity costs above.

The aim of any future food and farming policy, and the financial support that Government provides, should be to reduce these external costs. The current budget for farm support in the UK amounts to £3 billion (or 2.5p in every pound spent by the consumer on their food). This is one-fortieth of the total external costs, and less than one-tenth of the hidden environmental costs alone. On the face of it this level of expenditure seems too little to secure the public goods we need in each of these categories. In any case, the way the money is currently spent (75% of the farm support budget goes on area based flat-rate payments with effectively no environmental cross-compliance) delivers few public goods. This is clearly perverse.

Such estimates of the true cost of food are at the heart of True Cost Accounting (or True Value Pricing), these techniques can help estimate the external costs so that they can be factored in to the economics of food and farming. By doing this it highlights the challenges and provides a useful financial metric for policy makers and producers to make considered decisions as to how to shape the overall UK food and farming vision including what food to produce and how to produce it, whilst also enabling citizens to make informed decisions about what and how they consume. At present there are relatively few incentives to produce in a way that could remove significant hidden costs and instead we encourage production and consumption with high hidden costs to society.

The existence of these largely hidden costs is the result of a failure to recognise the public goods that should arise from food and farming. Far from costing society, our food and agriculture should bring a net benefit by being

entrepreneurial, innovative, efficient, productive, enriching, nourishing, healthy and culturally rich.

Public goods – definition and delivery

Public goods are defined by economists by their non-excludability (you and I can both enjoy them) and their non-rivalry (if you use it, it doesn't mean there isn't any left for me). However, as far as the public goods from food and farming are concerned, it is relevant to also look at the converse: the 'systemic failure', that which places an additional external cost – cash or non-cash – on the final food product and through the value chain. In contrast to the goods, systemic failures are includable (I can't avoid being included, I have no choice) and rivalrous (if you/I use it there is less of it for me/you).

For example, high biodiversity is a public good. This is non-excludable – everyone can enjoy high biodiversity, and it is non-rival – I can enjoy it and that doesn't limit your enjoyment. However the converse, the systemic failure, is seen in the ongoing significant decline in biodiversity, soil degradation, poor water quality, flooding and climate instability from which we all suffer. This current prevailing condition is therefore imposed upon me; I can't avoid suffering from it. It is essentially 'includable'. It is also 'rivalrous', in that if I exploit it, there will be less for you.

The key thing to note is that both public 'goods' – systemic success, and public 'bads' – systemic failures, all arise from complex 'system' level interactions. Consequently, we have to think in a systemic way if we are to overcome the failures and mitigate the unintended consequences.

It is these systemic failures, the external costs – not only environmental, but also social and economic – that have been imposed on society that cause justifiable concern. The hidden costs of UK food reveal the scale of these costs, possibly equivalent to the total amount spent by UK consumers on their food. These costs have arisen as a result of many interrelated factors, with complex relationships between the various elements of the farming and food system. These interact with market forces, largely out of control of Government and in the hands of private business. Although there is some commitment through CSR agendas, addressing environmental, social and economic issues, this is still largely only a priority for supermarkets and large brands and even with these more public facing companies there are several key issues that are yet to be coherently confronted. In any case, such concerns will always compete to a greater or lesser extent with the absolute priority for businesses to create shareholder value. It is also worth noting that the products sold will vary widely in the extent to which they offer benefits rather than costs (e.g. a pack of fresh vegetable stir-fry vs. an over-packaged, meat-based ready meal), whilst the perception of benefits and costs will differ amongst consumers and the businesses selling them the products.

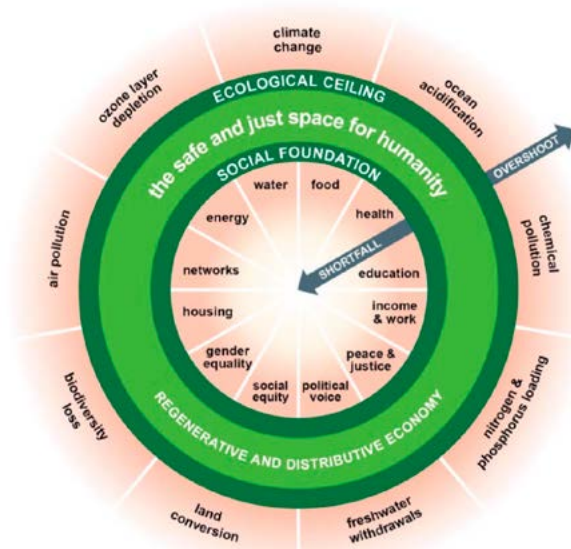
This paper is primarily concerned with the environmental public goods and 'bads' that may arise from farming, and the way in which organic production can help deliver these and thus mitigate the external costs. However, the farming system can and does have spill over effects into social and economic public goods and private benefits. A farming system that is focused on intensive production of cheap meat or commodity crops for making the ingredients for processed food will be likely to be associated with external costs to human health

and animal welfare, as well as the more obviously farming-related environmental costs.

Feeding people within 'planetary boundaries'

Overall, the intention must be to ensure that the delivery of public goods is such that we stay within the planetary boundaries, where the 'ecological ceiling' is not exceeded and at least a sufficient social foundation is secured (Figure 1). There is an imperative now to discover how we can live within the planetary boundaries such that environmental stability, social equity and economic security are achieved. This is of central importance for the continued development of more effective sustainable food and farming systems. It is also essential for achievement of the Sustainable Development Goals. This will underpin the resilience of food production in the UK whilst reducing the burden on other parts of the world through the 'footprint' that is presently derived from the UK food system⁸.

Figure 1: The safe and just space for humanity⁹



This is at the core of the underlying rationale of the approach proposed in this paper. The urgency of this is underlined by the extent to which, boundaries have already been breached, and the minimum social foundation is not reached. The nitrogen cycle, biodiversity and climate stability are the key examples where environmental planetary boundaries have been breached or are about to be breached. There are also many examples in the social and economic sphere where there has been failure and although these issues are not the primary focus for this paper, it is essential to bear them in mind whilst examining the need and scope of alternatives in the UK. The local and national interests must be seen from a wider perspective as our food system can result in negative global impacts.

8 WWF (2008) The living planet report. WWF, Gland, Switzerland. http://d2ouvy59p0dg6k.cloudfront.net/downloads/lpr_living_planet_report_2008.pdf

9 Doughnut Economics - Seven Ways to Think Like a 21st-Century Economist. By Kate Raworth

Public goods in the UK ‘National Accounts’

In the National Accounts, as presented in the Blue Book¹⁰, agriculture as a sector is a very small contributor (less than 1%), to the gross value added (GVA) in the economy. All parts of the economy, included together, amounted to £1,540 billion (one-and-a-half trillion pounds) in 2013. However, it is obvious that food and farming as a whole must represent a significant proportion in at least four of the sectors outlined in the Blue Book. This is not considered.

The Blue Book does not provide information on the aggregate contribution of food and farming as a whole, so it is not possible to determine whether this aggregate food and farming system is optimal from the point of view of the public goods at issue. Data is needed to reveal which costs are externalised and which are internalised. The evidence from the apparent hidden costs of UK farming shows it is definitely sub-optimal, with many external costs placed on society and the economy, hence the need for some new thinking. The mainstream approach maintains many perverse and profoundly unhealthy and unsustainable practices in a web of dependency.

There is a huge impact arising from the failure to ensure the provision of public goods through better food and farming. Given the potential significance of Government action to address this, whilst recognising the complex interactions within market economies, it seems to be of critical importance to encourage a systems approach to deliver at the lowest transactional cost. Beneficial systems have the scope to deliver on a multitude of required outcomes simultaneously. This has the potential to enable Government to deliver least cost solutions whilst ensuring that the delivery of public goods is not compromised.

Since public money is expected to provide public benefit, then there should be some mechanism to enable assessment, learning and improvement. The Treasury Green Book¹¹ outlines the way in which policies should be evaluated to ensure that public goods are delivered, lessons are learnt and policy improves in its targeting of public money towards the public interest. It presents the techniques and issues that should be considered when carrying out assessments of all new policies, programmes and projects, whether revenue, capital or regulatory. All of these should be subject to comprehensive but proportionate assessment, wherever it is practicable, so as best to promote the public interest.

From theory to practice

Taken overall, the Blue and Green Books show that the Government recognises issues relevant to public goods from food and farming as part of the National Accounts, but it is clear that there is a limited development of these issues in terms of the recognition of the importance of food and farming for a multitude of public goods; the methods for measuring

¹⁰ UK National Accounts, The Blue Book: 2015 Edition <https://www.ons.gov.uk/economy/grossdomesticproductgdp/compendium/unitedkingdomnationalaccountsthebluebook/2015-10-30>

¹¹ HM Treasury Guidance, The Green Book: Appraisal and Evaluation in Central Government July 2011 <https://www.gov.uk/Government/publications/the-green-book-appraisal-and-evaluation-in-central-government>

and rewarding public goods; and the type of farming systems that should be prioritised. This is a gap that urgently needs to be filled.

Organic farming is efficient by the Government's own measures and if productivity is deemed to measure output in terms of overall benefits to society as a whole, then organic production should definitely be in the mix. What has to be weighed up is how public goods are defined and valued and conversely how actions that negatively impact on them are mitigated, given the systemic nature of the failure. It is critical that Government implements policies that deliver on a multitude of public goods simultaneously whilst also ensuring that farm and rural community support can be delivered at a low transactional cost and with clearly demonstrable outcomes.

The importance of valuing costs and benefits is clearly acknowledged in The Green Book, although the dependence on a monetary valuation is a real problem, inadequately addressed. Since the policy appraisal process must consider all potentially relevant costs and benefits, it must overcome the fact that many of these will be non-cash, and will tend to be out of range of Government intervention; left instead to private individuals and businesses operating on a wide range of scales, from the household, to the community to the global corporation. Since this central problem is not addressed, the *de facto* approach to cost-benefit analysis is inevitably geared towards only those costs and benefits that are more or less internalised and thus can be (or are traditionally) monetised.

From the evidence presented above, it seems to be reasonable to judge that organic food and farming systems do successfully internalise external costs, so that the premium currently borne by the final consumer of organic food could, in fact, be borne by Society.

Public goods arising from farming

Public goods arising from farming have been defined by the Institute for European Environmental Policy (IEEP)¹², they identify 10 specific to the UK:

- Agricultural landscapes
- Farmland biodiversity and the protection of pollinators
- Water quality and availability
- Soil functionality
- Climate stability
- Air quality
- Resilience to flooding
- Rural vitality
- Food security
- Farm animal welfare and animal health

These are all clearly in the environmental sphere, although they have spill over into the social, for example through interaction with human health (diet-related disease, occupational health) and economic (employment, trading relations, rural economy). The public goods in the social and economic spheres do not strictly fulfil the economic definition

¹² Institute of European Environmental Policy (2009) Provision of public goods through agriculture in the European Union. https://ieep.eu/archive_uploads/457/final_pg_report.pdf

of a public good, in that they are neither fully non-excludable nor non-rivalrous.

Each of the public goods listed above have a direct, multi-factorial relationship with the practices adopted by farmers. Each must be subject to stable limits (outer ring – i.e. the planetary boundary) and achieve minimum thresholds (inner ring – i.e. a social and environmental threshold).

When considering policy to support the delivery of public goods (which must by necessity involve Government departments, the public sector, private businesses and individuals) then the fundamental approach to these policies, we propose, must begin by first assessing them within the context of a mitigation hierarchy¹³, a concept that has been specifically applied to policy analysis and development with respect to biodiversity loss. It is directly applicable to the avoidance of harm and the delivery of good. The hierarchy includes the following procedures:

- **Avoidance:** measures taken to avoid creating impacts from the outset, such as careful spatial or temporal placement of elements of infrastructure, in order to completely avoid impacts on certain components.
- **Minimisation:** measures taken to reduce the duration, intensity and / or extent of impacts (including direct, indirect and cumulative impacts, as appropriate) that cannot be completely avoided, as far as is practically feasible.
- **Rehabilitation/restoration:** measures taken to rehabilitate degraded ecosystems following exposure to impacts that cannot be completely avoided and/ or minimised.
- **Offset:** measures taken to compensate for any residual significant, adverse impacts that cannot be avoided, minimised and / or rehabilitated or restored, in order to achieve no net loss or a net gain. Offsets can take the form of positive management interventions such as restoration of degraded habitat, arrested degradation or averted risk, protecting areas where there is imminent or projected loss.

A 'cyclical, regenerative' systems approach, advocated here in this paper works within this hierarchy, aiming as it does to completely avoid or minimise the negative impact and contribute to restoration and offset of degraded environments.

Policy to encourage organic farming

Our contention is that each of the three areas of sustainability: Environment, Social and Economic are better served if the limits of the food and farming system are addressed together. This would mean that as many factors as possible are addressed simultaneously. From the point of view of the proposals made here, the farm production and processing standards that are a legal requirement for the organic label represent a well-defined and controlled system that touches on, more or less directly, many of the key ecosystem, social and economic limits and thresholds that are not so well provided for in other approaches. There are many examples where the link is not direct between prescription and outcome, but a clear relationship is apparent in many cases and this could be built on.

Regardless of the way in which the food and farming system is described – high-tech, agro-ecological or organic, there are

¹³ Department for Communities and Local Government (2016) Guidance: Natural Environment. <https://www.gov.uk/guidance/natural-environment>

key factors that must be taken into account to help stay within the critical limits that will dictate our future viability. There are different scales on which we can design and support systems of any sort that offer improved performance in terms of living within sustainable limits whilst meeting critical thresholds.

We propose that critical limits are observed and clear criteria for public goods agreed. In identifying these public goods, we must aim to create a broader framework that can address the challenges in a systematic way. The Swiss Institute for Organic Husbandry (FiBL) has analysed how a public goods oriented policy should be supported by payments that are made on the basis of outcomes and results, with the specific prescriptions relating to the farming practices that, taken together, can deliver system level outcomes¹⁴.

The implementation of a new UK farm policy aimed at providing public goods will require a significant transition period, but by supporting organic within a broader policy framework will signal a direction of travel and intent by the UK Government to UK citizens that they do indeed want to leave the environment in a better state than they found it. Under this policy, organic/agro-ecological farming could account for around 20% of food and farming allowing more mainstream policy approaches (as represented by NFU and Wildlife & Countryside Link) to deliver policy solutions more relevant to the remaining 80% of farms.

Detailed prescriptions and appropriate financial measures, with payments based on outcomes, will need to be defined to reward more, and discourage less sustainable options. It would reward organic farmers for the multiple public goods they deliver, but the outcome based support payments would also be of widespread application and relevance.

Based on these policies our vision would be that there should be a focus on more direct routes thus allowing greater opportunity to smaller, UK based food businesses to access the market and in so doing providing multifunctional benefits. There should be an emphasis on UK produced fruit, vegetables and salads, and on encouraging unprocessed or minimally processed foods. This will inevitably lead to less emphasis on fast and more highly processed foods and intensive pork and poultry products (both of these are self-limiting in organic standards). Extensive and welfare friendly livestock production should be the norm. There will be a focus on UK production, including for livestock feed and protein crops.

Organic practices for delivery of environmental public goods

Table 3 summarises the way in which certified organic production meets a range of environmental public goods. Detailed prescriptions for measures must be developed. These should provide the right incentives to unlock the entrepreneurial capabilities of farmers and food businesses to match the investment by Government. Payments will be based on outcomes, with a sustainability assessment used to evaluate eligibility¹⁵

¹⁴ FiBL (2017) Concept note: Towards a new public goods payment model for remunerating farmers under the CAP post-2020. http://www.ifoam-eu.org/sites/default/files/ifoameu_policy_cap_post_2020_public_goods_payments_concept_note.pdf

¹⁵ FiBL (2017) Concept note. op cit

Table 3: Organic production rules & the delivery of public goods¹⁶

| Rules (EU Organic Regulations) Article numbers refer to Council Regulation (EC) 834/2007 [A] and Commission Regulation (EC) 889/2008 [B] | Respect natures systems/cycles | Contribute to bio- diversity | Make responsible use of natural resources | | | |
|---|--------------------------------------|------------------------------------|--|-------|------|---------------|
| | | | Energy | Water | Soil | Air & climate |
| Prohibitions [A: 4 (a) iii and (c)] | | | | | | |
| No mineral nitrogen fertilisers | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| No herbicides, only authorised products can be used | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| No landless livestock production | ✓ | | ✓ | | | ✓ |
| No hydroponic production | ✓ | | | ✓ | ✓ | |
| No use of GMOs | ✓ | | | | | |
| Strict control of external inputs [A: 4 (b)], minimisation of the use of non-renewable resources [A: 5 (b)] and recycling of wastes and by-products [A: 5 (c)] | | | | | | |
| Only permitted fertilisers: low-soluble mineral fertiliser and soil conditioners when need proven | ✓ | ✓ | | | ✓ | |
| Only authorised plant protection products when established threat | ✓ | ✓ | | | ✓ | ✓ |
| Feed primarily from holding or same region (with exceptions) | ✓ | | ✓ | | | |
| Stocking density and use of livestock manure restricted to maximum of 170 kg N/ha and year | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Obligations to use good husbandry practises and prevention [A: 4 (a) iv and 5] | | | | | | |
| Multiannual crop rotation including legumes and other green manures | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Tillage and cultivation practices that maintains organic matter, and protects soil | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Maintain crop health through prevention (natural enemies, the choice of species and varieties, crop rotation) cultivation techniques and thermal processes | ✓ | ✓ | ✓ | | ✓ | |
| Number of livestock limited to minimise overgrazing, poaching, soil erosion or pollution | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Preference for inputs from organic origin (Art 4b with exceptions (Art 4d)) | | | | | | |
| Manage entire holding organically (with exceptions) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Only organic seed (with exceptions) | ✓ | | | | | |
| Only organic feed (with 5 % exceptional rule for monogastrics) | ✓ | | | | | |

Farming systems that provide public goods share many characteristics, although different practices will be relevant to different public good outcomes. Taken together they work more effectively than singly, the whole is greater than the sum of the parts. Farming practices listed in Table 4 represent a set of menu-based prescriptions that provide synergy, regeneration and protection of natural capital. Together they can operate within ecosystem planetary boundaries.

This scheme has been piloted in Germany and Austria, and provides a mechanism to allow farmers to choose appropriate measures for their local situation. They then receive payments based on the outcomes. A similar approach to the provision of social and economic goods, in line with the parameters outlined above, is more complex but urgently requires development. It is more complex because the social and economic goods are not, in the economic sense, public goods (i.e. they are neither fully non-excludable nor non-rival) and because they are influenced by many more factors than are within the control of the farmer (unlike the farming practices in Table 4) or Government policy. A diet that induces ill health, or a rural society with no jobs are both the result of many complex interacting factors, with food companies, advertising, business practice and cultural attitudes all playing their part.

16 Sanders, J., S. Padel, A Vieweger, M. Stolze, B. Huber, O. Schmid, L. Nocentini, A. Devot, T. Clement, J. Polakova, C. Keenleyside (2013) Evaluation of the EU legislation on organic farming. von Thunen Institute. https://ec.europa.eu/agriculture/sites/agriculture/files/evaluation/market-and-income-reports/2013/organic-farming/fulltext_en.pdf

Table 4: Land use practices that together maximise public goods and operate within ecosystem boundaries (list based on DVL proposals in Germany/Austria¹⁷)

| Types of land use | Arable |
|--|--|
| Number of types | Average field size |
| % permanent pasture | Plant cover during winter |
| Farm nutrient balance | Number of crop types (diversity) |
| Landscape elements | Fragmentation |
| Livestock | No use of chemical fertiliser |
| Antibiotic use, move to zero | No use of chemical pesticide/herbicide |
| Veterinary costs | Spring arable crops |
| Enriched housing | Peas & beans |
| Outdoor access | Green fallow |
| Forage % of diet and grazing and concentrate use | Uncultivated stubble, natural regeneration |
| Reliance on imported feed grains/pulses | Flower meadow/strips |
| Grassland | Conversion of arable to grassland |
| No harrowing period X-Y | Conversion of arable land to agro-forestry |
| No use of chemical fertilisers | Conversion of arable land to horticulture |
| No use of chemical pesticide/herbicide | |
| No organic manures (low fertility pasture) | |
| No mowing before month X | |
| Permanent pasture | |
| Fallow land | |

17 DVL (2016) Public goods bonus – putting a price on environmental services provided by agriculture. https://www.lpv.de/uploads/tx_tproducts/datasheet/PP_Gemeinwohlprae-mie_FIN_EN_web-neu_01.pdf

Defining and valuing public goods – working with Defra work streams

Defra are currently undertaking in depth analysis of post-Brexit policy options through five work streams:

- Resilience
- Productivity and growth
- Animal and plant health and welfare
- Rural growth
- Environmental outcomes

These work streams can be considered from the point of view of the public goods and the current systemic failures discussed in this paper. **Table 5** shows how the Defra work streams relate to both public goods potentially available (A), and systemic failures arising (B) from failing to provide them. Although all are equally important, the underpinning principle must be to secure a resilient food system in order for the Government to ‘grow more, sell more, export more’.

The system based cyclical approach advocated here works within the mitigation hierarchy already outlined, which provides the basis for recognising and valuing strategies that ultimately have a positive impact on public goods.

Table 5: Defra work streams: A framework to assess public goods and systemic failures.

| Defra Work stream | Public Goods arising (A) | Systemic failures arising (B) |
|---|---|--|
| <p>Resilience – Competitiveness can also be supported through resilience. Good risk management can improve productivity and help businesses to recover from shocks. In particular, the farming industry as a whole could be better supported to combat catastrophic risk, such as drought, flooding or disease.</p> | <ul style="list-style-type: none"> • Resilience to flooding • Food Security - sufficient quality nutrition accessible & affordable • Climate stability • Soil functionality • Air quality • Rural vitality/diversity • Farmland biodiversity (in the face of increased disease and pest threat from higher temperatures) | <ul style="list-style-type: none"> • Vulnerability to shocks (weather effects) • Diet and environment related ill-health - mal and over nutrition • Loss of top soil (2m+ tonnes/year) • Coalescing of farms and increased specialisation (high capital access) • High levels of incumbent inertia • Farming for support payments • Lack of active farmer engagement in marketing produce driving margin into the supply chain • Overreliance on farm of brought in inputs and expertise driving margin into agricultural supply sector and out of the rural community |
| <p>Rural Growth – Provide better opportunities for people in rural areas and an improved rural infrastructure to support farm businesses. Support for rural growth is currently offered through the CAP, so is considered here.</p> | <ul style="list-style-type: none"> • Rural vitality/diversity | <ul style="list-style-type: none"> • Coalescing of farms and increased specialisation (high capital access) • High levels of incumbent inertia • Farming for support payments • Lack of active farmer engagement in marketing produce driving margin into the supply chain and out of the rural community • Overreliance on farm of brought inputs and expertise driving margin into agricultural supply sector and out of the rural community |
| <p>Productivity and Growth – Boosting farm competitiveness, driving opportunities for productivity growth and improving competitiveness in the farming industry through the provision of business skills programmes.</p> | <ul style="list-style-type: none"> • Food security • Climate stability • Farmland biodiversity • Rural vitality • Air and water quality • Soil functionality • Animal welfare | <ul style="list-style-type: none"> • Intensity of resource use & disposal, exceeding carrying capacity • Excessive use of artificial nitrogen leading to increased GHG emissions, contamination of aquifers and aquatic ecosystems, and loss of soil function • Loss of 2M+ tonnes of topsoil/annum in the UK • Sources of phosphate depleted and increasingly sourced from unstable/economically difficult areas of the world. • Current system is inefficient because the returns from farming differ from the returns expected by society as a whole • Current system is unproductive as the output overall is disadvantageous to society |
| <p>Environmental Outcomes – Delivering improved environmental outcomes and public goods through effective land management; such as landscape protection and enhancement. We want to make sure that we have a system of agricultural support that recognises the work of farmers and puts environmental protection and enhancement first.</p> | <ul style="list-style-type: none"> • Climate stability • Air quality • Water quality & availability • Soil functionality • Farmland biodiversity • Agricultural landscapes | <ul style="list-style-type: none"> • Increasing global temperatures • Poor air quality • High costs to provide safe drinking water • Declining biodiversity (farmland birds, pollinators, insects) • Excessive use of artificial nitrogen leading to increased GHG emissions, contamination of aquifers and aquatic ecosystems, and loss of soil function • Loss of farm/crop diversity within the farmed landscape |
| <p>Animal and Plant Health and Welfare – Safeguarding animal and plant health and welfare standards. British food enjoys a reputation for quality which has been built on high animal welfare standards, we are determined to maintain our high standards and keep improving where possible.</p> | <ul style="list-style-type: none"> • Farm animal welfare and animal health • Climate stability • Food security • Air quality | <ul style="list-style-type: none"> • Loss of efficacy of antibiotics • Poor nutritional outcomes from intensively reared/cheap food • Increased global temperature rises from intensive ruminant production systems • Loss of faith in food system by consumers |

A - Public goods: Non-excludable (you and I can both enjoy them) + Non-rival (your use does not limit my enjoyment)

B - Systemic failures Includable (I can't avoid suffering), + Rival (my use adds to your burden)