Paper 5/2 Agriculture session
For information

1. Purpose

1.1 To provide Commissioners with background information on agenda item 2, an information gathering session exploring the agriculture sector.

2. Background

2.1 This note provides detail of the participants who have been invited to give evidence as part of this session along with a list of suggested questions. Further background information is also included in the Annex to help inform the session.

What	Agenda item 2: Agriculture information gathering session
Who	Ruth Taylor, Policy Manager, National Farmers Union of Scotland Jane Slater, Head of Environment Policy, Agricultural Industries Confederation Steven Thomson, Senior Agricultural Economist, SRUC
Why	An opportunity to examine the opportunities and challenges for the agriculture sector relating to the move to a net-zero economy. Participants have background and knowledge across a wide-range of the sector, including front-line farmers in various sub-sectors, the agriculture supply chain and rural communities. A selection of possible questions are included below: • Do you see positive examples of the industry developing lower-emissions ways of farming? What are the lessons? • Is there an economic opportunity for Scotland in being a pioneer of low-carbon farming? • What would the impact of an unmanaged transition for the sector be? For example, imposing targets but without providing required support. • Is there an opportunity to boost resilience of farmers and rural communities by supporting diversification? (such as promotion of agroforestry) • How might the transition to reduce emissions affect different sub-sectors of agriculture differently around the country? • What skills do farmers need to adapt to lower-emissions practices? How can they be supported? • What impact might new innovative methods of farming have on the labour market and wider industry? (such as vertical farming) • Could a shift toward more sustainable local systems of agriculture help tackle food insecurity at the same time as reducing emissions?

	• Are there social/cultural factors that may impact whether farmers are willing to adopt new practices? (security of tenancy, attachment to way of doing things etc). How can they be overcome?
Additional background information	• Annex A: submission from AIC Scotland • Annex B: submission from SRUC • Annex C: submission from Nourish • Annex D: submission from SAOS

Annex A – submission from AIC

The Agricultural Industries Confederation (AIC) of which AIC Scotland is a part, represents over 95% of the UK's agricultural inputs: fertilisers, feeds, seeds, crop marketing, integrated crop protection solutions and in addition, professional accredited advice to UK farms.

The value of the Agri-supply chain we represent is approximately £9 billion and integral to the £120 billion food and drink industry in terms of supply of goods and services which support the stable, safe and traceable provision of UK foods etc.

We are committed in our contributions to helping the UK meet Net Zero commitments seeing this as compatible with our members' existing and longstanding goals to become more sustainable: environmentally, socially and commercially. Considerable progress has been made in energy, and input use optimisation across our sector and we are continually building on our investment and efforts.

Our response is framed under the three questions raised by the Commission:

1. **What are the main economic opportunities and challenges for the agriculture sector associated with meeting the 2045 net-zero target?**

<u>We have identified the following economic opportunities:</u>

i. To position Scotland as a global leader in farming the landscape in synergy with its natural assets, geography and climate. COP26 In Glasgow next year presents a timely opportunity for Scottish Government and Industry to work in collaboration to tell Scotland's story and to shape the future vision in real terms.

> We believe it is important to provide leadership, incentives and the business transition funds to help farm businesses adapt quickly and confidently to grow income from all their farm assets: excellence in food/ bioenergy production alongside carbon capture and other environmental goods.
>
> The key to success is identifying and promoting win-win changes in farm practice which will deliver productivity growth, farm performance and profitability while also meeting the 25 year environment plan goals and the three pillars for achieving net zero:
>
> 1) Boosting productivity and farm efficiencies and thus reducing agriculture's greenhouse emissions
> 2) growing farmland carbon storage in hedges and trees, and other environmental goods and
> 3) coupling bioenergy to carbon capture, utilisation and storage.

Efficient and productive farms tend to be the most environmentally sustainable ones and this integration between high performance and environmental good is well understood. In this knowledge lies the opportunity to grow the rural economy and jobs.

Experience reliably informs us that integrated Farm Management Plans, created by farmers and/or with professional farm advisers work in practice and are a recipe for success in delivering for agriculture, the environment and hence net zero. The benefit lies in the principles of creating a learning, dynamic process for change – maximising outputs and minimising impacts based on a holistic attitude to land management. Once farmers can see the value in taking a proactive/ self-audit approach to benchmarking what they are doing, taking the next step to have performance verified, is less of a barrier. Building on carbon reduction planning and reporting would be a logical step. Many existing farm auditing tools either include carbon auditing or are being adapted. (See annex, for existing measurement/benchmarking tools).

ii) The net zero commitment provides an opportunity to draw investment into the rural landscape to secure the supply of a diverse range of farm goods: crop and animal proteins, bioenergy, carbon sinks in natural habitats, biodiversity and landscape benefits.

The creation of a resilient and confident farming sector, which is equipped to adapt is vital. This will require annual investment in business adaptation productivity programmes, alongside land use management programmes so that the synergies can be fully explored.

Joined-up strategies from Scottish Government are required – enabling business to adopt best practice and innovation to realise production and carbon net zero goals in tandem.

Government will need to use practical support mechanisms, professional influences (farm advisers) and fiscal levers to change the farming mindset from annual costing cycles to longer term income from farming and new carbon, bioenergy and biodiversity markets.

Early adopters in the Integrated food and drink supply chains and also landowners, are already changing their business models to capture the total value in the farmed landscape, not only in the stable provision of safe, reliable foodstuffs but in selling the wider benefits of good landscape management to investors, including carbon capture in farm woodlands and hedges and biomass crops in less favoured areas.

iii. Tapping into the knowledge and skills of private professional sector advice, to complement that of Scotland's Rural College etc. in supporting for farming business to adapt

Government's open recognition and support for industry led advice services would be extremely beneficial in unlocking the knowledge, for example, held by crop agronomists and animal feed advisers. From the basic level uptake of sound crop nutrient and feed plans to the complexities of delivering fully integrated farm plans linked to soil and animal health, to wider and land use planning, these advisers have a range of skills to assist farmers to reduce their carbon emissions, and create carbon storage opportunities (e.g. in biomass cropping, coppice, hedges, tree corridors and woodlands).

The training that is required to enable farm advisers to practice at professional level standards, has been designed to assist farmers to make the incremental changes necessary to reduce their production emissions. Existing training programmes overseen by independent schemes (Feed Adviser Register (FAR) and FACTS for crop nutritionists) specifically cover the policy rationale for change and the economic & technical rationale for reducing nitrous oxide and methane emissions. Furthermore, advisers are assessed on the status of the knowledge in order to maintain their professional status and are required to keep their knowledge and skills continually up to date. The Continuing Professional Development approach which exists creates an opportunity for bolting on new training in farm carbon management to fill knowledge gaps as they are identified.

Farmers need to be incentivised to be more professional, to be the best that they can be and take the best advice available as required. This incentivisation should be integrated into the state financial support.

iv. Accelerate adoption of best practice, new genetics and innovation

There is untapped potential in average performing farmers adopting the best practices of the top performing businesses and in so doing reduce farm greenhouse gas emissions by 25%. (Defra modelling, 2018). Good farm nutrient and Integrated Pest Management (IPM) agronomy plans are key drivers in delivering multiple production and environmental goals and there is evidence that the there is a relationship between knowledge and advice and positive changes in farming practice (P97)

Further opportunities exist for integrating soil health and crop nutrition with animal nutrition and health to achieve greater levels of resource efficiencies and to bolster crop resilience to stress and disease.

A focus on managing new crop, and grass varieties to a level of performance more closely linked to genetic potential, similarly so for breeds of livestock, is required through greater attention to optimising conditions for growth and disease resistance.

Support for new plant breeding techniques which create new varieties, or crops (for food or biomass) which are more resilient to climate change, are higher yielding and more resource efficiency, will be necessary.

Farmers will need further support in selecting the right fertilisers, feeds, combinations and treatments and precision techniques to reduce GHG emissions - Scottish Government can support this process by signposting farmers to tools which report the emission factors for different materials.

vi. Develop domestic and export markets based on audited environmental accounts

This can be done (using aggregated farm data, presented by sector or region. A good indicator of carbon production efficiency is in Nitrogen Use Efficiency http://www.eunep.com/or Nitrogen Utilisation Efficiency in livestock. Other sustainability metrics exist (Sustainable Farming Trust, LEAF, Cool Farm tool etc). It is important that action to achieve the net zero outcomes complement the delivery of wider sustainability goals.
We have identified the following economic challenges:

i) The need to avoid exporting our carbon burden:
Open trade allows importation of lower cost food potentially carrying a higher carbon footprint (2-5x higher than UK produced food e.g. for beef). A future taxation system needs to reflect the environmental standards of imported foods allowing a level playing field for Scottish producers.

ii) Current EU Emission Trading Scheme rules place the last two remaining UK production facilitates of Nitrogen (Ammonium Nitrate) fertiliser at risk until such time as the process of production can be fully decarbonised by carbon underground carbon storage. Similarly, other European Nitrogen production facilities face the same uncertainty.

It is therefore essential that sustainable production and consumption policies are joined up and carbon accounting is considered in full life cycle terms. UK mineral nitrogen is amongst the lowest in the world and it is strategically important that Scottish Government supports fiscal interventions or allowances necessary to prevent displacement of UK production at the expense of imported materials which cannot claim similar carbon footprints.

ii) There are still challenges in quantifying enhanced carbon storage potential in soils

However, this challenge should not be confused with the production benefits of well-structured soils enhanced by organic matter which can support stepped changes in improving input use efficiencies and therefore reducing farm greenhouse gas emissions.

iii) Competing policy priorities can be a challenge: Renewable energy polices which create unintended consequences/imbalances (as has been the case in Germany with AD)

The focus should be on decarbonising technologies which don't solve one problem and replace it with other e.g. compete for resources i.e. diverting material from animal feed to energy plants

2) What are the likely wider social (health, community etc.) opportunities and challenges associated with meeting this target?

The solutions to achieving the net zero goal lie in the balance between the carbon emitted when food is produced and as a result of food consumed (in human respiration) and that which is possible to reduce and offset in above or below ground carbon storage.

Simple messages and one-track thinking which are easy for society to pick up on usually fail to explain the bigger picture or inform the populace and can hinder finding the right balance, as single interest parties rush to score points/moral high ground.

There is an opportunity for Government to educate and communicate the value of a balanced diet lifestyle which depends on a balanced ecosystem. There will be challenges to face as society pitches livestock protein v crop protein – however, not one solution is the right one in isolation and there is merit in considering how to educate communities on what the concept of balance means in our culture.

3) What actions do you think Government should take to manage the opportunities and challenges mentioned above?

Within the framework for rural funding, allocate specific support for farmers to develop whole farm adaptation plans in the short, medium and long term – assisting an incremental improvement from subsidy to market and public goods (including activities which move towards a zero carbon situation).

In addition to the actions we have covered above, in realising opportunities and overcoming challenges, we recommend that a proportion of state funding is allocated to facilitate the bringing together of knowledge on farm (funding the time for the farmer, agronomist, animal feed, wildlife, woodland advisers etc. to work together to form the collective farm goals and plans). This would mean that all experience and knowledge could be combined for the benefit of rural businesses for the long term with the intention of making them more resilient.

It could be envisaged that the whole farm business plans point to the technical investment/ innovative solutions required.

Annex: References – farm carbon accounting:

The LEAF whole farm audit is a good start (under continual development to account for all farm assets. Also: see:
Cool Farm tool
https://www.farmcarbontoolkit.org.uk/
https://woodlandcarboncode.org.uk/

A GLFI (Global Metrics for Sustainable Feed) database is also available for animal feeds which will shortly be more user-friendly when the Product Environmental Footprint calculator is available.

https://www.fertilizerseurope.com/initiatives/carbon-footprint-calculator/

There is also a clear link between biodiversity net gain and contributions to net zero carbon.

Note: Carbon trading already exists: Ref: The Environment Bank https://www.environmentbank.com/ Worth talking with the CLA Scottish Association of landlords

Annex C – Submission from Nourish

About Nourish Scotland

We are an NGO campaigning on food justice issues in Scotland. We believe tasty and nutritious food should be accessible to everyone, be sustainable, and be produced, processed, sold and served in a way that values and respects workers. We campaign for solutions that work across the board: we take a systems approach toward food and health, poverty, fairness, workers' rights, rural economy, environment, climate change, land use, and waste. Nourish is a member of the Scottish Food Coalition, Stop Climate Chaos Scotland, and Scottish Environment Link. Nourish is also a co-sponsor of the Farming for 1.5°C Enquiry. This response is however from Nourish, not from Farming 1.5.

Thank you very much for the opportunity to provide evidence to the Transition Commission. Please find our responses to your questions below.

1. **What are the main economic opportunities and challenges for the agriculture sector associated with meeting the 2045 net-zero target?**

There is potential for an increase in productivity across Scotland to improve the GHG emissions per kg of product or per calorie of nutritional intake. This is through a variety of technical measures, many of which will save farmers money. For example: better nutrient management – half of Scotland's fertiliser use is wasted at present and better slurry management can improve the product and uptake on field. Better attention to animal health will improve the productivity of a herd. Further suggestions can be found in the paper by V. Eory and colleagues[1].

However few of these technical fixes are new and are still not taken up by many farmers outside the pig and poultry sectors. Maximising profitability is assumed to be a major motivator but farmers and farming businesses are more complex that. Lessons need to be taken from this in order to ensure change is seen as positive.

However merely concentrating on improving productivity misses the larger issue as those farmers who are motivated by greater productivity will simply produce more rather than the same amount more efficiently.

The economic opportunities of shortening supply chains and making the industry as a whole more resilient are huge. By properly recognising and internalising the risks of inaction, it is easier to see how the economic opportunities exist.

[1] https://www.theccc.org.uk/wp-content/uploads/2016/02/MACCUpdate2015_FinalReport-16Dec2015.pdf

It is an opportunity to explore new varieties and types of crops, vegetables and fruit. At the moment the average person in Scotland eats only 3 portions of fruit and vegetables a day[2]. A switch to the Eatwell Guide – which includes more veg and less meat and dairy would cut the UK's food related emissions by 17%. Currently the UK produces 54% of our veg supply with only 3.3% of Scotland's arable land used to grow veg. If we are serious about meeting a 2045 net-zero target and peoples diet's change to reflect this, Scotland will have a huge opportunity to meet this higher demand for vegetables, fruit and pulses. The last decade has seen a resurgence of market gardening without a lot of support. This could be massively stimulated with the right policies and attitudes to what agriculture is in Scotland.

It is crucial however that reducing consumption is part of the same conversation as discussing reductions in livestock production as otherwise we will simply increase imports and push our greenhouse gas emissions somewhere else. This is not just for the communities we will be exploiting, nor for the people and ecosystems of Scotland as the impacts of climate change will continue to be felt. This cannot just be a superficial accounting exercise, it needs to consider the other impacts.

Yet there is a further complexity. QMS estimates from abattoir figures that we produce 144.5% of our beef needs and 193% of our sheep meat[3] and consume 2.2kg/yr/person. According to the Economic Report on Scottish Agriculture 2018 we produce 60 000t of sheep meat in Scotland or 11kgs per person – that's 500% of our sheep meat requirements. Much of this production is labour intensive, poorly paid, isolated and dangerous. Could there be farmers who don't want to do what they do but feel there is no option? Could we help them transition to what they would like to do? Or at a lower level of production? But the decision to reduce our food and drink exports from Scotland would have major implications on current policy and funding as Scot Food and Drink's ambition is to double the size of their industry to £30 billion by 2030[4].

Another element of reaching these targets is the need to reduce food waste in all parts of the system, but first these all need to be accounted for including on farm. Field veg is a particularly wasteful production as farmers will plough their crops back into the ground if the price isn't right. Certainly this adds extra nutrients in to the soil in a positive sense, but the waste of the inputs for that crop is massive and needs to be accounted for as most than just a financial loss. The GHG emissions of the fertilisers, pesticides, fuel and more need to be remembered as impacts on all of us, not just the farmer.

A major opportunity of meeting the 2045 target is that soil becomes the heart of the solutions and farming in Scotland. Investing in the health and carbon levels of our

[2] Scottish Government (2016), Scottish Health Survey - Main Report & Supplementary tables
[3] https://www2.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/PubEconomicReport/ERSA2018
[4] https://news.gov.scot/news/food-and-drink-exports

soils can lead to increased productivity as soils are able to retain more nutrients thus needing fewer inorganic inputs, reducing farmers' inputs bills and their reliance on worldwide supply chains. According to Climatexchange there is broad agreement across the evidence studied that some opportunities exist to use agricultural management to increase carbon storage in agricultural soils of around 174 Mt C[i].

Soil and resource use is at the heart of organic farming methods thus both saving GHG emissions and sequestering carbon. As such, an increase in land under organic farming in Scotland would greatly assist reaching our targets. It is also a vehicle to lower production intensity for those farmers who would like to continue farming livestock while maintaining the biodiversity benefits of having livestock in the food system.

Agroforestry is another tool that can be used to sequester carbon while still having land available for grazing. Studies[5] have shown that animal health and welfare increases in systems using agroforestry because of nutrient diversity and cover from inclement weather. Land management comparison shows that large proportions of grassland would need to be converted to woodland to provide similar carbon benefits as the integrative silvopastoral system[6]. Recognising the importance of agroforestry because of climate change benefits can have many other benefits that have positive economic consequences. This is before counting the economic production potential of the additional crops such as fruit, forage and fuel, or the biodiversity potential of the mixed habitats.

The challenges of meeting the targets is that there will have to be a reduction in the number of livestock being produced in Scotland and without suitable transition structures in place, current livestock and highly intensive arable farmers will have a challenge changing their mindsets and culture. This would have knock on implications to agricultural supply businesses and the people working in them.

2. What are the likely wider social (health, community etc.) opportunities and challenges associated with meeting this target?

If we meet the target in a just and holistic way, the opportunities are huge as we will be setting an example for the world in how to make rapid and major change so that we can all together transition to a cleaner, greener world.

In the shorter timeframe, meeting this target will mean we have cleaner air and water as agricultural inputs are reduced reducing nitrous oxide and ammonia emissions. This will have major positive implications for people with respiratory diseases who live in both our urban and rural areas. This will also reduce the weight on the NHS, the economic burden of asthma and COPD on NHS Scotland is estimated to be

[5] https://www.agricology.co.uk/resources/agroforestry-livestock-systems
[6] Beckert, M.R., Smith, P., Lilly, A. et al. Agroforest Syst (2016) 90: 371. https://doi.org/10.1007/s10457-015-9860-4

£266 million a year[7]. Air pollution plays a major role in these diseases so cleaner air will help reduce this burden and make living with the diseases easier. Many of those suffering are from deprived communities, so this may be a positive move for those communities. This will also have positive implications for biodiversity as toxins are taken out of habitats.

Researchers are demonstrating that certain phytochemicals in fruits and vegetables can help prevent type 2 diabetes, cardiovascular disease and cancer. Further they are an important source of dietary fibre and provide all the micronutrients our body needs to function well. Dietary fibre is essential for health-promoting gut bacteria to thrive. If Scotland's population ate more vegetables there are positive health implications in reducing obesity and chronic disease. Many of those from disadvantaged areas have the least access to fresh fruit and veg. If their intake improved this would again be an opportunity for Climate Justice in Scotland.

Making soil the heart of the debate will not just have economic advantages. In 2015/16 in a survey of catchment areas, 1/5 of top soils showed degradation. This reduces their capacity to store water thus increasing the risk of erosion and flooding[8]. As climate change increases the intensity of frequency of high precipitation evets, managing flood risk is of great importance to the health and safety of people, land and property across Scotland.

3. What actions do you think Government should take to manage the opportunities and challenges mentioned above?

We would recommend the following policies:

- All farms develop and implement 5 year soil plans as part of their eligibility for agricultural subsidies.
- Advisory services and agricultural teaching programmes adopt a soil first approach to their work, ensuring existing and new farmers understand the importance of soils and keep abreast of new expertise and best practice.
- Advisory services and agricultural teaching programmes prioritise productivity over production, with the culture of better meaning more animals and bigger machinery as replaced with more profit and healthy soils.
- Targets are set for 20% of Scottish arable land to be organic
- A redundancy type programme is set up for farmers and farm workers who no longer want to stay in farming but are at a loss as to how to transition to an alternative employment, lifestyle and potentially culture. Transition in this fashion can be particularly difficult for people who are self-employed. There are many

[7] https://www.gov.scot/publications/scottish-health-survey-2016-volume-1-main-report/pages/87/
[8] Scotland's Centre of Expertise for Waters (2016) Effect of Soil structure and field drainage on water quality and flood risk.

examples where this has been done in industry for the closure of factories where each individual's needs and experience is taken into account.

- A legal duty is on those responsible for livestock to promote positive animal welfare and high levels of health. This should be matched with easily accessible and affordable personalised veterinary services for all scales of farmer.
- Note must be taken of the outputs of the Woodland Expansion Advisory Group in 2009 – which advocated greater support and finance for agroforestry expansion in Scotland. Since that report not one system has been funded. Identifying the barriers to agroforestry is required.

[i] https://www.climatexchange.org.uk/media/3046/soil-carbon-and-land-use-in-scotland.pdf