

Technical Report on the evaluation of quantitative storytelling - Synthesis of lessons for QST for the Land Use Transformations Project (JHI-C3-1)

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List of abbreviations and acronyms

ARIOB	Agriculture Reform Implementation Oversight Board
ARP	Agricultural Reform Programme
EARS	Economic Advice for Rural Scotland (RESAS-funded SRP research project)
EC	Enhanced Conditionality
EFA	Ecological Focus Areas
Hutton	James Hutton Institute
LFASS	Less Favoured Area Support Scheme
M&E	Monitoring and Evaluation
NTP	National Test Programme
QST	Quantitative Story-Telling
QST 0	Initial QST cycle
QST 1	First QST cycle
QST 2	Second QST cycle
RESAS	Rural and Environmental Science and Analytical Services Division
RPID	Rural Payments and Inspections Division
SG	Scottish Government
SARP	Support for the Agricultural Reform Programme (RESAS-funded SRP research project)
SPI	Science-Policy Interfaces or Interactions
SRP	Strategic Research Programme
VCS	Voluntary Coupled Support
WP	Work Package

1 Summary

The purpose of the document is to report on what we have learnt from the two cycles of Quantitative Story Telling (QST). Capturing this learning delivers to our objective of evaluating inter- and transdisciplinary research in WP3.4 *Scientific and Wider Societal Exploitation of Research outputs* to inform and improve **science-for-policy practice**.

The report introduces the idea of science-policy interactions (see section 2). Quantitative Story Telling (QST) is designed to deepen science-policy interactions (K. B. Matthews et al., 2022). There have been **two QST cycles** during the Land Use Transformation Project to date, excluding start-up process which we refer to as QST0 (see [Milestone 10](#)). The first cycle focussed on **'Enhanced Conditionality' (EC) payments**. The second cycle undertook a **policy options appraisal of the distributional outcomes of regions**. In both cases, the QST cycles were to provide evidence to help design the first two tiers of the Scottish Agricultural Reform Programme (ARP) (see section 3). The evaluation methodology is described in section 4.

The findings cover the anticipated **impacts** of the cycles (section 5.1); information on **participants and interactions** (section 5.2); how the cycles were **implemented** (section 5.3); how the cycles were **experienced** (section 5.4); outcomes or **impacts** (section 5.5) and **what contributed** to these (section 5.6). The findings are presented per cycle and then compared.

The implications of these findings are discussed in section 6. Focussing on **policy processes** within the ARP meant the findings were important and urgently required. The main outcomes sought by Scottish Government were **independent evidence provision**. However, the outcomes sought by the Hutton researchers were broader: to **build more capacity, improve networks** and **broaden the framing** for current Agricultural policy. The two cycles were very different in terms of how researchers interacted with Scottish Government, and how the 'quantitative' aspect of storytelling was operationalised. However, both cycles produced **tools** for Scottish Government to use. There were also **trade-offs**; involving a lot of researchers in QST1 built capacity and networks within the James Hutton Institute but slowed down the responsiveness to Government, whereas the more iterative approach in QST2 could react to the policy rhythms more effectively but limited the learning to a few individuals. Most participants were not very interested in how QST worked, rather they appreciated the **delivery of relevant findings** with visualised results. However, many of the impacts accruing to QST1 and QST2 required the capacity building, networks and learning generated by the cycles. For example, raising awareness of the 'policy sudoku' – in other words, how choices in one tier of the ARP could have consequences for other tiers as well as other policies or across geographies and farm types seemed particularly resonant. The implications are also summarised in a **policy briefing** (K. Blackstock, Juarez Bourke, Matthews, & Nicholson, 2025).

The findings will be discussed as part of our end-of-year meeting in March 2025 and, depending on interest, monitoring and evaluation of the **next QST cycle** will start. We will continue to discuss the implications for practice with RESAS and other interested parties. It has been a privilege to observe and reflect on these interactions and **we thank all participants** for being willing to share their experiences to allow our learning to take place.

2 Introduction

This technical report is an output from the project (JHI-C3-1) within the Scottish Government’s Strategic Research Programme (SRP) 2022-27. It focusses on the task of synthesising the monitoring and evaluation of inter- and transdisciplinary methods within the work package on *Scientific and Wider Societal Exploitation of Research outputs* (WP3.4). The purpose of the document is to report on what we have learnt from the two cycles of Quantitative Story Telling (QST), a methodological approach designed to deepen science-policy interactions (K. B. Matthews et al., 2022). This provides insights for both the science and policy teams engaged in the research; and potentially, insights for other scholars and policy actors wanting to implement QST in other settings.

The purpose of the evaluation of inter- and transdisciplinary research in WP3.4 is to make an impact on the international science-for-policy domain. This means considering how well the data, tools, and processes within the two cycles of QST combined to deliver the anticipated impacts from the science-policy processes. QST is based on the principle that operationalising integrative land use science requires decision-making, whereby participants co-construct the research questions and not only provide data but also interpret and act on the implications of the analysis.

QST is used to support social learning between researchers and policy actors. It is well suited for governing complex issues, such as those involved in Land Use Transformations (multiple land use sectors, multiple objectives, multiple scales). The QST approach (illustrated in Figure 1) is typically conducted in cycles that combine qualitative analysis of themes, ideas and concepts; and quantitative analysis of ‘results’; with two transitional steps (what to quantify and how to summarise and visualise the results). This recognises that issue-framing and the interpretation of outputs can have a profound influence on what is analysed (or excluded), how it is analysed and what impact the research can have.

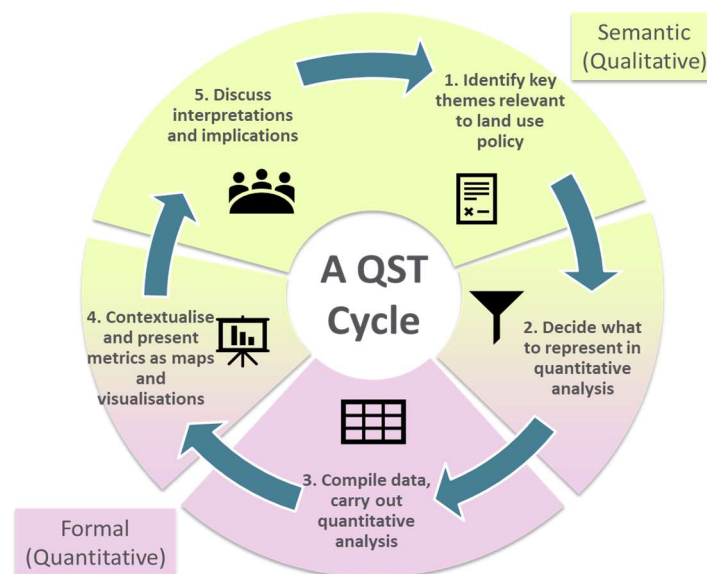


Figure 1: The Quantitative Story Telling Cycle

Five stages of QST can be recognised. Although these steps are described sequentially, there may be occasions to move backwards and forwards around the cycle to modify the analysis. The intention is not to pursue ever-greater depth of analysis, but to complete the QST cycle and generate meaningful outputs that stimulate deliberations with stakeholders.

1. **Identify key themes relevant to land use policy.** This part of the cycle can draw on analysis of documents as well interviews to identify the issues and ideas of relevance to stakeholders. This establishes if and how problems are represented, and which actors are involved. The outputs shape and initiate the formation of 'Mixed Teams' comprising non-academic stakeholders as well as researchers.
2. **Decide what to represent in quantitative analysis.** This entails progressively moving from higher-level priorities – i.e., the type and number of themes to analyse – towards decisions on the specific aspects of systems that will be represented, i.e. semantic definitions. Further choices also shape the analysis, i.e., setting system boundaries, scales of analysis, functional and structural types, and indicators. The result is a specific shared understanding of what will be analysed.
3. **Compile data and carry out quantitative analysis.** The contents and duration of this stage can vary greatly depending on the QST topic and the capabilities of the QST research team. Initial iterations of any QST have an overhead of investment in sourcing data, integration, quality control and visualisation. This stage can see the deployment of statistical, simulation and agent-based models.
4. **Contextualise and present metrics as maps and visualisations** that can be used to assess the system's feasibility (within biophysical limits), viability (within socio-economic limits) and desirability (compatibility with societal norms and aspirations). The process of summarising and communicating the outputs also aims to convey uncertainties and sensitivities arising from all parts of the analysis.
5. **Discuss interpretations and implications.** This stage sees deliberation and interpretation of the significance of the outputs of the QST analysis with stakeholders, and the shaping of any further cycles – with either new themes or alternative cases.

QST has been applied in a range of settings to date (Allen & Giampietro, 2016; K. L. Blackstock et al., 2023; Giampietro et al., 2017; K.B. Matthews et al., 2020; Keith B. Matthews et al., 2021; Waylen et al., 2023). These provide inspiration for our work. However, in our approach, we have prioritised using QST to enhance science-policy interactions and impact pathways; and therefore, have emphasised less some of the other aspects associated with earlier societal-metabolism based work, e.g. complexity theory and narrative analysis.

The evaluation of QST was guided by literature on science-policy interactions and understanding different dimensions of impact. Within the literature on working across the science-policy interface (SPI), it is essential that the focus is policy-led (i.e. salient or relevant), the science is credible, and the process of knowledge sharing is legitimate with due process and quality assurance (Bremer, Wardekker, Baldissera Pacchetti, Bruno Soares, & van der Sluijs, 2022; Cash et al., 2002). However, there is increasing attention to how

knowledge is used (Waylen et al., 2023; Waylen & Young, 2014; Young et al., 2014). Furthermore, there is increasing attention to the importance of iterative research cycles to improve engagement and impact (Sarkki et al., 2015). This potentially links with ideas about pathways to impact (Edwards & Meagher, 2020). Furthermore, there are important enabling conditions such as having time to experiment, strong organisational leadership and long term, flexible funding (Kapoor, Cvitanovic, Klenk, & Nguyen, 2024). In sum, these literatures remind us that SPI approaches such as QST depend on relationships and are strongly influenced by both individual commitments and wider institutional conditions.

The overall purpose of the research was to contribute to Open Science by focussing on practice of doing QST for real and to make visible the experience of participating in a SPI. This report focusses on linking what happened during the QST cycles to inform us about how to improve science-policy interactions and therefore interdisciplinary and transdisciplinary methodologies like QST. The focus is on what we learnt regarding the link between the QST process and the outcomes, to improve impact in future QST. Therefore, the methodological learning about how to *evaluate* QST cycles is not addressed in this report but will be developed for an academic audience (see section 7). The research questions for the report are as follows:

- What was the focus and anticipated impacts of the QST cycles?
- How were the QST cycles enacted?
- How were the QST cycles experienced?
- What impacts arose and how can these outcomes be explained?
- What are the lessons learned for future QST cycles, within the Land Use Transformations project and beyond?

3 The two QST cycles

Two cycles of QST have been undertaken with policy stakeholders:

1. Evaluation of Enhanced Conditionality Measures – QST1.
2. Options for Payment Regionalisation – QST2.

QST1 was started in the context of an active future Scottish agricultural policy development cycle that had specified Enhanced Conditionality (EC) measures being considered as conditions for up to 50% of direct support payments. These EC measures were judged by the researchers as being a critical element that would translate the funds to which conditions were attached into climate or biodiversity positive outcomes. At the start of QST1 the National Test Programme (NTP) was considering testing and demonstrating EC measures, yet the more transformative EC measures were judged, by the research team, as being too expensive to implement within the NTP. This meant that it would be valuable to provide research-based evaluation to complement any empirical findings from NTP. To that end QST1 conducted an expert based, evaluation of all the EC measures with both potential effectiveness and likely uptake considered in detail. The QST team organised workshops with domain experts from the wider Strategic Research Programme (SRP), on biodiversity, soils and waters topics. The QST team also placed the EC measures in the wider context of all the Agriculture Reform Programme (ARP) Tiers, highlighting key budgetary and other decisions that could enhance or limit what EC measures could be expected to deliver. The annotated timeline of QST 1 is shown in Figure 2.

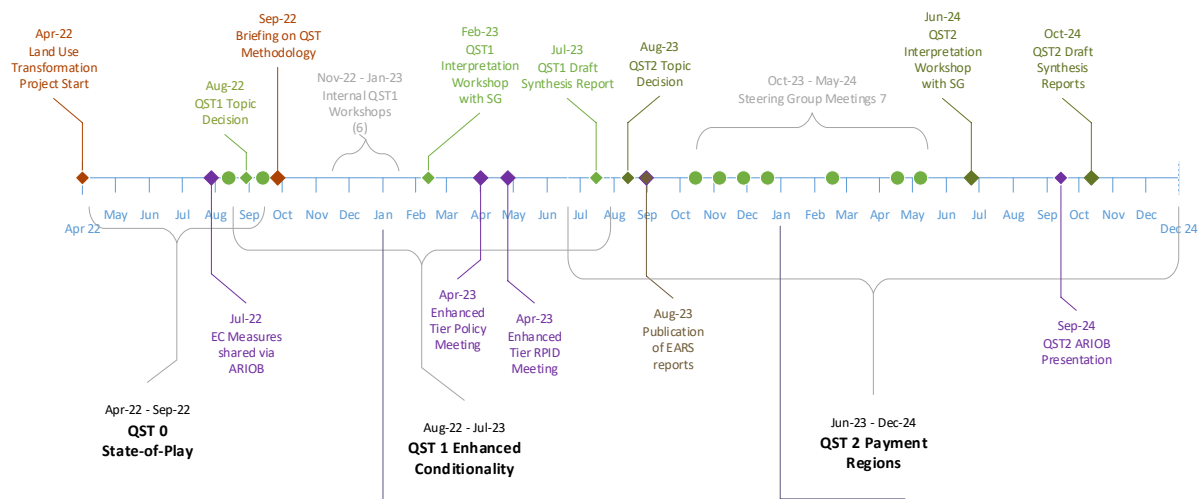


Figure 2.

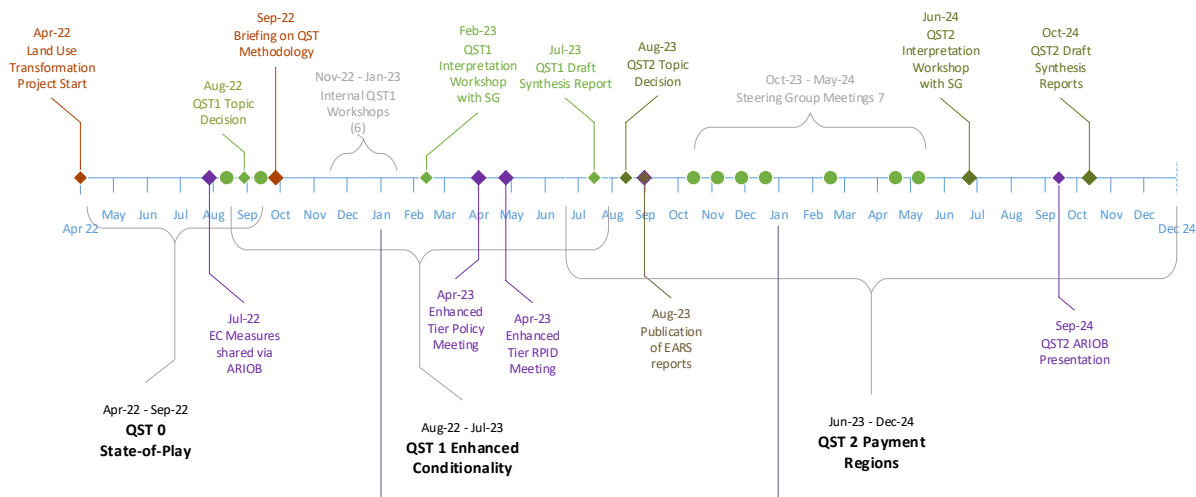


Figure 2: Timeline for the QST cycles

The second QST emerged from ongoing discussions of future agriculture policy options both generated by QST1 and from linked [contract research fund projects](#). QST2 was a more detailed policy options appraisal of alternative payment regions options linked to the Tier 1 planning within Scottish Government (SG), led by Rural Payments and Inspections Directorate (RPID). This was a much more narrowly focused analysis that dealt with the distributional outcomes of regions linked to rates of payment per hectare (area-based payments first introduced in 2015). All the analysis was undertaken by one team within the Land Use Transformation project, with the specification of the analysis constructed between the project steering group (RPID and RESAS - Rural and Environmental Science and Analytical Services Division) and Hutton leads. This was an intensely iterative process that experimented with using online tools (a Scenario Builder and PowerBi dashboard) to allow SG analysts and policy makers to generate their own scenarios and interpretations. Therefore, both cycles were undertaken to support different parts of the ARP, which between them are likely to account for most of the overall payments and will be the first parts of the ARP to be implemented.

4 Methodology

4.1 Data sources

The research team collected primary and secondary data for each of the two QST cycles. Primary data consisted of interviews with relevant stakeholders from the Scottish Government and the James Hutton Institute who were involved in each cycle. Secondary data consisted of existing documents that are relevant to the QST processes, such as research reports, presentation slides, research memos and meeting minutes or transcripts. We also tracked the events and people involved in each QST cycle; for the purpose of preserving anonymity, people are referred to in this report with a H (for Hutton participants) or S (for non-Hutton participants) followed by a number, e.g. 'H2'.

Additionally, QST1 and QST2 sit within a suite of other projects within the Hutton C3 strategic research project, all of which are aiming to inform Scottish Government’s (SG) land use, agricultural, climate and environmental policies. Alongside the RESAS-funded SRP, are contract research projects EARS (Economic Advice for Rural Scotland), SARP (Support for the Agricultural Reform Programme), and several other projects with a Scottish Land Use component. All these processes, as well as past research captured in the QST0 process (see project [Milestone 10](#)), influence the choices made in the QST cycles, the data used, and the way results are understood. These ongoing deliberations around policy development that are not strictly QST activities are therefore not ‘project data’ but are relevant context for understanding the choices made in QST1 and QST2. We refer to these as ‘external’ data.

The table below set out the data collected for each of the two QST cycles (Table 1Table 1). The research was approved by the James Hutton Institute ethics committee.

Table 1 Types of data collected for each of the two QST cycles.

QST cycle	Type of data	Description	Quantity
QST1	Primary data	Interviews with participants from the Hutton conducted at the end of the QST cycle	5
		Interviews with participants from SG conducted at the end of the QST cycle	4
	Secondary data	Workshops and meetings	33
		Other	11
	External data	Documents that provide context for QST1	26
QST2	Primary data	Interviews with participants from SG conducted at the beginning of the QST cycle	2
		Interviews with participants from the Hutton conducted at the end of the QST cycle	3
		Interviews with participants from the Hutton conducted at the end of the QST cycle	3
	Secondary data	Workshops and meetings	29
		Other	12
	External data	Documents that provide context for QST2	16

4.2 Data collection

4.2.1 Interviews

We conducted semi-structured interviews with people who had been involved in each of the QST cycles. Towards the end of each QST cycle, we conducted evaluation interviews with colleagues from both the James Hutton Institute and from Scottish Government. The aim was to deepen and complement the insights provided by the secondary data. We used an interview guide including questions about the interviewees’ understanding of QST; their experience of being involved; their perception of what worked well and what could be improved; and the impact of the process (see Appendix 1). These interviews were conducted by researchers who had previously not been involved in the QST cycles to enable interviewees to be candid in their responses.

There was a total of 41 people involved in QST1, and we aimed to interview 25% of these. We interviewed five people from the Hutton and four people from Scottish Government.

Four additional people were approached (one from the Hutton and three from Scottish Government) but they either declined due to changes in their roles, or did not respond.

There were seven central people involved in QST2 (four from the Hutton and three from Scottish Government). We interviewed three from the Hutton and three from Scottish Government. No other people were approached. Three people who were interviewed as part of QST2 had also been interviewed as part of QST 1 (one from the Hutton and two from Scottish Government – see Table 2Table 2).

In addition, we interviewed two participants from Scottish Government at the beginning of QST2 with the aim of understanding the reasons for the focus of QST2. The interview guide used for these interviews can be found in Appendix 2. These interviews were conducted by researchers who were involved in the QST process as they had a better understanding of the policy focus, enabling them to focus the interview more easily. Both these interviews were with people who were also interviewed at the end of QST1 and QST2.

All interviews were conducted online and were audio-recorded and transcribed with participants' informed consent.

Table 2 Interviews conducted during QST1 and QST 2. Interviewees are referred to with a H (for Hutton participants) or S (for non-Hutton participants) followed by a number, e.g. 'H2'.

QST cycle	Interview type	Organisation	Interviewee ID
QST1	Evaluation interviews (July – September 2023)	Hutton	H7
			H4
			H6
			H2
			H10
		Scottish Government	S18
			S15
			S8
			S2
QST2	Start-up interviews (November- December 2023)	Scottish Government	S18
			S8
	Evaluation interviews (July – August 2024)	Hutton	H2
			H27
		Scottish Government	H14
			S18
		S30	
		S8	

4.2.2 Secondary data

Secondary data consisted of documents that are relevant to the QST processes, such as research reports, presentation slides, research memos and meeting minutes or transcripts. Table 3 Table 3 and Table 4Table 4 list the documents and events included in the monitoring and evaluation of QST1 and 2, respectively.

Table 3 Documents and events included in the monitoring and evaluation of QST1. Research participants are referred to with a H (for Hutton participants) or S (for non-Hutton participants) followed by a number, e.g. 'S8'.

Type of data	Document or event	Date	Number of documents analysed
Workshops and meetings	Notes from quarterly meetings with the team conducting the QST monitoring and evaluation work	May 2022 – March 2023	8
	Summary notes from meeting on Enhanced Conditionality with SG	Sept 2022 – Feb 2023	3
	Notes from monthly meetings with the leads for the wider C3 project's work packages ('team leadsleader meetings')	Sept 2022 – Sept 2023	13
	Enhanced Conditionality measures screening – notes from meetings with Hutton soils, ecology, biodiversity and water teams	Dec 2022 – Jan 2023	5
	Notes from internal End of Year 1 meeting	March 2023	1
	Notes from meeting with S8	Aug 2023	1
	Notes from internal QST1 workshop held at the end of QST1	Jan 2024	1
	Notes from Ecological Focus Area (EFA) meeting	Sept 2024	1
Other	Slides from presentation on Enhanced Conditionality Measures screening for QST Steering Group QST1	Feb 2022	1
	Literature review on the need for people to practice coherence, for internal use	March 2023	1
	Proposal for QST1	Aug 2022	2
	Internal report capturing intentions for QST1 ('Baseline established') (two versions)	Aug 2022	2
	Internal report defining the scope for QST1 ('Decision on focus')	Sept 2022	1
	Agricultural Reform list of Enhanced Conditionality Measures	Feb 2023	1
	Email exchange with S8 and S17 on enhanced conditionality screening	Feb – March 2023	1
	Slides from end of year meeting presentation to SG	March 2023	1
	Synthesis Report: Screening Enhanced Conditionality Measures (report to RESAS)	Sept 2023	1

Table 4 Documents and events included in the monitoring and evaluation of QST2. Research participants are referred to with a H (for Hutton participants) or S (for non-Hutton participants) followed by a number, e.g. 'S8'.

Type of data	Document or event	Date	Number of documents analysed
Workshops and meetings	Notes from meeting with S8	Aug 2023	1
	Notes from quarterly meetings with the team conducting the QST monitoring and evaluation work	Oct 2023 – Dec 2024	7
	Notes from Regionalisation Analysis Meeting with S30, S18, S8	Oct 2023	1
	Notes from monthly meetings with the leads for the wider C3 project's work packages	Oct 2023 – Oct 2024	12
	Slides from presentation to SG: Overview of the project, baselines, interactive tools, and scenarios.	July 2024	4
	Redacted meeting notes from regionalisation Analysis meeting with RESAS and RPID	July 2024	1
	Notes from meeting with S14, S30 and S36	Aug 2024	1
	Notes and presentation slides from meeting with ARIOB	Sept 2024	2
Other	Report on SRP – ARP Regionalisation Analysis – Research specification (5 versions)	Oct – Nov 2023	5
	List of attendees to Discovery meeting (email exchange)	May 2024	1
	ARP Regionalisation Options: Synthesis report for RESAS	Nov 2024	1

Type of data	Document or event	Date	Number of documents analysed
	QST2 decision on focus – internal report	Nov 2023	1
	QST2 baseline established – internal report	Dec 2023	1
	Email from S30	Jan 2024	1
	List of PowerBi and Scenario Builder approved users (email exchange)	May 2024	1
	Regions Analysis-Notes on Charts v5' - explaining presentation slides to SG (precursor to final reports)	June – Nov 2024	1

4.2.3 External data

One emerging finding from the M&E was the difficulty in drawing a boundary between what were the 'QST' process data and what were wider research activities within the Strategic Research Programme or other policy research processes. These meetings or documents, which were not strictly part of QST1 or QST2, provided additional insights and ideas that were used in the QST discussion and analysis. There is a total of 42 external documents. The main aspects of these processes were summarised in individual memos to collate the relevant information.

4.3 Data analysis

Qualitative analysis has two steps – organising and coding the data (primary and secondary) by theme and case; and then analysing the data into overall summaries associated with each theme using analytical memos.

The interview transcripts and secondary data were uploaded to Nvivo software. These, and the memos associated with the external data, were coded to the relevant 'cases'; these cases are set up for every event which took place during each of the cycles, such as meetings and workshops, and every person involved. There are 70 events which took place throughout both cycles, and 116 people involved in QST1 and QST2, of which 34 were Hutton staff, and 82 were external participants.

The data was also coded using the following analytical themes:

- Choices and decisions made during QST1 / QST2
- Desired impacts QST1 / QST2
- Focus of QST1 / QST2
- Ideas for the next QST cycle QST1 / QST2
- Perceptions and experiences of QST1 / QST2
- What contributed to outcome of QST1 / QST2
- What happened in each stage of QST1 / QST2
- What impacts occurred from QST1 / QST2
- What was learnt in QST1 / QST2

- Who is involved in QST1 / QST2
- Other QST1 / QST2

For each of these themes we wrote an ‘analytical memo’. Some of the data that were collected and coded during QST2 M&E are also relevant to QST1 and provide new insights on that cycle.

External documents were not uploaded to NVivo. However, to help keep track of the influences that have contributed to thinking during the QST process, we generated research memos associated with our ‘external’ data, with short descriptions of the processes, meetings or insights. There are 19 research memos relating to QST1, and six relating to QST2 in the NVIVO database. Research memos are used instead of directly importing documents. There are two reasons for this – firstly where there could be confidentiality issues associated with the original documents and secondly to summarise technical documents such as PowerPoint slide decks that proved difficult to code accurately for the purposes of M&E. The latter was partly to do with limitations of coding detailed visual documents in Nvivo and partly due to the detail in the slide decks, that made it hard to see the overall aspects relevant to M&E.

In summary, the methodological design for evaluating QST has been and continues to be developed since April 2022. Initial data collection, analysis and interpretation were undertaken from September 2022 to October 2024 as recorded in ten Milestone Reports, which are available on request. Further analysis was subsequently conducted from November 2024 to February 2025 to generate this deliverable.

5 Findings

The findings are set out per QST cycle and then compared. The implications of these findings for the research questions and overall purpose of the research are discussed in section 6.

5.1 Focus & anticipated impacts

This section describes what each QST cycle focussed on and what impacts were hoped for, which are also described in Milestone reports M5 and M23.

5.1.1 QST1 – Enhanced Conditionality

QST 1 had a focus on screening the proposed enhanced conditionality measures to be used in Tier 2 of the four-tier rural support package set out in the Scottish Government’s Vision for Scottish Agriculture, Next Steps Statement and Route Map. Enhanced conditionality is seen as a core mechanism for future agriculture support delivering the environmental objectives in the Vision. QST1 had the aim of answering three questions: 1) who will take up enhanced conditionality measures; 2) where in Scotland will they be taken up, and by what farm types; and 3) what outcomes will the take-up of enhanced conditionality measures achieve in terms of net zero and other environmental goals.

From the Hutton perspective, it was hoped that the project would lead to new ways for researchers and policymakers to interact, improving communication with policymakers; this would lead to shared understandings between researchers and policymakers of the data analysed and the story they wanted it to convey. It was expected that the iterative nature of QST would deliver insights at a faster speed, helping researchers and Scottish Government (SG) work together, given the fast-moving pace of policy development.

For participant H2¹, one of the desired outcomes was an increase in interactions between the project team and teams from other projects, leading to interdisciplinary learning. This was seen as an effective way of drawing on specialised expertise. It was also expected that the project would build capacity at the Hutton to run analyses, and to frame, present and share data with wider policy stakeholders.

It was also hoped that the project would raise awareness about the capacity at the Hutton and help sustain the existing network with the SG Agricultural policy unit. Finally, one of the purposes of the QST1 cycle was to highlight the experiences of engaging in SPIs, especially for the non-academic team.

5.1.2 QST2 - Regionalisation

The focus of QST2 was an analysis of the options for how direct agricultural support payments to farmers and crofters can be geographically distributed across Scotland. The analysis assessed the current Basic Payment Scheme's regionalisation and its limitations, and tested different regionalisation options.

The choice of focus was seen as having to be both relevant to policy, and within the scope of expertise of the Hutton team. Regionalisation was seen to fit these conditions; it responded to SG's need for a better understanding of what the current model delivers, and SG's commitment to provide information in 2025 about the support model beyond 2026. The research would also be building on previous analyses of potential regionalisation options for basic payments and redistribution payments. This focus on regionalisation options was initially one of several analysis options offered in the Enhanced Conditionality Screening synthesis report. The decision to focus on regionalisation options for Tier 1 options was discussed between RESAS (SG's Rural and Environmental Science and Analytical Services Division), RPID (SG's Rural Payments and Inspections Division) and Hutton, and was confirmed and formalised in October 2023.

Although the broad focus was commissioned by SG, the details were deliberated jointly between RPID, RESAS and Hutton, resulting in a joint specification developed over several months. The work started out as a long list of options, ranging from a single region (no regionalisation), to "*not paying on the basis of land, paying on the basis of something else.*" (QST2 start-up interview with S8, November 2023). The options that were seen as not likely to deliver policy outcomes, or as too complicated, or too costly, were discarded. Four

¹ Research participants are referred to with a H (for Hutton participants) or S (for non-Hutton participants) followed by a number, e.g. 'H2'.

options were selected: ranging from maintaining the status quo, to options with significant redistribution impacts.

The boundaries are blurred between 'regionalisation' and other adjacent approaches to distribution of payments such as the Less Favoured Area Support Scheme (LFASS), Voluntary Coupled Support (VCS), capping and front-loading of payments. These boundaries were set through discussions between RPID, RESAS and Hutton.

The main purpose of this QST cycle was to provide evidence to SG to inform decision-making, to ultimately improve policy outcomes: *"there is an end game, which is understanding how the regions could or should be altered in the Agriculture Reform Programme at Scottish Government ... So, the tools and the analysis will feed into decision-making and discussions around that until the point in time when it's decided to change or not change the regions."* (QST2 evaluation interview with S30, August 2024). The synthesis report described regionalisation as aiming to deliver the agricultural and environmental policy objectives of the Vision and describes how the regionalisation scenarios would contribute to these. However, there was some uncertainty regarding exactly what the policy outcomes sought from changing regional payments were. The analysis was expected (by S18) to potentially have an impact on the other policy instruments that interact with regional payments. Regarding when policies informed by the regionalisation analysis would be implemented there were different views, ranging from 2026 (as presented to ARIOB - Agriculture Reform Implementation Oversight Board, in September 2024) to late 2020s (QST2 evaluation interview with S30, August 2024).

In addition, for the Hutton researchers an important desired impact relates to the process of how evidence is used and how SG and researchers work together. It was hoped that the interactive tools would contribute towards capacity-building, giving policymakers the ability interact directly with the data, identifying what is most useful to them, and directly conducting options appraisals themselves. During his start-up interview S8 reported he had high hopes for the project because of the novel approach to interactions between SG and researchers: *"it's not typically the way that we work with external experts, so I think there's something almost quite novel about the way that we are setting this up and yeah, I've got high hopes for it. I think it's going to be really effective"* (QST2 start up interview with S8, November 2023).

There were different expectations on how findings would be communicated to produce these impacts; participants from SG expected results to be presented to policy through conventional means such as written reports, spreadsheets, and PowerPoint presentations. The interactive tools, where data could be analysed independently, was an unexpected but welcome output: *"I thought we were just going to get a set of spreadsheets or something like that which gave us the result and, you know, PowerPoint presentations, which would have been good as well, and we are getting that, but the fact that we've got the tools is even better."* (QST2 evaluation interview with S30, August 2024). However, a written report synthesising results was still seen as necessary to understand the findings, and to be able to communicate them to others.

5.1.3 Comparison between cycles

Both cycles were similar in that there was an ambition, from Hutton researchers, that the process would increase capacity within research teams, and improve the way that researchers and policy work together. However, while QST 1 drew expertise from a wider team of researchers from different disciplines and departments, QST2 was restricted to a core team of analysts.

In both cases, the cycles were set up to provide evidence for different aspects of the ARP. Although in this report we are looking at each QST cycle as separate and distinct, there are links between the cycles; for example already in QST1, the Hutton team had begun experimenting on the effect of replacing LFASS with other existing mechanisms, including regionalisation. This led SG participant S17 to request a separate review on this.

5.2 Sites and actors

This section provides some insights into how the science-policy interactions took place and which participants, from the Hutton and from Scottish Government and other stakeholder organisations, were involved.

5.2.1 QST1 - Enhanced Conditionality

There are 59 people identified as being involved in QST1: 30 from the Hutton, and 29 external to the Hutton. Participants from the Hutton comprised researchers with specific skills and knowledge across multiple areas, to form a multi and interdisciplinary team. These included researchers from across the wider Strategic Research Programme, as well as researchers working on the C3 project, to include experts on biodiversity, soils and water topics. There were three researchers who took part as 'waters' experts (H16, H17 and H18), five who took part as 'soils' experts (H19, H20, H21, H22 and H23), and three who took part as 'biodiversity' experts (H24, H25 and H26). H2 was identified as the main driver of the process; he was discussed during interviews as the one scoping out what was happening in the SRP and what would be most valuable to include in the research.

Participants also included key agricultural policy actors from SG. Not all participants from the SG engaged in QST1 to the same degree; for example, some individuals only took part in the End of Year 1 meeting (e.g. S19), while others took part in several events. The five individuals from SG who engaged the most were S8, S2, S4, S5 and S7. Important individuals were targeted - the findings from QST1 were pitched to the head of Agricultural Transformation for Environment and Climate Change; and the head of Agriculture Support Policy Development, with particular focus on the policy unit designing Future Agricultural Bill.

Most of the events that took place as part of QST1 occurred online as virtual meetings. However, the final 'QST1 wash up workshop' with Hutton researchers in November 2024 took place in person. There were also written documents (internal milestone reports, the research proposal, and the synthesis report), and email interactions. The benefits of in-person as opposed to virtual interactions was highlighted in the evaluation interviews, due to the additional informal conversations that happen in person.

5.2.2 QST2 – Regionalisation

There are 59 people identified as having been involved in QST2 – however, some of them are attributed to meetings where QST2 findings were discussed, although they did not actively participate in the discussion. Of these, 17 are from the Hutton and 42 are external to the Hutton. However, most of these took part in the QST activities only peripherally – for example, all but four of the 17 Hutton participants were mainly coded to M&E or team leader meetings, and there were 25 stakeholders who were only involved by participating in the ARIOB (Agriculture Reform Implementation Oversight Board) meeting in September 2024. There were three SG people with accounts for the Scenario Builder, and eight approved SG PowerBi dashboard users. However, not everyone accessed or used the tools.

Most interactions that took place as part of QST2 occurred online as virtual meetings. There was however an in-person presentation to ARIOB in September 2024, and email interactions with S30, S18 and S8, written reports (several versions of the research specification, internal milestone reports and synthesis report), and interactions with the online tools.

There were three SG individuals who were particularly actively involved in QST2: S8, S18 and S30. All three of them took part in the regionalization analysis meeting in July 2024 and were approved users of both the PowerBI dashboard and the Scenario Builder. In addition, they took part in additional meetings (in August 2023 and August 2024 respectively, and the ARIOB meeting (in September 2024).

There are four Hutton individuals who were central to the QST2 cycle: H2, H10, H14 and H27. Other members of Hutton staff who did not actively take part in QST2 are still identified as participants, by taking part in internal team meetings relating to the wider project or to the monitoring and evaluation of the project, or by conducting the monitoring and evaluation interviews.

Scottish Government had the role of client where the Hutton was the service provider, supplying the analyses on regionalization options. However, despite the client-service provider relationship between SG and the Hutton, Hutton participants refer to SG participants as ‘colleagues’, both in written reports and in interviews, e.g. the synthesis report summarises the project as having being *“conducted by James Hutton Institute staff from the Land use Transformations project working with Scottish Government (SG) colleagues in RESAS and RPID.”*

The working relationships between Hutton and SG were seen, both by Hutton and SG individuals, as well established, and this was perceived as helpful in understanding each other’s thinking. Although the project served to establish new connections between SG and Hutton staff, the better-established relationships were developed over many years between specific individuals. This makes particular people difficult to replace: *“There’s very few people that could step in ... if I was to take time off through illness or what not like that, that would create difficulties... These working relationships develop over time... it would be great to have the luxury of having plenty of people to cover for you, that’s just a luxury we can’t afford.”* (QST2 evaluation interview with S18, July 2024).

Each of the central actors in QST2 played different and often multiple roles. H2 initiated the process: *“I’m the initiator of the process. I sought out colleagues in government to discuss what we would do as a follow up to QST1”* (QST2 evaluation interview with H2, July 2024). He also led the project: *“I initiated all of this, I led the project through the stages of it, I do the write up, I have done the presentation to the steering groups and latterly to the workshop participants.”* (QST2 evaluation interview with H2, July 2024). Hutton colleagues (H10, H14 and H27) assisted him in this process, but additionally had their own specific roles to play: H14 and H27 built the digital tools (PowerBI dashboard and the Scenario Builder), and with H2 they also helped to interpret SG’s ideas which they used to further develop the tools. They also analysed and visualised the data.

S30 described his role as that of developing the research specification, along with S8 and H2, to *“agree on what was achievable within the timeframe that we had and what we wanted to sort of discover, what we wanted analysed and how we wanted that presented”* (QST2 evaluation interview with S30, August 2024).

An important role played by both Hutton and SG actors, was that of interpretation; H2 described part of his role as *“interpreting the client’s wishes”* (QST2 evaluation interview with H2, July 2024); he also used the tools to help interpret the data; and presented these insights to SG. The core participants from SG also contributed to this interpretation role, for example, presenting findings to wider stakeholders at the ARIOB meeting. The need for interpretation also existed in the opposite direction; S8 described his role as helping to translate the policy context for the Hutton team, but he also helped policy colleagues understand the Hutton’s work: *“[I] play that go-between role ... to translate the policy context for [H2] and colleagues, but then also help translate the other way so that policy colleagues understand the sort of work that [Hutton team] are doing.”* (QST2 evaluation interview with S8, August 2024).

S18 described part of his role in the project as ensuring quality, making sure that the right data and the right scenarios were being used, and this was done in collaboration with other SG participants and the Hutton. S18 also described his role as an intermediary between the Hutton and SG teams, ensuring that the Hutton had the data they needed, organising the data sharing agreement, and liaising with SG’s IT team.

5.2.3 Comparison between cycles

Although the total number of actors is the same in each cycle (n=59), there is a different balance between those belonging to, and those external to the Hutton; QST1 involved Hutton researchers from across the wider Strategic Research Programme, and beyond the C3 project, to include experts on biodiversity, soils and water topics. QST2 on the other hand included a smaller group of researchers working specifically on the C3 project.

There are several individuals who participated in both QST1 and QST2; all those who constituted the core participants in QST2, except for S30, had already taken part in QST1. Participants S8, H2 and H10 were central participants in both QST1 and QST2. H2 was identified in both cycles as being the driver or the initiator of the process.

Both cycles were similar in that most of the interactions occurred online through virtual meetings, and through written reports. However, QST2 differs in that the online tools offered SG individuals the opportunity to directly interact with the data.

5.3 What happened within the cycle, choices & decisions

This section describes how the QST cycles were implemented, including how choices and decisions were made.

5.3.1 QST1 – Enhanced Conditionality

The data are analysed against the main stages of the QST cycle highlighted in bold.

Identify the themes (starting point)

QST1 was located within the overall context of the Scottish Government's Agricultural Reform Programme (ARP), in particular the decision to split farm payments across two tiers. However, there was no formal analysis of the overall ARP, its governance and main actors, primarily as the core Hutton team delivering QST1 had a long track record of working on Agricultural Policy, including attending several meetings (including ARIOB - Agriculture Reform Implementation Oversight Board) regarding the evolution of Agricultural Policy since the UK formally withdrew from the European Union.

The decision on the themes and focus was made by the Hutton PI in discussion with the RESAS contact, based on *“that kind of negotiation of what you're going to work on, how you're going to work on it, then being confident that you're not going to do something stupid that's going to cause trouble for them”* (QST1 evaluation interview with H2, August 2023). The interest from ARIOB in the topic was also seen as a reason to prioritise EC as the focus over other choices; the options provided to SG by the Hutton PI were based on a combination of policy relevance and capacity to deliver timely and credible research with the Land Use Transformations project team.

The process took from August 2022 to November 2022 to get 'sign off' to look at Enhanced Conditionality (EC) measures required for additional payments. A meeting was held on 2nd September with wider SG participants when priorities for QST were discussed and an email with the proposal was circulated for comment. The concept of QST, and using it to consider the EC measures, was pitched to head of Agricultural Transformation for Environment and Climate Change; and the head of Agriculture Support Policy Development, with particular focus on the policy unit designing Future Agricultural Bill by the Hutton PI with the support of the RESAS contact. Therefore, the research was designed to deliver to an ongoing area of policy development (see section 5.1.1). The client for the work appears to have been RESAS.

Decide what to represent in quantitative data

QST1 focused on the list of EC measures that were made public as part of the ARIOB meeting minutes from July 2022. This list was a set of possible measures; however, exactly which ones would be implemented and in which combination was not yet decided. Therefore, the starting list was not decided by the Hutton or SG main actors but taken from a live policy process.

The Hutton PI decided to use QST1 to bring various expertise and evidence from across the Strategic Research Programme, relevant to EC measures, to evaluate the choice of measures, as reported in November and December 2022 team leader meetings (see Table 3). This expert elicitation process is very different from previous published QST cycles (Keith B. Matthews et al., 2021) but built off the experience of eliciting input and building shared capacity to respond to policy requests within the Land Use Transformations Project starting year (see Figure 2). Capturing expert views on measures reframes the concept of quantification away from indicators, charts and maps and towards prioritisation and evaluative scoring.

The PI created an excel-based scoring matrix for the EC measures (see Table 5). The range of criteria reflect questions arising from prior discussions at ARIOB and the main issues likely to affect uptake, based on experience and building on research projects, including a national farmer intentions survey. During this process, insights from parallel discussions around learning from reviews of Ecological Focus Area data and the contract research project ‘Economic Advice to Rural Services (EARS)’; and stakeholder discussion on agricultural policy reform also influenced the focus and process of the QST1 cycle. Furthermore, as the next stage was planned, potential gaps in the EC measures (e.g. the potential lack of attention to water resources and climate adaptation) were highlighted and used to adapt the screening matrix.

Table 5: Perspectives used in the screening p8 of QST1 Synthesis Report.

Framing – what changes?	SG Classifications	Multi-functionality	Measure definitions	Uptake	Reduced financial capital value? More complex?
Land?	Cost	Meets Objective?	Compound?	Efficiency	More complex?
Livestock?	Complexity	GHG	Standards	Reduced inputs	Tenure
Trees?	Capital	Soils	Qualitative, Improve, Presence	Margins	Tennant?
Cover?	Existing?	Biodiversity	Scale and Lags	Land take?	Seasonal?
Use?	CAP Greening?	Water	Action/Detection	Extra Labour?	Change Degree
Management	AECS?	Adaptation	Time Lags	New Skills?	Transformative?
Reversible?	GAEC2 or SMR?			Extra Capital?	
				Reduced output?	

Compile data and carry out analysis

This was a knowledge elicitation process built around six workshops designed to codify and corral expert opinion and evidence. The matrix was discussed in a scoping meeting and then a full workshop for each of the three groups (soils, biodiversity, waters) where there was discussion, live editing of the excel, and further offline editing and contributions, which were then synthesised by the PI. This was done December 2022 – February 2023. Other researchers working on governance, climate adaptation and natural capital reviewed the resulting excel database and added information to bolster any gaps. Here, all workshop participants were involved in the choices about how to evaluate each measure and what was important to highlight in the presentation of the findings to SG.

Present Metrics and Visualisations

This stage must be understood in terms of presenting material to a specific audience. In this case the audience were those involved in the design of the ARP tiers, particularly those

responsible for developing EC but also drawing attention to how EC measures nest within wider choices being made in other parts of the ARP.

Initial findings, including visualisations of how the EC measures fit into the wider ARP, and examples of the screening matrix, were presented to members of SG in February 2023. This was a 2-hour meeting involving 17 participants, where the Hutton PI gave an overview of the findings, particularly a detailed look at the list of measures and how they contribute towards different objectives. Decisions were taken by the PI regarding what to present and how to present the materials. This part begins to overlap with the next stage in the cycle, as the presentation was designed to prime discussion, interpretation and develop the implications of the materials. The choices of what to present and how were then adapted when the same material was presented at a 'end of year' workshop for the wider project in March 2023. The final written document "Synthesis Report: Screening Enhanced Conditionality Measures" was not published until July 2023, which gave more time for choices to be made about what to include and how to represent the material, as well as to collate as much supporting evidence as possible. The final product was a 58-page document, with 16 tables and six figures.

Discuss Interpretations and Implications

As early as November 2022, the importance of feeding insights into the policy teams in February-March 2023 was recognised, to ensure that evidence was available at the point that decisions were potentially going to be taken. During the discussion at the February 2023 workshop, further questions were raised, e.g. complexity, landscape coordination, trade-offs, points-based menus, and thresholds. These are tackled in the final synthesis document. During the workshop, it was evident that some important parts of SG were missing (RPID) and these perspectives were collected as part of the March 'end-of-project' meeting.

The final document reflected on and responded to these insights. The draft final document was shared with the main point of contact within RESAS, but they were unable to respond due to leave, so the document was published without the planned further round of interpretation from SG. The document was widely shared with contacts within SG but arrived at the start of the summer holiday season, so there was limited direct response or comment provided. However, as part of the start-up of QST2, there were discussions with RESAS and RPID about the findings from QST1; and whether to build on these findings or focus on a different aspect for QST2. Therefore, starting QST2 gave an extra round of interpretation and discussion of the findings from QST1.

An internal workshop to feedback and discuss the results of QST1 with Hutton staff was held in January 2024 (note this is six months after QST1 officially ended). This was responded to the findings that some participants in the QST workshops were unclear about how the cycle had been closed and were keen to find out more about what happened next.

In summary, QST1 did move through several stages. Phase 1 was informal and quite opaque to those not directly involved; phase 2 and phase 4 involved tacit and implicit choices by the PI; stage 3 happened but was not particularly quantitative – rather it focussed on formalising and codifying expert opinion; and phase 5 happened quite early, triggering more ideas that were worked into the final document. While the EC topic was agreed with the then EC project lead in SG, and there were other RESAS and RPID staff involved in agreeing scope (QST Stage

1), and interpreting findings (QST stage 5), the content of the QST was more research-integration led (bringing together expertise from a wide team of experts), with less frequent iterations and less shaping of the analysis by policy teams. Furthermore, the priority was on starting and finishing the cycle with SG actors, with less attention given to involving Hutton participants in these stages, beyond being co-authors of the report that concluded the cycle.

5.3.2 QST2 – Regionalisation

Identify the themes (starting point)

The decision to focus on the regionalization options for tier one payments was made in discussion with RESAS and RPID to respond to their business needs, as RPID have responsibility for a workstream on the ‘base payments’ (also referred to as Tier 1) and there was a commitment to share information on the model for regionalized payments during 2025. Note that this work was undertaken in parallel with other analysis within Scottish Government that also were reviewing the regional payment models and so the work in QST2 had to align with these processes. There was therefore strong interest in the topic, and the SRP process provided additional capacity to address aspects that were neither being addressed by these internal projects nor covered by in *“a contract research fund project that runs in parallel with this.”* (QST2 evaluation interview with H2, July 2024) The overall context was that ARIOB were seeking to *“whittle’ down the options from full set of scenarios to a few in order to make choices about the future programme”* (QST2 evaluation interview with S18, July 2024). The process was managed by RESAS but the main client was RPID.

Options for QST2 were first discussed during a meeting with RESAS on how best to disseminate results from QST1 in August 2023, and the focus was quickly decided. Although there are multiple tiers and workstreams or projects nested in the ARP, the focus was primarily on tier 1 and 2. Therefore, there was no formal analysis of the main policy actors and governance structures involved in developing, trialling and implementing the ARP tiers, however, QST2 built on what was learnt within QST1 and the Policy Coherence Analysis (K. L. Blackstock et al., 2024) within the Land Use Transformations [project](#). Those involved in identifying the starting point were embedded in ongoing discussions on the overall Agricultural Reform Programme, including parallel projects looking at the ‘strategic business case’ for changes and therefore, were using tacit knowledge of the wider policy context.

Decide what to represent in quantitative data

Whilst the overall decision on focus was made quickly, the specification of exactly how to bound the focus on ‘regions’ involved several iterations made over the autumn of 2023. The process involved RESAS providing an outline specification, which was edited and revised by the Hutton PI, and then discussed in a series of meetings; after each one the specification document was updated. Note the specification was still being updated in April 2024. The final specification for the work was detailed, involving baseline information and three agreed scenarios to run as different options for regional payments. The client (RPID) decided which of the long list of scenarios were selected, including screening out options based on their own internal desk-based review findings on technical feasibility.

These options were also to be assessed to see how alternative payment regionalisation models would interact with Less Favoured Area Support Scheme (LFASS) options and Voluntary Coupled Support Scheme (VCS) options. The last two aspects are not strictly 'regional' analyses but were added at the request of RPID to ensure the capacity being built would be able to respond to future associated policy developments. These analyses were to be explored across a range of variables including numbers of businesses affected, the direction, degree and distribution of changes in payments, and patterns by size, geography and farm type. The detail in the specification also applied to the format of the final outputs (report, presentation, and slide decks).

By the time the final set of outputs were being delivered, the analyses were complemented by adding several different ways of understanding patterns and impacts of distributions, including aspects like 'fragility'; 'rurality', change for peatlands; and other alternative lenses on these data. Our interpretation is that some of these choices, including inclusion of other scenarios like the 'No Less Favoured Area Support Scheme' scenario used as an exemplar for illustrating the tools, were decided by the Hutton PI, to provide additional evidence for decision making (see 'what contributed to impacts and outcomes' below). The choice of three scenarios was made to narrow the option space – even so, the resulting findings were numerous and complex sets of graphs, tables and maps. Although the three scenarios were critiqued by NGOs in an ARIOB meeting as being too conservative, even these were judged to *"have quite significant distributional consequences."* (QST2 start-up interview with S8, November 2023).

The iteration over the specification of the project was extremely important in terms of refining the scope of the analyses. There were many choices to be made, from selecting the baseline year (2019 or 2022) and other issues such as how to handle land that is not currently claimed on but could be claimed in the future, and associated eligibility and activity criteria, all of which affect the starting point for any analyses. There were four distinct versions of the specification documents *"I think by the 3rd spec there is no more than about 25% of the original words that still remain"* (QST2 evaluation interview with H2, July 2024), which illustrates the commitment to iterative, co-produced and fast paced QST cycles (see M27 QST baseline report). These changes were decided in the meetings between RESAS, RPID and Hutton.

Compile data and carry out analysis

Compiling and quality checking the data, when dealing with potentially sensitive farm payment data, was an important and time-consuming process, before analysis could begin. It involved developing or updating data sharing agreements, getting Scottish Government IT specialists to upload the data to file sharing platforms, and then Hutton checking the databases were correctly downloaded and checking for anomalies. The decision to undertake analysis through building interactive tools, available for Scottish Government to use themselves, also saw the reverse of this process, where protocols had to be put in place to allow Scottish Government individuals to access these data safely when hosted on a Hutton secure server.

The analysis agreed in the specification could simply have been carried out by the Hutton team and presented to Scottish Government. Instead, a decision was taken by the Hutton PI

to build two complementary tools: a scenario builder that allows different scenarios to be developed and run, providing different views on the potential impacts; and a PowerBI dashboard, that allows the user to visualise the scenario outputs and interrogate different dimensions of the data (first mentioned in the specification document 2/2/24). This was a deliberate choice to encourage the Scottish Government actors to make choices about which data combinations were most important for their needs, rather than the research team trying to anticipate what might be needed. This potential was appreciated by Scottish Government as they want to be able to ask *"What does that mean in terms of redistribution? Does that mean that certain cohorts of farmers and crofters would be economically vulnerable? And, in turn, what would that mean for the communities that they're in?"* (QST2 evaluation interview with S18, July 2024).

The baseline analysis provided an illustration of the dashboard capabilities and provided an opportunity for deliberation over how to further develop these tools. It provided important details regarding the baseline, as illustrated at the ARIOB meeting, where stakeholders expressed surprise at some of the findings, for example that region 1 (normally thought of as only covering the most productive arable land) contains holdings with rough grazing land cover.

Therefore, rather than stage 3 becoming a discrete phase, there were many rapid iterations through stages 3, 4 and 5 involving the core Hutton and Scottish Government individuals discussing results as they became available, improving the tools and doing further analyses. Therefore, although stage 2 lasted six months, these months overlapped with stage 3 and 4 a lot – as analyses were completed and visualised, this led to re-specifying analyses and metrics (e.g. building visualisations to better illustrate any changes to livestock farms receiving Voluntary Coupled Support). The Hutton PI elected to develop a scenario of 'no LFASS' as a demonstration example, anticipating that this scenario was not seen as politically viable, to illustrate problems with the existing LFASS intervention. The tools continued to evolve, and further supporting materials (e.g. a training manual for the scenario builder) were developed.

Present Metrics and Visualisations

The activities at this stage should be understood as decisions about how to present findings to an internal Scottish Government workshop (July 2024) and the ARIOB meeting (September 2024). The purpose of the tools described was to allow many analyses and visualisations to be run, to service different policy requirements. For QST2, the focus was to inform policy teams about the current regional model (including its existing implications for payments) and options for change; particularly in terms of interaction with other payment regimes (LFASS, VCS). Most of the visualisations were maps, tables or graphs; and the metrics looked at different ways to characterise the existing regions; and also how payments would shift if regions were changed by a number of different combinations of variables. The two-hour workshop in July included four different presentations, including information on what can/can't be analysed and visualised and also a guide to set up, run and understand the tools – scenario builder and PowerBI dashboard -, with worked examples. So not only are decisions being made about what to do and how to do it but also how to explain it and

even teach others how to do it. Recall how the specification already anticipated the need to provide an *“accompanying narrative to support interpretation of each page of the dashboard”* (quote from the research specification) to aid interpretation by the audience.

Further discussion about what to present, and how to represent it, continued after the summer break, in preparation for a 40-minute slot on the ARIOB agenda in September 2024. Here there was less time available, and a different audience who required an overall update on progress on wider workstreams on the tiers and regionalisation, as well as these specific results. Therefore, further decisions were made on which graphs, tables and maps were to be presented. For both the July workshop and September presentation, the Hutton PI drafted the slides based on discussions with the RESAS and RPID colleagues and adapted them based on their feedback. For example, there were at least four iterations of the slides to be presented at ARIOB before the team were happy to make the slides available as part of the agenda pack.

Discuss Interpretations and Implications

Due to policy sensitivities, the detailed information about the discussions and interpretations of the material presented at the July workshop was not available to the evaluation team. However, the meeting was reported to be lively with discussion about the findings but also the potential use of the tools for further analysis. After this meeting, there was a further meeting with a member of the Scottish Government policy team, to work through the tools and learn more about their functionality. This meeting prompted further technical tweaks e.g. *“[S14] made the suggestion on “saving” a scenario and exporting outputs.”* (Notes from the meeting, August 2024).

The ARIOB presentation also generated discussion, with questions or comments from six individuals, about what the intervention logic for the ARP should be/is (from NGO representatives); about where the losses/changes fall by geography and farm types (from farming representatives); and a Minister reflecting on the importance of getting the ARP through the Parliament. Again, the presentation in this setting generated a request for a further one-to-one meeting to explain the tools, this time with the RESAS Chief Scientific Advisor.

Work on the final written products began in May 2024, and the final set of 8 outputs from the process were published on the Land Use Transformations website on 29th November 2024, a month later than planned due wider policy developments and the need to complement the ARIOB process. Between the ARIOB presentation and final publication, there were many iterations of the documents (written reports and slide decks) with inputs from the RESAS, RPID and Hutton individuals discussing what to include, how to describe the materials and what implications to prioritise. Analysis of the text in the Synthesis Report and the Notes on Charts Report shows that the Hutton PI wrote the draft text and SG staff (S8, S18, S30) read, edited and commented to improve clarity of argument, highlight duplication and advise on choices over which charts/results to show. The Hutton authors included interpretation of findings, including posing questions or even provocations (e.g. whether the current region 2 is fit for purpose) as well as results. There are many examples of the authors

taking 'multiple equivalent perspectives' on the farming in Scotland e.g. looking at peatland/urban-rural/Socio-Economic Profiles which suggests an opening up and reframing of the process beyond a narrow focus on how regional payments are allocated.

The Hutton PI initially felt they were “*corralling the data in every greater detail but not putting it together to answer an actual policy question.*” (M&E meeting 30th January 2024) but then there followed a very busy period in February 2024, when the LFASS became a topic for a policy statement, leading to questions about how it would work with regional payments. Again, things went quiet in the summer but there was more engagement in how to craft key messages during October and early November 2024.

The decision to move from two outputs (report and slide deck) to eight outputs (two reports and then six PowerPoint slide decks from the ARIOB and policy workshop presentations plus a further worked example) appears to have been made by the Hutton PI. Therefore, the outputs respond to the original specification for a report, slide deck and presentation.

5.3.3 Comparison between the cycles

The two cycles were purposively conducted differently, as QST2 built upon the learning from QST1. For example, in the startup interview with S8 he states: “*this time is using a very iterative approach. ... to some extent we did that in the enhanced project. But I think probably part of the learning from that we didn't do it enough*” (August 2023).

Key differences were that QST2 had a much tighter specification of the focus (stage 2) and unpacking the concept of regions was an important part of the process, whereas EC measures were provided, but no further interaction or discussion was had during stage 2 about these measures or how to evaluate them. Furthermore, QST1 did not require any data sharing with SG. QST2 involved a lot of quantification across many different variables but QST1 was more qualitative in style. Finally, the “*enhanced work. I think was a really good example of [H2] pulling in a kind of wider group of people to support the work, perhaps the regionalisation is a bit more, um kind of like the core work of his small team.*” (start-up interview with S8, November 2011).

Both QST cycle results were made public on the project website. However, the tools are not open access due to sensitivities over framing/data content and potential to generate politically unpalatable outcomes. As promised at ARIOB states “*With the permission of the SG project leads a wider community of interest can have access can granted*” (quote from QST2 final report). Both cycles were influenced by ARIOB but the presentations to ARIOB were the start of QST1 cycle and with QST2, it was the end of the cycle.

Other similarities were the influence of and intertwined nature of separate contract research funding (EARS/SARP) with the QST cycles. Neither cycle did a formal overview of the phase 1 potential framings but relied on tacit and shared understandings between H2 and his Scottish Government contacts, yet we know that framing is integral to QST. In both cases, the decisions on Hutton side were clearly made by H2, according to the interviews and meeting data. Both cycles built tools, but the QST2 tools were more sophisticated than those in QST1, both in how they were build and in how they were to be used. Finally, both cycles

were followed by meetings with RESAS to discuss what was learnt and how to use this in the future (e.g. use of slide decks being useful for dissemination).

5.4 Perceptions and experiences

This section focusses on what was reported within the evaluation interviews about how individuals experienced QST and the SPIs.

5.4.1 QST 1 – Enhanced Conditionality

Not all participants had a clear understanding of what QST is, or in what ways they were involved; when asked during the interviews, some QST1 participants had forgotten some of the events they had taken part in, or mistook QST1 with the start-up cycle, QST0, or were not aware that they had been involved in the QST cycle at all. The classic structure of QST cycle, described in section 2 (i.e. 1. Identify the key themes related to land use policy; 2. Decide what to represent in quantitative analysis; 3. Compile data, carry out quantitative analysis; 4. Contextualise and present metrics and maps and visualisations; and 5. Discuss interpretations and implications) was difficult to discern for many of the participants in QST1 who only participated in the expert elicitation workshops. This invisibility of the QST cycle was felt with participants both from the Hutton and from SG and may be due to it not being highlighted by the project team when interacting with participants; for example, the term QST or structure of the QST cycle was not mentioned in the synthesis report.

For many of the participants, their involvement felt marginal, and some participants would have liked to be more involved in the process; for example, H7 would have liked more direct engagement across the research team with policy-makers, and more in-person meetings, and S18 said he would have liked to be involved earlier on in the process, rather than being invited only to discuss findings; he found that he had been brought in too late, when he could not have influence over the development of the project. However, this feeling was not universal; for example, H6, felt like her involvement took a lot of time and she would have liked to know in advance how much of a time commitment her involvement in the project would take. Some participants said during their interviews that they would have liked a final meeting, to understand what had happened during the cycle; this did happen in January 2024.

Some of the SG participants were more interested in the content of the research rather than the QST approach; for example, S18 said: *“if it’s using a different methodology to the conventional methods then yeah, I’ve no real issue with that, I’m kind of fairly neutral in what the methodologies are, I’m looking for information that can help us move forward”* (QST1 evaluation interview with S18, July 2024). He also felt that focusing too much on the methodology may be to the detriment of understanding the impact of policy decisions, particularly on farmers and land managers.

People enjoyed the collaborative and interdisciplinary aspect of the project; this was seen by some as a unique approach, which brought together people with different skills and knowledge. However, some thought it was going to be more novel than they found it to be, using processes that they hadn’t come across before; instead they experienced it as good

communication and co-construction, therefore QST was a formalisation of research processes that are already standard. However, even these participants thought it did enable people to think more about these steps in their research.

Other aspects that were appreciated by participants were the graphical representation of findings, particularly the 'policy sudoku' included in the enhanced conditionality synthesis report, and having meetings with clear agendas and action points. However, the action points were not always followed up with people.

5.4.2 QST 2 – Regionalisation

Perceptions of the interactions between the Hutton and SG were varied; while SG participants felt they had worked very closely with the Hutton researchers; the Hutton team would have liked to have even more interactions with SG. For S8 it had been a novel experience to work so closely with researchers: *"I've never worked quite this closely in such an integrated way with an academic team. ... there's something really interesting and exciting about the idea and the way of doing it."* (QST2 evaluation interview with S8, August 2024). He appreciated the structure of the project including various iterations over time, although he would have liked to spend more time on the project that he was able to. He also expressed appreciation for the researchers' flexibility and willingness to learn and improve the approach: *"they've been very considerate, very understanding of where we're coming from ... showing flexibility ... I work across many different projects that are all hoping to have an impact on government, but nobody else is routinely asking me: how did that go? Could we do better next time?"* (QST2 evaluation interview with S8). S30 described interactions as light-touch but regular. He highlighted people's flexibility, balancing engagement in this project with other commitments: *"both on our side and on the Hutton side we were really flexible in terms of our demands on this project because ... it was quite a light touch, although it was regular, it was a light touch over the period."* (QST2 evaluation interview with S30, August 2024). S30 also felt that overall he had had a lot of interaction with the Hutton, which helped ensure everyone was on the same page: *"I found the process really quite helpful because it was iterative, because there was a lot of contact between us and the Hutton guys, we – it kind of kept us very close and we were working with them really closely. So, it sort of helped the project move in the right direction and there was a lot of check-ins and a lot of, you know, making sure that we were all on the same page sort of thing with things and different revisions of the specification, but also of dashboards until we got to a point where we had something which worked for us and, you know, worked for everyone."* (QST2 evaluation interview with S30). For S18 these interactions with the Hutton did not feel unusual, having worked with researchers in the Hutton team for many years. He did highlight that the planning stages took a substantial time, such as setting up the data sharing agreement.

H2's experience of the interactions between the Hutton and SG varied throughout the cycle; he described the early phase of the process as *'really good'*, when there was a lot of engagement between the Hutton and SG. Later in the cycle, when he found it *'harder to get interaction'* and described this as *'less satisfying... it felt that we'd kind of been deprioritised, we weren't as high up the list of government priorities'* (QST2 evaluation interview with H2,

July 2024). Later, he found interest from SG to be rekindled: *“now they seem to have taken a greater interest as we’ve got to the write up and the workshop, that seems to have restimulated the interest and the potential for our work to be transmitted into the Agricultural Reform Implementation Oversight Board.”* (QST2 evaluation interview with H2). However, he was disappointed about the project not having as much impact as he had hoped. H14 also would have liked there to be more interaction with SG: *“the only thing would be potentially getting more interaction with the Scottish Government, but it’s not something I had control over really. ... they were quite busy with about seven or eight different things going on at the same time from those, particularly the three guys that were the main contacts for us.”* (QST2 evaluation interview with H14, August 2024). In terms of the wider stakeholders, H2 thought interactions were limited.

There were discrepancies in how the interactive tools were viewed; the Hutton team saw these as decision support tools, while SG participants were more focussed on the results they could generate. H2 and H27 were disappointed that the tools had not been used as much as they had hoped they would. S8 said that he found the tools accessible and intuitive to use but admitted that he had not spent much time using the tools because of lack of time. Despite this, S8 described the tools as being a ‘game changer’, a shift in how SG works with academics: *“clearly what’s been novel about this round of QST work has been the development of this dashboard. That has, I think, been a real game changer in how we work with academics like you guys and how we make it relevant, useful for policy ... the way it’s presented, the functionality, the ability that we have as policy officials and analytical officials in government to be able to actually just play around with it, to work out options I think has been a really big shift actually in how we work on this sort of issue. ... I think it’s been transforming, the way it is working. I’m really excited about it and I think I’ve seen that response from policy colleagues too.”* (QST2 evaluation interview with S8, July 2024). The tools appear to have been useful, not just in using them, but in their development: *“[S18] and [S8], who were working on it, found ... the approach of developing the tools and using them really useful.”* (QST2 evaluation interview with S30, August 2024). However, when interviewed, S18 said that he was not aware that there were two different tools.

The tools were also seen as freeing up time for researchers, by allowing SG people to interpret the data directly: *“just in playing around with this, working out options etcetera ... and somethings also interpreting outputs, hopefully that frees up [name] and their team to kind of focus on their really kind of value areas of the high value add”* (QST2 evaluation interview with S8, July 2024). To an extent this may be the case; H2 said that it would be too time-consuming for him to write an interpretation of every output of the tools, compared to SG people looking at the metadata and tools themselves (C3 M&E catch up January 2024).

On the other hand, there were concerns from SG participants about how the tools might be used, and about data being misinterpreted: *“there is the risk of misinterpretation of results. ... I feel nervous about [policy colleagues] taking whatever they find, you know, taking their own interpretations from it and then putting it into things like submissions to ministers.”* (QST2 evaluation interview with S8, July 2024). *“if you don’t understand the data you might be looking at it and saying that it’s go this particular effect. ... you’ve got that capability but*

it's understanding that, and that's why it could be dangerous in the wrong hands." (QST2 evaluation interview with S18, July 2024).

Overall, SG participants found taking part in QST 2 helpful; S30, who was new to the topic of regionalisation, said he found the process *"extremely helpful and sort of at each stage it was reconfirming my knowledge on [regionalisation]"*. (QST2 evaluation interview with S30, August 2024). S18 expressed a sense of satisfaction about being a key part of the process. However, it was not necessarily important to participants to think of their involvement in the project as part of a QST cycle: *"it was more the project focus for me rather than the QST focus. Like, I knew that it was part of the QST area, but for me it was just, that was more like the vehicle in order to get what we needed to get."* (QST2 evaluation interview with S30).

5.4.3 Comparison between the cycles

QST1 involved more people, but they only took part at only a few specific points throughout the cycle, while QST2 involved fewer participants more regularly, meeting in an iterative and collaborative way. As H2 put it, QST2 was *"more focused and it was more policy responsive... the interactions here were much more tightly focused, at least initially"* (QST2 evaluation interview with H2, July 2024).

Participants in both cycles commented on QST's collaborative and iterative approach. However, from our evaluation interviews, there appears to have been a stronger awareness of the QST cycle among QST2 participants, though this may be due to us only interviewing QST2 participants who were closely involved in the process, whereas in QST1 we also interviewed people who had taken part in a single event. Participants in both cycles were less interested in QST as a method than in the content of the research. The SG participants seemed to enjoy the deliberation aspect of both QST cycles.

H2 perceived QST2 cycle to be more difficult than QST1 because of its less conventional way of presenting data, i.e., letting SG people access the data and make their own interpretations. He also thought QST2 was *"more what I would expect the QST process to do; there was more active development of the stage 1 and stage 2, with kind of agreeing the specification, and to a degree more interaction on the outputs"* (QST2 evaluation interview with H2, July 2024).

5.5 Impacts

This section looks at what the data suggest about the kinds of impacts achieved.

5.5.1 QST1 – Enhanced Conditionality

At the February QST meeting with SG, two products were asked for by S8 *"Line by line excel to allow assessment of each measure; Report highlighting missing measures and addressing the overarching issues of how to combine, weight and evaluate"*. In terms of project outputs, the main outcome of QST1 was the publication of the Enhanced Conditionality Synthesis Report, and the influence it had on policy. The report illustrated whether and how the current list of proposed EC measures was fit for a land use transformation; and highlighted several challenges to address. Within this report, the graphic representation of findings,

particularly the ‘policy sudoku’, were found to be important for communicating findings to wider stakeholders.

When interviewed, many people felt that it was too early to know the full extent of the research’s impact. However, overall, interviewees discussed how QST fits well within a fast-paced policy cycle. It was felt to be an effective method of interdisciplinary working and with policy actors. QST1 led to an improved communication between scientific disciplines; researchers enjoyed learning from other disciplines, and the methodology allowed for researchers to have more time to stop and think through each step of the research as a team. SG participants also discussed how storytelling was an effective form of communication with different levels in the Scottish Government, particularly communicating with ministers.

The research was received enthusiastically by policymakers; Scottish Government employees discussed how QST helped them to have a wider view of a complex topic, such as Enhanced Conditionality. The findings became part of the evidence used to inform policymaking, for example, participant S18 described the QST1 work as *“just part of the building blocks of the policy development. ... it's just another aspect of evidence that we can draw into the policy development process.”* (QST1 evaluation interview with S18, August 2023). This is also evidenced by H2 being invited to present the findings from QST1 at an SG ‘discovery’ meeting. However, at the time of the interviews it was unclear how much this would translate into impact, or how long-lasting this impact would be. Finally, the QST1 work helped shape the choice of topic for QST2.

5.5.2 QST2 – Regionalisation

The timing of the evaluation interviews (July – September 2024) meant that some of the impact has not been recorded; several interviewees noted that it was too early to know the impact of the project on policy. For example, S18 said: *“it’s too early to be able to answer that [what have been the wider impacts of this QST process] because we’re very much in the early stages of bringing it to life, if you like, and it’s only recently that policy colleagues have seen it.”* (QST2 evaluation interview with S18, July 2024).

However, there is some early impact recorded in terms of policy-research interactions, and on policy processes; the project presented a new way for SG officials of working more closely with researchers, helping SG participants identify the specific information they needed. The discussions between SG and Hutton participants led to the emergence of unexpected ideas: *“Just talking through the way the spec[ification] evolved kind of brought some things out that I don’t know if they were expecting to be brought out, and we weren’t expecting them to be brought out, around some of the ideas for some of the schemes being shelved, and some of the ideas for some of schemes being made more possible, even before the tools were built ... just the idea of talking through what our data might be possible to analyse, I think helped to formulate some things in their minds, definitely.”* (QST2 evaluation interview with H14, August 2024). The way that the data was presented to SG participants also impacted on how decision-makers think and talk about policy options: *“clearly this project has had an impact on the three of us [S30, S18 and S8], and our thinking around what we*

should be doing in the future ... I know from observations with [S18], and also from documentation around this that the evidence that [H2] and colleagues have pulled together and are presenting to us is having an impact on what we're communicating internally, the options that we're looking at and the considerations for future policy. It's definitely having that impact on the kind of the... It's a small group, but those are the key decision-makers." (QST2 evaluation interview with S8, August 2024). This is also evidenced S14's observation that "[S18] has been presenting regionalisation options internally, including splitting R1, merging R2/3 and the status quo." (Meeting with S14, August 2024).

The interactive tools played an important part in the project's impact by providing SG participants with information and insights relevant to policy; S18 said that the tools had given him more access to knowledge and evidence, while S30 said that they were useful in confirming what he already knew and expanding his knowledge, and that using the tools helped him understand the impact of policy changes. S8 also said that the tools helped him and other policy and analytical officials in SG to understand the different policy options, which represented a big shift in how they work: *"the way it's presented, the functionality, the ability that we have as policy officials and analytical officials in government to be able to actually just play around with it, to work out options I think has been a really big shift actually in how we work on this sort of issue."* (QST2 evaluation interview with S8, August 2024). The tools were also seen by SG participants to have additional potential impacts, in helping test out and develop policies, for example, in developing future support for Less Favoured Areas. In addition, the interactive tools also built capacity within the Hutton teams; for H27, developing the tool improved his software skills, and his ability to see and think of the data in new ways.

The project write-up and the workshop in July 2024 generated interest in the project among wider stakeholders, which, as S18 put it, *"can provide the basis of future policy"* (QST2 evaluation interview with S18, July 2024). Interest in the project included both the methodology used in QST2 and the research findings: *"the regionalisation analysis and the QST process that's kind of done that analysis for us feeds into quite a number of areas across the Agriculture Reform Programme ... it has sparked interest across a lot of groups in Scottish Government who are working on Agricultural Reform, and they ... are keen to understand how to use the tools that have been developed and what we can get from them"* (QST2 evaluation interview with S30, August 2024). This interest led to one follow-up meeting with S14, but the timing of the workshop just before summer holidays may have meant that the interest expressed didn't materialise in additional follow-up meetings. However, there were subsequent EFA (Ecological Focus Areas) adjacent meetings that may have been prompted by these project outputs. Overall, the research made the Hutton better known amongst a wider group of stakeholders, and with new SG staff.

At the time of the evaluation interviews, the tools were seen as having the potential to shape discussions and help develop upcoming policies: *"it's been a great help in providing the sort of underpinning data and evidence that will help us take forward the next iteration of discussions with ARIOB in the context of that wider policy development and how we*

actually configure the information that we put into the route map for 2025 that will set the course.” (QST2 evaluation interview with S18, July 2024).

Changes in the policy context mean that QST2 may have had less impact than anticipated. These changes include a decision to slow the pace of implementing the first two tiers of the agricultural reform programme, meaning that the insights from QST2 would be less likely to have an immediate impact on policy design. In October 2024 the team was asked to delay the publication of findings from the research to take account of further policy deliberations.

Despite these barriers, and beyond the impact of QST2 to date, the project may potentially impact future policies through future projects with RESAS analysts who expressed interest in how this research was conducted. The interactive tools are still active at the time of writing this report, so the impacts derived from using them may be ongoing. It was noted however that, to be useful, the information elicited from the tools should be accompanied by researchers’ interpretation and insights. In addition, the approach used in QST2 was seen as potentially being useful in other policy areas: *“I think this could work across many areas of agricultural land use policy, you know, and wide, more widely too.”* (QST2 evaluation interview with S8, August 2024).

A potential negative impact of the interactive tools would be the misuse or misinterpretation of results; this is outlined in section 5.4.2.

5.5.3 Comparison between the cycles

In both QST1 and QST2, the timing of the interviews meant that participants felt it was too soon to assess the impact of the research.

One of the main differences between the two cycles was the introduction of the interactive tools in QST2, which enabled policymakers to directly access information and policy insights, whilst in QST1 SG relied on the more conventional outputs such as the synthesis report.

QST1 involved a wider team of researchers from different departments, leading to an increased communication and learning across disciplines, while QST2 worked with a smaller core group of researchers so lacked this interdisciplinary learning. From a Scottish Government perspective, whilst QST1 was seen to be an effective method of working with researchers, the more frequent interactions, as well the interactive tools, appears to have made QST2 have had a stronger impact in terms of introducing a new way of approaching research-policy interactions.

There are data in QST2 that show how results on regionalisation also contributed to QST1 EC measures, for example that current models of regions 2 and 3 payments might affect the ability of business based purely on ‘rough grazing’ to implement some proposed EC measures (M&E meeting notes, 14th May 2024).

5.6 What contributed to the impacts

This section discusses what contributed to the outcomes and impacts of the QST cycles. The outcome of QST1 was the publication and influence/impact of the Enhanced Conditionality synthesis report. The report illustrates whether and how the current list of proposed EC

measures was fit for a land use transformation; and highlighted several challenges to address, which helped show where further iterations of the intervention might be required. The impact of the QST2 process was evidence provision for the Scottish Government to help with their Agricultural Reform Programme, particularly how to design and implement Tier 1 payments; and by implication, how enhanced conditionality might interact with Tier 1 (see QST1). The tools also built capacity for both SG and researchers to generate scenarios more quickly, to allow further iterations for future policy decisions.

5.6.1 QST1 – Enhanced Conditionality

The process of QST1 allowed several researchers to present their expert knowledge, and recycle existing products, to a live policy development process. Therefore, the willingness of Hutton participants to engage with the QST workshops, and to reframe their material into ways that supported the policy process, was essential. It was clear that these individuals were able to synthesise not just their own knowledge but to highlight insights from colleagues who were not participating. Experienced and confident researchers were better able to fill in the excel tool, even given uncertainty and need for more evidence (see below).

The QST1 process was mainly strategic summaries of qualitative, or ranked, information with supporting evidence provided. However, in both presentations and in the supporting evidence, quantified data were used, and this gives some authority to the summaries. An example is statements like *“50% of businesses have 90% of the support, can they deliver 90% (or more) of the outcomes sought”* (End of Year 2 project meeting slides, March 2024).

However, involving scientists also introduces uncertainty and complexity as biophysical processes are not always linear or predictable. In both the soil and biodiversity workshops, there were quantified and qualified statements about trade-offs and limits to generalisation about how the measures might work. In many cases, the measures were too generic for the scientists to respond e.g. *“Cover cropping and inter cropping are not the same thing but they are in the same measure”* (ecology workshop notes); and responses differ across the variety of terrestrial and aquatic habitats or soil types (soils, ecology, water workshop notes). These insights provide more precision but require translation from specific insights into more transferable principles. When making a robust policy framework for future payments across all farm types and all regions in Scotland, some generalisability and predictability will be required, and this requires additional skills from scientists who tend to focus on precise evidence which is often time and context specific.

The ability to reuse data and insights from prior work played a major role in QST1. Recycling prior work, including the analysis of Greening Measures under CAP, was used as a proxy for how farmers might uptake the EC measures. Existing research and expertise created the ability to identify gaps (e.g. plant genetics as a potential measure) or prioritise the effectiveness of a measure (e.g. building on the British Ecological Society review on regenerative agriculture). The combined experience and deliberation led to over ten gaps or issues being identified by the workshop participants, all of which ended up in the final report. The deliberation also prompted new ideas for the PI to check using their existing data sources and analysis, creating a more robust evaluation. This reuse of knowledge and

expertise is also evident within Scottish Government. The February QST workshop also highlighted or amplified some of the questions and comments that arose during the soils, water and biodiversity workshops; again the deliberation provided more ideas that ended up in the final synthesis document.

However, involving more people seemed to slow the process down considerably. The workshops were run in January 2023 to feed into the SG meeting in February 2023, but the final report was not ready until July 2023, partly as the PI was waiting on some evidence to be provided. This may explain why further workshops with other forms of expertise (e.g. on peatlands or socio-economic researchers) were supplemented by an invite to comment on the draft synthesis document.

Doing QST is time consuming and requires iteration between provision of expert opinions and crafting the message to respond to the interests and questions from Scottish government. Some Hutton interviewees found the process more time consuming than they anticipated, yet they also felt disconnected from the overall QST cycle (being only involved in the 3rd stage): *“the way this particular piece of the work went was all of this is extra on top of very full plates already for many of these guys in the workshops”* (QST1 evaluation interview with H10). The documentation of the process (including the evaluation data) was one solution to this disconnect, and the internal research workshop also provided an overview of what QST1 achieved, to help participants better understand the full cycle.

Relationships were therefore central to the delivery of QST1 – within Hutton, within Scottish Government, and between the Hutton PI and the contacts in Scottish Government. The workshop participants were well known to each other and the PI, but if the participants had not been known to each other, or had a combative relationship, the same expertise might not have been used to collectively identify issues and areas for improvement. Likewise, any impact the work has will be partially explained by having people within Scottish Government (RESAS and ARE) willing and able to promote the material and bring it to the attention of the relevant people. For example, S23 takes an action at the end of year meeting to *“make sure that relevant people are aware [of the EC analysis and when it would be available]”*. However, there were often long delays or no responses to emails sent to Policy units, which made it harder to then frame the material in ways that are most salient. The timing of the final publication (at the start of the summer holidays) also made it more difficult to follow up with key players within the ARP and ensure that they were fully aware and able to use the synthesis material.

There was also a useful synergy with the EARS project (Economic Analysis Research Support) within RESAS that provided additional analyses and insights to the QST1 analyses. The EARS meetings also provided a forum for discussion of the context into which the QST outcomes could be provided; plus the project allowed the QST1 team to be updated as the thinking around EC and the relationships with payments and other tiers of the support scheme evolved over time. However, this also created a very fuzzy boundary between the Land Use Transformations project QST process and other research activities involving the same Hutton researchers and SG policy actors. It made it very difficult to understand where the boundary of QST1 finished and the EARS analyses began.

5.6.2 QST2 - Regionalisation

The QST2 cycle was again explicitly designed to provide evidence for potential interventions and therefore possible changes to the existing payment regime, from 2027 onwards. Doing QST as part of the SRP was important as it provided more freedom to explore technically and politically ambitious scenarios (M&E meeting 30th January 2024) and it also allows SG to have an *“independent view of the pros and cons of these models, independent of government, to say that ‘this is what the modelling shows will happen if you go to this particular type of region model, or if you go to a different type of region model”*, (QST2 evaluation interview with S18, July 2024).

The QST2 cycle had many detailed graphs, figures, tables and metrics and these were not just for future scenarios of change, but there was also a lot of detailed information about the current situation and how the existing payment regime works. S8 commented a few times on the need to inform the audience (both the SG policy workshop and the ARIOB audience) about the perhaps unknown or unexpected aspects of the current regional payments regime. For example, one of the four sets of presentations given at the 3rd July policy workshop was a 16-slide presentation on ‘baselines and characterisations’ that explicitly set out to highlight any limitations of the current system.

However, during the QST cycle, there were changes in the timing of when decisions on payments would be made, and whether some complementary topics, such as the Less Favoured Area Support Scheme, would be altered or not. The wider uncertainty in the overall policy direction reduced the urgency and acceptability of change– *“[H2] thinks the change in openness for radical reform has diminished due to political background and financial situation”* (notes from M&E meeting, September 2024). Even with close communication with government actors, the researchers are not always privy to these changes - *“I suspect there's an awful lot going on in government that we are not necessarily seeing”* (team leads meeting, April 2024). The choice of what to quantify nests within a wider review of regional and other payments being done by the Scottish Government and other contractors, affecting which scenarios were to be analysed and what land cover classes and types of measures were to be included in the analysis (see for example, discussion at the team leads meeting in August 2024). The QST cycle was undertaken in the anticipation of what would be politically acceptable as well as technically feasible, yet the former was not always clear to the participants.

Therefore, doing policy-led work can drive the analysis; QST2 started with expectation of secondary regulations being drafted, but when its implementation was delayed by 18 months, *“that now means that there's less likelihood of us having immediately tangible instrumental impacts just now”* (QST2 evaluation interview with H2, July 2024). Without a ‘specific policy question’ the interpretation phase is much harder: *“You're constantly in this kind of wide-open spaces and nothing to hem you in other than your own decisions”* (QST2 evaluation interview with H2). As noted before, when the SG participants were able to engage and guide the communication of the main messages, the researchers felt they could have more of an impact. However, the lack of strong policy direction may have created space

for discussion of wider scenarios for change in payments and schemes at the July 2024 workshop.

Formal feedback workshops and stakeholder meetings were again important to provide structure and focus for the cycle. The main milestones were the July workshop (with those involved across the ARP) and the Agricultural Reform Implementation Oversight Board meeting in September. The ARIOB meeting allowed the key points from the regionalisation analysis to be presented directly to the Minister. The workshops forced several interactions within the team to agree the interpretation and main messages and may have framed the way the audience legitimised the findings.

The mix of team members was important. On the SG side, there were two very experienced individuals, but with different roles and working in different departments. There was also another member who was new to this part of government and to the topic of agriculture and its reform. As he had not experienced working with the team, or on the topic before, he was able to ask questions about how things were done, potentially creating opportunities to reflect on choices.

On the research side, the PI had a long track record of working with the underlying data and national scenarios and an interest in having impact on policy. Therefore, this enabled them to make bold statements about implications which could be checked and revised with SG. For example “Maintaining the differential in payment rates between BPS R1 and R2 is incompatible with the SG aspiration to make 50% of direct payments conditional (via Enhanced Conditionality) as it would mean differences in payment rates for the same actives being undertaken on land that is otherwise functionally identical, except for historic stocking rates.” (first point in the synthesis report’s key findings). The PI also chose to expand the brief to have a strong but multi-perspective focus on distribution of outcomes in terms of farm types, geographies and land cover, and *“It’s also linking to other kinds of distributions, so we’re linking money distributions to that other phenomenon. So, how much money is going to areas in the lowest quartile of the socioeconomic performance metrics, what proportion of money is going to accessible rural as opposed to very remote rural, or what proportion of money is going to high capability land or different kinds of peatlands.”* (M&E meeting, May 2024). This reflects his prior experience with QST where attention to multiple perspectives on distribution was seen as fundamental to the methodology. The ability to move from handcrafted to industrialised computer-based tools including the PowerBI dashboard creating ArcGIS maps, was also down to a new member of the team who had prior experience of the programmes and was willing and able to experiment to make it work for the task.

As much effort went into the creation of tools as to the provision of evidence on regional payments, to build capacity for the Scottish Government analysts to run their own analyses. This could be argued as increasing transparency and therefore trust in the outcomes of these tools and was supported by guidance documents and/or training sessions to help people become competent to use the tools. These were additional to the request in the original specification. On reflection, the tools were also useful to help the Hutton researchers manage the complexity of the results, improving their technical skills, as *“at the*

back end, everything is now held in largely a single data structure.” (M&E meeting, May 2024). The improved user interface is due to a lot of software engineering behind the scenes and make it easier for the user to compare and contrast scenarios. The PowerBI tool also made it easier to export materials into the PowerPoint slides which is likely to have helped the development of the six slide decks that make up the overall package of materials arising from QST2. The ability to tame and present complexity (avoiding 17 diagrams on one page, as stated in the regional analysis meeting in October 2023) was delivered through these innovations, which helped streamline the provision of visual data. However, the ‘industrialisation’ of these data makes the problem of selecting what to produce more pressing, requiring direction from the policy participants.

Two things seemed fundamental to the delivery of a successful QST2 cycle: the availability of up to date, detailed and appropriate data, and the iterations of the stages 2,3 and 4 of the cycle. Firstly, the Synthesis Report acknowledges the fact that the Hutton team could use the *“integrated administrative, and research derived datasets”* – these data are not widely available and illustrate the long-term relationship of trust that researchers are able to store and exploit the data in ways that protect anonymity of the individual businesses. Where data were missing or needed verification, the RPID participants were willing and able to provide the material. Secondly, the process was designed to take a ‘stepwise’ approach *“to ensure the next learnings can be incorporated from each previous question/requirement and later requirements can be suitably altered”* (18th October 2023 version of the specification document). In the words of S30 *“if ... there wasn't the kind of iterative process, we would have got something that was probably much more basic and, you know, less developed and it would not have had such an impact.”* (QST2 evaluation interview with S30, August 2024).

This iterative process required the willingness of the Hutton team to be responsive, but also to try to anticipate policy requirements, push for clarity on policy positions and trial different messages and ways to convey them. It also required the Scottish Government team to comment, critique and add insights, putting them in a much more active role in creating the final products than most research projects, even if they are not officially authors of the products. This iteration was prized, not just for the improvements in the products, but also for building mutual understanding and capacity in the Hutton team and the Scottish Government team. The comments and edits on the final documents show detailed information exchange between SG participants as well as between SG and Hutton, and the joint development of key messages. The QST2 interviews with the three SG participants all highlighted the importance of trust and the fact that SG felt that Hutton were listening to them and willing to react and do things to meet their needs.

5.6.3 Comparison between cycles

Both cycles built on prior and complementary policy related research, e.g. the QST2 slide deck on the overview of the project highlights that QST *“draws on previous work Strategic Research Programme (2022-27 and earlier 2016-22); EARS regionalisation scenario analysis (2023); and Analysis of Enhanced Conditionality Measures (2023)”*. This is important for credibility and perhaps explains the lack of attention to stage 1 in both QST cycles.

Both cycles were part of a wider policy context that includes decisions being about the Agricultural Reform Programme. The data seem quite vague about these wider reforms – ARIOB September 2024 states that the papers presented “*updates the Agricultural Reform Programme (the wider context) and the Changes due in 2025 and 2026 that are already agreed*”, yet both QST cycles were explicitly designed to provide evidence for these decisions. Therefore, the wider context and lack of clarity on exactly how the Tiers or interventions will work together were both the driver, and constraint, on the QST cycles.

Both cycles used workshops to drive the process, but in different ways. QST2 had much more focus on external users of the QST outcomes, which influenced the choices made in the cycle. In theory, the more public-facing QST2 should have had more impact as the material was directly presented to more decision takers, but both cycles show the conditioning effect of wider policy development on the ability of research to impact on policy.

QST2 explicitly learnt from QST1 and focuses on iterative, responsive analyses. Having the tools and an agile team were essential for the iterativity, credibility and relevance of the work. Using the tools to make bold statements about the need for, and consequences of, change seems more important than making the tools available, but by providing the tools, it may have made the analysis more transparent and legitimate. Overall, the iterative process seemed to be powerful, but this creates more pressure on the participants and requires more of a commitment from them, making it harder to engage a wide range of experts. Finally, in both cases, QST simultaneously required strong existing relationships, and also helped to sustain these relationships. However, this does make QST a risky endeavour, as any difficulties or controversies arising from QST may jeopardize these relationships.

6 Concluding Discussion

This report sets out what we have learnt from the two cycles of Quantitative Story Telling (QST) undertaken from August 2022 to October 2024. Data were collected from the decisions about what each QST would focus on, through to the publication of the final outputs from the cycle, as shown in Figure 2. These data were analysed and the findings set out for each cycle and how the cycles were similar or different. The combined findings are now discussed in terms of the answers to our research questions.

6.1 What were the anticipated focus and anticipated impacts of the QST cycles?

QST1 focussed on screening the proposed enhanced conditionality measures to provide research evidence on whether the measures were likely to achieve their desired environmental objectives. The additional impacts sought by the Hutton researchers were to identify gaps to ensure that these gaps were filled, such as lack of attention to water resources, or to landscape-level emergent outcomes. Through this, it was hoped that existing capacity within the Hutton would be visible to Scottish Government, and researchers would experience how best to respond to policy requests.

QST2 focussed on three scenarios of changing the model for regional payments as well as retaining the status quo. With the agreement of the Scottish Government participants, the focus was broadened to include how regional payments interacted with other forms of voluntary coupled and less favoured area support. The development of tools was done with the explicit aim to build capacity within Scottish Government to run their own scenarios, as well as improving ongoing policy-research interactions.

Therefore, both cycles were focussed on the main funding mechanisms of the proposed ARP which were, at the time of QST1 and the start of QST2, to be operational in 2025-26. This meant the findings were important and urgently required. The main outcomes sought by Scottish Government were independent evidence and suggestions to develop the funding regimes for Tier 1 and 2 in the Agriculture Reform Programme. However, the outcomes sought by the Hutton researchers were broader: to build more capacity within the transdisciplinary teams, improve connections and networks, and broaden the framing for the current agricultural policy.

6.2 How were the QST cycles enacted?

QST1 deliberately focussed on harnessing the expertise of a wide range of researchers to feed into a policy instrument being developed for the first time. The process involved prioritisation and categorisation but did not attempt to model or map the findings, making it a more conceptual approach than previous applications of QST (see examples referenced in section 2). Evidence was provided to relevant SG individuals, and the findings were debated with these individuals, but the QST cycle was not as policy driven as QST2. The outcome of the QST cycle was a synthesis report.

QST2 was a much more quantitative approach generating a large volume of evidence about potential outcomes of the current, or proposed, regional payment models. It involved a small group of researchers and a core team within Scottish Government, with the same process of providing evidence to a wider set of relevant SG staff for them to discuss and debate. The evidence was also presented and briefly discussed with wider stakeholders at the ARIOB meeting. The outcome of the cycle was a synthesis report, an associated technical report, and six slide decks with information on the tools and the results from the scenarios.

The two cycles were very different in terms of how closely and how often the researchers interacted with Scottish Government, and in terms of how the 'quantitative' aspect of storytelling was operationalised. Furthermore, whilst both cycles offered some form of 'tool' that Scottish Government could use themselves, the tools in the 2nd cycle of QST were much more sophisticated and generated additional analytical and presentational capacity within the Hutton team as well as for Scottish Government. Both cycles followed the main stages of the QST cycle illustrated in Figure 1, and there were iterations back and forwards between stages. However, QST2 was extremely iterative, particularly in terms of what was to be quantified (e.g. from stage 2 through stage 3 to stage 4 and then back to stage 2 again for the next iteration), whereas QST1 was more of a single cycle with some fuzziness between the end of one stage and the start of the next. In both cycles, there were dominant individuals from both Scottish Government and Hutton who made the major decisions about

how to proceed. This highlighted the need for flexible, responsive and committed individuals from both policy and research teams. However, their familiarity with the policy domain, and prior research, meant that the first stage about framing the topic and the governance context was not fully addressed.

6.3 How were the QST cycles experienced?

QST1 created interesting and enjoyable interactions for most participants but many did not really understand the full cycle or feel strongly engaged in influencing policy due to only participating on one research workshop. In contrast, QST2 was much more demanding of the main participants. Ironically, the Hutton researchers were seeking more interaction and engagement from the policy participants, whereas the SG participants found it very unusual to have such frequent iterations with researchers working on the SRP. From the evidence on the use of tools, building the potential capacity was appreciated but it was not fully exploited due to the lack of available time from the Scottish Government participants.

What was interesting to observe was that for most participants, the methodological approach of QST was not really of interest; the focus was on the impacts achieved, particularly the provision of credible and timely evidence for the policy development processes. However, the lessons learnt is that many of the impacts accruing to QST1 and QST2 were not instrumental impacts around policy change, but other process impacts as described in section 6.4.

6.4 What impacts arose and how can these outcomes be explained?

QST1 was appreciated for its provision of evidence to support the development of EC measures, and the fact that discussions around EC and its links with EFA research undertaken in other projects continued alongside QST2 shows that impact can take some time to be fully understood. QST1 was also appreciated by researchers for giving them time to reflect and reframe their existing research findings in ways that were relevant to important policy decisions.

QST2 was also appreciated for its provision of evidence into a live policy decision space, although again, the discussions about regionalisation of payments continued after QST2 ended. As with QST1, the discussions between researchers and policy officials provided space and time for reflection and mutual learning. The evaluation interviews suggest that the tools did build more capacity within Scottish Government than was visible to H2 and his team. From a more detached perspective, the data can be read to show that both researchers and SG participants grew in confidence about how to interpret and present the data to wider policy and stakeholder audiences over the QST2 cycle.

In both cases, the evaluation interviews suggested that the full impact was difficult to know yet, as the policy changes were still under discussion and final decisions were not yet made. Thus, in both cycles, the impacts were often procedural such as building and sustaining networks, building capacity and challenging how the policy areas were being framed,

including raising awareness of the ‘policy sudoku’ – in other words, how choices in one tier of the ARP could have consequences for other tiers as well as for other policies.

All outcomes (provision of evidence, building networks, building capacity, conceptual change about the boundaries and connections between different parts of the ARP) were delivered, but trade-offs were experienced. For example, to build capacity with key Scottish Government participants in QST2, the Hutton team was smaller, and the focus was on iterative development of tools and their outputs. This was valued but the networks within Hutton were less developed; and capacity was only built for a few individual researchers. The QST cycles were clearly driven by the policy context and development of new policy after the UK’s exit from the European Union, however, the apparent uncertainty and delay in implementing the first two Tiers changed the urgency and pace of the cycles. The ability to convene relevant policy actors and present draft findings seems to have contributed to building networks and capacity, such as in terms of how to present evidence and pitch key messages, even if it is difficult, and potentially too early, to see if the evidence contributed to any final policy decisions.

6.5 What are the lessons learned for future QST cycles, within the Land Use Transformations project and beyond?

The QST1 cycle taught research participants about how to pitch their research to policy makers and the different cultures and pace of research between different research domains. However, the transaction costs in convening multiple researchers and their evidence detracted from engagement with Scottish Government in QST1, leading to a deliberate decision to have smaller and more agile teams for QST2. The main lesson here is that science-policy interactions require more commitment than most individuals were expecting. Therefore, QST needs appropriate institutional support to allow for the ‘stop-start’ nature of policy responsive work.

QST2 built capacity in the research team and offered capacity to Scottish Government participants, who were pleased to have the potential but were not able to fully utilise the tools at the time. Evidence was provided for different models of regionalisation, including how these scenarios interact with adjacent policy areas, anticipating further policy decisions to be made. This shows how the framing and interpretation of evidence by experienced and far-sighted policy entrepreneurs can extend a simple call for evidence into a wider and more political piece of research. The main lessons here are that trust, and experience, are essential to such an ambitious approach, and these require long-term relationships and therefore long-term investment in research on the same research domain. However, the expertise and experience are concentrated in a few individuals, making the process vulnerable to staff changes.

Overall, QST appears to be a good way to develop and sustain science-policy interactions. However, the context for these cycles was unique – in the policy window of a once-in-a-generation reboot of agricultural policy – and was undertaken by a set of policy and research

participants who had a long track record in the domain and were well-known to each other. Therefore, the ability to replicate the success of QST may be contingent on similarly conducive conditions. The findings therefore confirm wider literature that QST needs to have a salient focus, and to provide credible evidence from a trusted team. Iterations that respond to policy-led questions do indeed amplify these success factors. However, relationships and commitment to going beyond a traditional purchaser-provider relationship were also elements that seem to have generated the outcomes being sought. The main lessons here are that QST is partially based on technical skills and expertise, and partially driven by personality and values, meaning that some of the process can be taught, but other aspects need to be experienced.

7 Next steps

The research has fed into other aspects of land use transformations research, including Milestone 38 internal working paper on insights from the policy coherence for which has been shared with the team leads to help with discussions over the next potential QST cycle.

The insights from these two QST cycles will be shared with the Scottish Government and the Land Use Transformations research team. We will also seek to discuss the findings with others with an interest in Science-Policy interactions within the SRP, such as KJHI-C5 ('Large Scale Computer Modelling' and KJHI-D5.3 ('Galvanising Natural Capital'). We will share results with the responsible RESAS analysts interested in science-policy interactions. Based on interest, particularly from the end-of-year meeting in March 2025, the next phase of data collection for QST3 will be started. However, this should only be undertaken if there is sufficient resource and interest to analyse and learn from these data.

Finally, there is a formal commitment to an academic output such as a journal paper on methodological lessons learnt for QST (D12) due March 2026. This will combine the empirical findings in this report with reflections on what was learnt about how to monitor and evaluate QST in future.

8 Acknowledgements

It has been a privilege to observe and reflect on these interactions and we thank all participants for being willing to share their experiences to allow our learning to take place.

9 Appendix 1: Interview guide for QST1 and QST2 evaluation interviews

Introduction

Informed consent

About you

- Could you briefly introduce yourself?
- What is your role in [insert relevant organisation here]?
- How long have you worked there?

Involvement in QST process

- Do you know what we mean by QST?
- How have you been involved in the QST process?

Preconceptions about the QST process

- What were you hoping QST might achieve before getting involved in the process?

The QST process

- How did you find being involved in the QST process? Was it what you expected? Why?
- Were there any things you would change about your involvement? Or that you particularly liked? Anything you didn't like or would make you wary of participating again?

Impact of QST

- What do you think has been the wider impacts of this QST process?
- What type of impact has the QST had on you personally? What do you feel like you've learnt from the process?
- Did you expect QST to have these sorts of impacts? Do they match with what you were expecting to come out of the process?
- What do you think contributed to these impacts and/or learnings?

Future QST process

- What do you think we should do differently in future QST cycles?
- Is there anything you think worked really well?
- Any other final remarks – anything we haven't covered?

Next steps

10 Appendix 2: Interview guide for QST2 start-up interviews

- [Summarise rationale and context from research specification] – is there anything further you'd like to add on why regionalisation of tier 1 payments was selected as the priority for the next QST?
- We understand that there are links to the work in QST1.0 on enhanced conditionality, in terms of the overall farm support payments across tiers 1 and 2. Did the thinking in QST1.0 influence the research specification in any way?
- What is your role in the steering group?
- How do you envisage the findings of the regionalisation research being used? When? Which governance or advisory groups will be most appropriate to discuss and interpret the results?

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