S-map

Indicative benefits

m.e consulting

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Manaaki Whenua Landcare Research

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SUMMARY

S-map Online is a tool that is administered by Manaaki Whenua – Landcare Research (Landcare) to deliver digital soil information. This information is used to inform a range of activities, supporting activity and delivering a wide range of benefits. Some of the benefits are direct, flowing to users, and others are benefits flowing to non-users and the wider community. Landcare is exploring options to expand S-map coverage and we understand that a business case (for funding) is being prepared. As part of this process, the potential benefits that such a roll-out could deliver is being assessed.

Market Economics Limited (M.E) worked with Landcare to estimate the benefit of S-map and of expanding its coverage. This assessment considers the level of use and estimates the benefits flowing to users. It is a first cut, indicative assessment of the user benefits. It is not a full cost and benefit assessment. It was not the intention to complete a 'final' and detailed estimate of the benefits, but instead to prepare an indicative benefit estimate. During November 2024, S-map users were invited to complete a survey about their usage patterns, and we draw on the survey to estimate the value of work done using S-map. Where possible the spatial and sectoral patterns were applied to the current S-map user base.

We estimate that there are 13,600 active S-map users and the survey returned 581 usable responses. Most users identify as 'private businesses' (42%) and 'landowners' (13%). Not surprising, the top ten applications show a strong connection to agricultural land use and processes, e.g. crop/pasture production management decisions or planning, farm nutrient budget or management models[1], managing nutrient losses and irrigation management. This points to the fact that S-map is used as an input to farm processes, directly and indirectly. S-map is also used in non-farm settings. Most (61%) users indicate that S-map is an important or very important input into their processes.

Base values and wider rollout

Using the survey results about frequency of use, charge-out rates and the sectoral mix of users, we estimate the direct value of S-map related work (direct work) as being **in the order of $54.6m per annum**. Most (73%) of this value is associated with regions that have 'good' S-map coverage. A quarter (27%) of the value is associated with areas with low coverage. Professional, scientific and technical services have the highest level of direct use benefit, valued at $28.1m, followed by agricultural activities, specifically horticulture and fruit growing ($12.9m), and sheep, beef cattle or grain farming ($2.8m).

The potential use value of expanding S-map assumes that areas that are currently not covered by S-map will see the same use values as the currently covered areas. Using current sectoral usage intensities and values as proxies[2] for sectoral benefits, and applying these to the activities in uncovered areas, we estimate the potential lift in benefits. Assuming that the 'new areas' would see between 80% and 90% of the potential gains, rolling out S-map across a wider area will deliver up to **$19.6m per annum** in additional value or benefit. Most (79%) of this lift is in area that already have some, but low, S-map coverage.

Importantly, these benefits are not one-offs, but will occur over multiple years. We use a scenario approach to illustrate the magnitude of the multiyear benefits. The present value of rolling out S-map over the uncovered areas is between **$91.7m and $112.6m over 10 years**. It is also very important to bear in mind that in addition to the use benefits, other benefits arise. These wider benefits are discussed in the next section. Quantifying these 'facilitated effects' and benefits are beyond the scope of this project.

[1] OVERSEER®, MitAgator.

[2] We used several different approaches to estimate the proxies, including averages like the benefits per farm, and the $/business.

Comparison with 2019 assessment

The results show a considerable lift in the estimated potential value (benefit) of S-map, relative to the previous (2019) assessment. This can largely be ascribed to greater availability of information, i.e., wider S-map coverage, and a larger number of active users. The largest group (private users) have also reported an increase in their charge out rates, which in part, drives use value.

Wider benefits

As mentioned, the analysis outlines the direct use values but information dataset and tools, like S-map, assist users to complete analysis to a deeper level. This enables higher quality results, more detailed assessments which should lead to better decisions and improved outcomes. This assumes that decision-makers act on the available information – something that is not guaranteed. These facilitate or enable effects which have long-lasting and large effects.

S-map has a direct link to natural capital, an increasingly important consideration. While there is a lack of research and case studies on measuring the value of information products, several authors have examined the value of making better farming decisions, from various perspectives[3], such as increased productivity, reduced inputs (e.g. fertiliser), long-term gains through soil conservation, and the like.

Erosion control is an example where S-map users can influence processes with wide benefits. To put the scale of this potential gain in context, the Ministry for Primary Industries states that erosion and its effects – lost soil, nutrients and production, damage to trees, houses, infrastructure, and waterways – in hill country areas alone are estimated to cost New Zealand's economy **$100 million to $150 million a year[4][5]. Over 10-years, this equals between $963.8m and $1.1bn. If using S-map contributes to a 1% saving, then S-map's value is between $9.6m and $11.4m per year.** Importantly, the savings reflect the outcome of many actions, and not just the availability and use of S-map.

Looking forward, climate change will change the frequency and severity/intensity of storms in some areas and result in drier conditions in other areas. Both trends would increase lost agricultural production from mass movement in hill country and surface erosion, respectively. S-map has a role to play in responding to these pressures, protecting the natural capital and enhancing the response to climate change (i.e. lifting resilience).

The link between land use and freshwater quality is noteworthy. Fresh water contributes to the economy and is valued by New Zealanders. It has cultural, social, economic and recreational values. Maintaining and improving water quality are two key government priorities. There is limited research that values freshwater quality in Dollar terms. Nevertheless, the role of land-use management is important. S-map data has a natural fit with such management and will make an important contribution to land use management. Drawing from the Lake Taupo example, and assuming that soils information is used to (and contributes to) reduce nitrogen use and leaching, then reducing nitrogen discharge to water is put at between $43m and $87m (per year)[6].

Concluding remarks

S-map is a valuable resource enabling users to undertake research and modelling work that would be difficult to undertake in the absence of the information. The survey illustrates the mix of users, with a large

[3] Giasson, Van Wambeke & Bryant, 2000

[4] https://www.mpi.govt.nz/forestry/funding-tree-planting-research/hill-country-erosion-programme/. Accessed 23 December 2024. This figure has not been updated by MPI since the 2019 M.E report.

[5] Another study for the Ministry for the Environment quotes research highlighting the annual cost of soil erosion and sedimentation, suggests that the value is in the order $229m. Furthermore, the highest component of costs is lost agricultural production, estimated at $66m (2024 value).

[6] Based on communication with, and information from, Landcare.

portion of private users – either a private business or landowners. This suggests that most of the immediate use benefits will accrue to private users. It is not difficult to foresee a situation where requests for additional funding are responded to by using user-pays arguments. It is worth noting the wider benefits – facilitated benefits as well as avoided costs – of S-map are mostly public benefits, i.e. benefits that will accrue to the wider public and society. Soil information is also required by those who influence or inform farm decision making, such as policymakers and consultants.

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1 Introduction

S-map Online is a tool that is administered by Manaaki Whenua – Landcare Research (Landcare). It is used to deliver digital soil information. The information in S-map is used to inform a range of land planning, management and investment decisions.

Intuitively, there is value in having the S-map resource. Landcare is exploring options to expand the S-map coverage to include other areas. As part of the process, Landcare is preparing a business case for central government funding to enable S-map to be rolled out across New Zealand and it needs to understand the benefits of increasing the coverage.

Market Economics Limited (M.E) worked with Landcare in 2019 to estimate the benefit of S-map and of expanding its coverage. Since then, S-map's coverage and user base have been expanded and Landcare commissioned M.E to update the 2019 assessment incorporating the updated information. This report presents the results. Importantly, the assessment is not a 'full cost and benefit assessment'. The focus is on the benefit side of the equation. Further, it was not the intention to complete a 'final' and detailed estimate of the benefits, but instead to prepare an indicative benefit estimate. The assessment draws on a survey conducted during November 2024. M.E and Landcare collaborated during the survey design process and Landcare managed the surveying stages. M.E analysed the relevant parts of the collected information and used it in estimating the potential benefits. It is however beyond the scope to explain and quantify all the benefits that current users derive.

1.1 Key tasks

The project was delivered by way of several key tasks, focusing on estimating the potential benefits that rolling out S-map over currently uncovered areas could deliver. The main steps were:

1. Consider and update (where possible) available information about current S-map coverage, the existing user profile and user base.
2. Identify and review the benefits that current users are getting from S-map and how this links to the spatial distribution of S-map coverage (around the country). During this task, we looked at the spatial patterns revealed during the survey (e.g. where an Auckland based consultant services a Southland farmer).
3. Define the opportunity associated with a wider S-map rollout using a scenario approach[7], and expressing the change in quantitative terms.
4. Estimate the revealed benefits that users are deriving from S-map.
5. Not all benefits of S-map are reflected in the survey, and we provide a brief narrative on the other benefits. For example, having access to 'better' information leading to 'better quality' decisions and then enhanced outcomes.
6. Present a high-level comparison of the key variables and results of the previous (2019) and current (2024) assessments.

[7] We have allowed for 1 scenario but can vary this if needed.

1.2 Limitations and caveats

The estimates presented in the report are subject to limitations and caveats, including:

- Several data sources were used, including the survey and the information about S-map users. Regarding the user information, we assume that it is accurate and current. We did not audit it for accuracy, duplicates or any data errors. In terms of the survey, we have assumed that the collected results reflect the spatial and user (by type) distribution of active users.
- The sampling of S-map users is targeted at those who use the S-map Online website to access S-map information. S-map information is also available through 65 commercial users, representing larger organisations such as fertiliser companies, banks, valuation etc. A number of these users incorporate S-map information through their own proprietary tools. For example, S-map data is integral to the Overseer nutrient budget model, which is reported to be used in over 15,000 NZ farms[8]. This assessment excludes these users meaning that a substantial portion of S-map users are excluded because the use is 'indirect'. Therefore, the benefit outlined in this assessment captures only a portion of total use and are likely to be conservative.
- The assessment reflects the current understanding of S-map, its coverage and the roll-out. The roll-out of future S-map coverage expansion is distributed over 5 years. It can be brought forward or delayed, but the timeframe is used to show the potential value over time.
- The report shows indicative estimates only, the results are not forecasting, or projections of the future – they are simply a scenario showing the potential outcomes based on the settings. Similarly, the outcomes are not guaranteed.
- The benefits are based on available information as collected during the survey. We rely on the survey information but in some cases the coverage (return rate) is low, widening the margin of error and lowering the confidence intervals. We note that the information collected on the S-map alternatives is very limited, and this reduced our ability to reflect the potential costs (and benefits) of the status quo approach in the areas without S-map.

As mentioned, a brief narrative about the potential benefits of having better information is included. This narrative is excluded from the analysis, i.e. we did not attempt to quantify these effects.

1.3 Report structure

The report is structured as follows:

Section 2 provides a high-level summary of S-map users and the key ratios identified from the survey.

Section 3 presents the analysis and scenario modelling.

Section 4 includes a high-level comparison of results and variables from the current and previous (2019) assessment.

Section 5 concludes the report with a high-level narrative of the potential wider benefits of S-map and soil information.

[8] https://peak.overseer.org.nz/our-story.

2 Base information

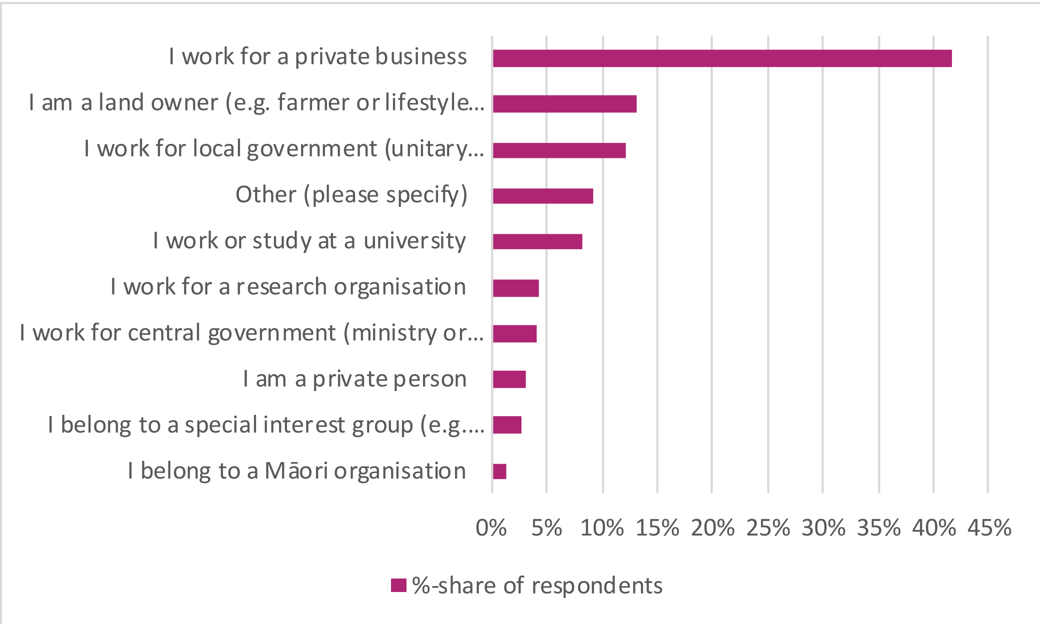
Information about S-map users, and the survey results are used to estimate benefits. Where possible the spatial and sectoral patterns were distilled and applied to the New Zealand-wide landscape. The existing S-map user base was used to scale the survey results.

2.1 User information

The S-map user base information was used as a starting point for estimating the potential benefits of S-map. The user database contains over 31,100 individual records. The records were reviewed, and we adjusted the dataset for non-current users and to remove users that haven't used/accessed S-map in the past two years. One-off users are also identified. After these adjustments, there were 13,600 active users in the dataset. This is seen as the S-map 'user population' and the survey results are scaled to match this estimate. It is noted that this is nearly double the number of users than were reported in 2019. However, the share of the data base that are 'regular' users, have fallen from 52% to 44%.

The survey returned 581 usable responses that were used to inform the analysis, approximately half the number of respondents compared to the 2019 survey. The percentage breakdown of users by type was derived from the survey and applied to the active user base. Figure 1 shows the percentage breakdown.

Figure 1: Percentage breakdown of users by type



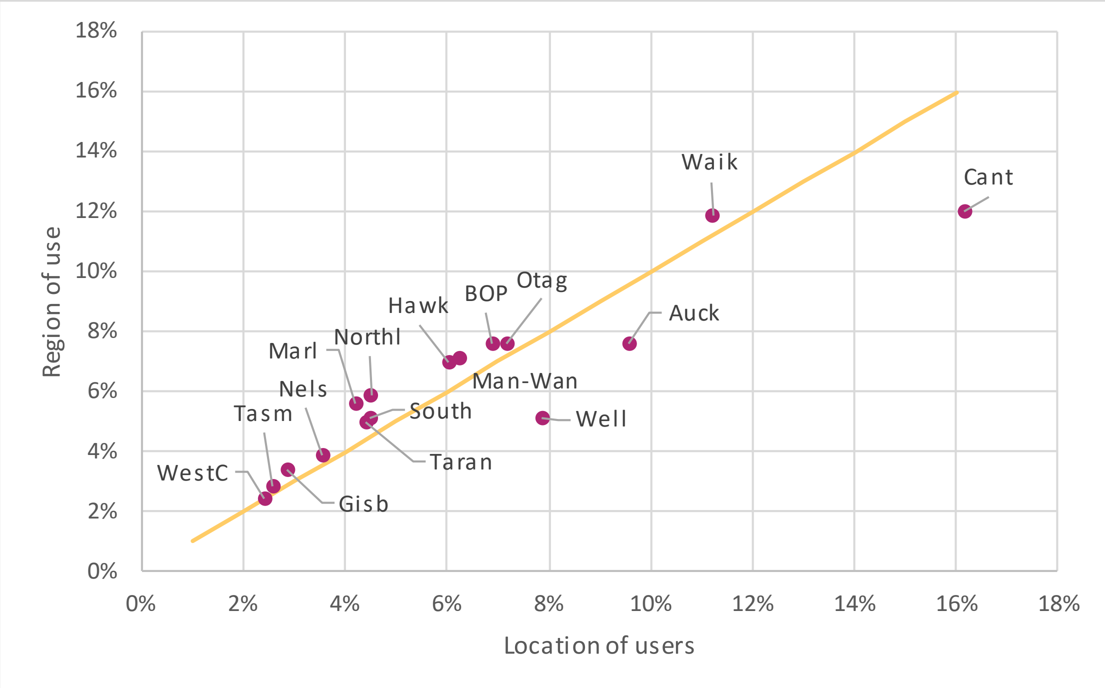
It is evident that the 'private business' segment is the main user group with 42% of the respondents falling in this group. Landowners (13%) are the second largest group. Several smaller groups make up the balance. This includes:

1. University related users (workers or students; 8%),
2. Government – central and local (4% and 12% respectively),
3. Research (4%),

4. Other[9] (16%).

With reference to the spatial distribution of users, we considered both the location of users (where they are based) as well as where they work (in which region did you apply the soil information). Figure 2 shows the relationship between where users are located and the regions where S-map is used. The figure includes a 45°-line. A location below the lines reflects an over representation of location vs regions of use.

Figure 2: Spatial patterns



For example, Auckland hosts nearly 10% of users but the region represents around 8% of use. Wellington and Canterbury have similar patterns. Conversely, the Waikato has a slightly higher 'share of the use' relative to users located in the region. Overall, the spatial pattern suggests that most users are located in the main regions. A share of respondents indicated that they deliver services (or use S-map) across New Zealand but these users are concentrated in government and research organisations and private businesses. When combined with the user profile – that 42% of users are private businesses – this suggests that a sizable share of S-map usage is via contractors or consultants and the service is 'sold' to the regions. Around 43% of users indicate they service multiple regions, i.e. use S-map information for more than one region. Around 31% of the respondents indicated that they service all NZ regions. This has increased markedly since the 2019 survey, when only 10% of respondents indicated they service all of New Zealand. It is possible that as competition for work grows (due to the slowing economy), consultants and contractors widen their area of service.

Many of the smaller regions, like Hawke's Bay, Bay of Plenty and Marlborough, have a marginally larger share of users relative to the level of use. This suggests that the regions are 'importers' of the services.

[9] This includes Māori organisations, special interest groups, private individuals and not elsewhere classified groups.

Application of S-map

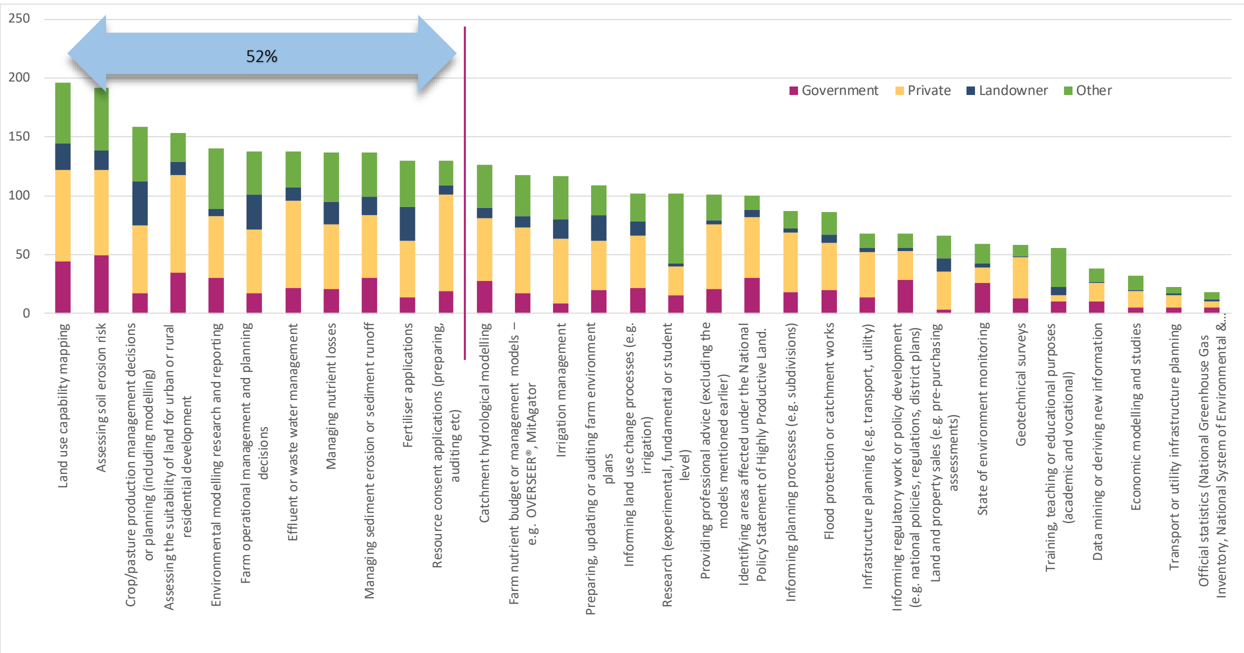
S-map is used for a range of applications. Figure 3 shows the responses for different applications, by user type. Respondents are grouped into four user types, with two (private business and landowners), representing the entire groups as used in the survey. The government group includes both local and central government. The 'other' group includes the balance of respondents, inclusive of researching organisations, special interest groups, university workers/students and so forth.

Overall, the top ten applications that get the most use across all user types are:

- Land use capability mapping
- Assessing soil erosion risk
- Crop/pasture production management decisions or planning (including modelling)
- Assessing the suitability of land for urban or rural residential development
- Environmental modelling research and reporting
- Farm operational management and planning decisions
- Effluent or wastewater management
- Managing nutrient losses
- Managing sediment erosion or sediment runoff
- Fertiliser applications

The top ten applications are largely similar to the 2019 survey, although there is some movement in the relative ranking. These top ten applications account for half (52%) of all applications. This points to the fact that S-map is used as an input into many farm processes (8 out of the top 10), directly and indirectly. Users also used S-map to inform the wider implications of land use, for example suitability of land for residential development and catchment modelling.

Figure 3: S-map applications



The relative importance of private sector users across all applications is noteworthy. In fact, it dominates virtually all applications, except 'research (experimental, fundamental or student level)'. The applications with the highest relative (%-terms) use by private users are (note, this is a large %-share of a small number of users):

- Resource consent applications (preparing, auditing etc)
- Geotechnical surveys
- Informing planning processes (e.g. subdivisions)
- Infrastructure planning (e.g. transport, utility)
- Providing professional advice

These are relatively specialist areas needing special capability and know-how. These applications tend to form part of technical processes and so the over representation of private users is as expected. Importantly, private users apply S-map for a wide range of applications and the above list is only the top 5 (applications associated with private users, not the entire sample). Private users are over-represented across[10] almost all applications with a median share of 42%. The second largest group, landowners, have a different use profile. This group's top applications, in terms of %-share of overall use per category, are:

- Crop/pasture production management decisions or planning (including modelling)
- Fertiliser applications
- Farm operational management and planning decisions
- Preparing, updating or auditing farm environment plans
- Land and property sales (e.g. pre-purchasing assessments)

When compared against total use, landowners' share is around 9%. This is the average level of use across all the individual use categories.

Government's use (local and central) is double that (average of 20% across all the use categories and user-types). The largest use shares are in areas associated with planning, infrastructure and information management. The top five applications for government users are:

- State of environment monitoring
- Informing regulatory work or policy development (e.g. national policies, regulations, district plans)
- Identifying areas affected under the National Policy Statement of Highly Productive Land.
- Official statistics (National Greenhouse Gas Inventory, National System of Environmental & Economic Accounts)
- Data mining or deriving new information.

With reference to other users, the applications are varied with the survey suggesting that other users are diverse, but as a group, they are an important segment. This group used S-map for the following applications:

- Training, teaching or educational purposes (academic and vocational),
- Research (experimental, fundamental or student level),
- Economic modelling and studies,
- Environmental modelling research and reporting,
- Official statistics (National Greenhouse Gas Inventory, National System of Environmental and Economic Accounts).

[10] In this section, the measurement is based on the count/number of times a user uses S-map across all the applications and is based on the response rates.

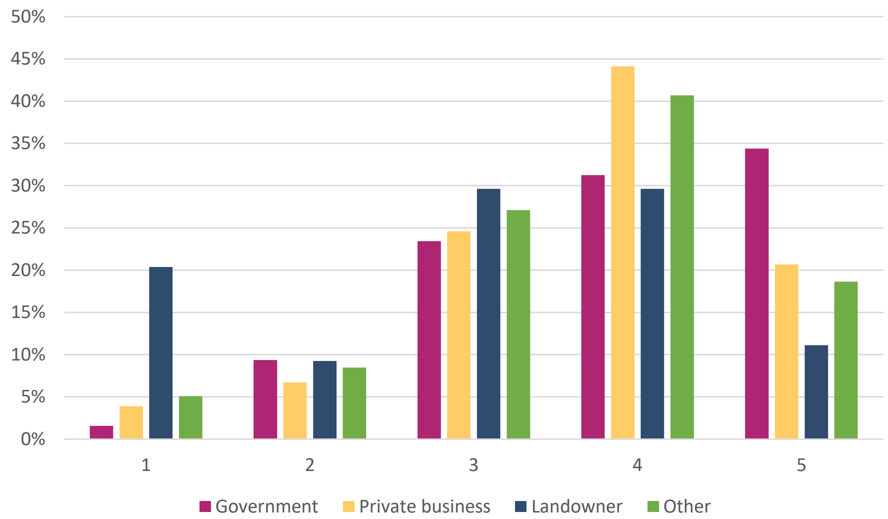
Importance of S-map to deliver work

A key aspect in estimating the value of S-map to users is to gauge the underlying importance of S-map as an input into project work. If the input is critical and there are limited alternatives, then it can be argued that S-map underpins a wide range of work/projects that have benefits[11]. The survey enquired about how important S-map is as an input into project work. A score of 1 is seen as not important, 3 is neutral and 5 is very important. Figure 4 reports the scoring across the main groups.

As expected, the relative importance of S-map varies across user groups but, overall, most (39%) responses rate S-map as important (score: 4). Almost two-thirds (60%) of respondents indicated that S-map is either 'important' or 'very important' with landowners reporting the lowest score for relative importance, i.e. 41% of them indicating S-map is 'important' or 'very important'. The other groups put a high value on S-map:

- Government 66%
- Private business 65%
- Other 59%.

Figure 4: Relative importance of S-map



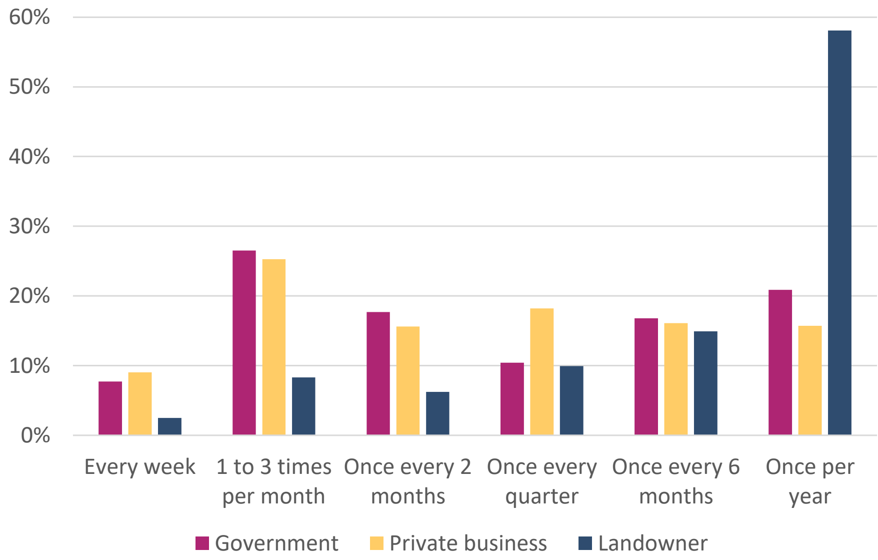
The relatively low score of landowners is not surprising. We suspect that this reflects landowners' views that S-map and the associated work is part of managing their entire operations, but not a part of the core business. For the other groups[12], the opposite would hold true since S-map is an input into the core business processes.

With reference to the frequency of use, a low response rate in some groups limited our ability to compare usage rates across the groups. Private and government users have a similar use profile with use distributed evenly across the different time-cohorts. Close to 1-in-10 private and government respondents indicated that they use S-map every week. Beyond this, government users show a marginally more intensive use of S-map with more than half (52%) of users accessing S-map at least once every two months (so 6 times per year). For private users, the equivalent figure is 50%. Landowners do not use the facility as intensively, with most (58%) users accessing it only once per year.

[11] These benefits can be valued using different metrics and a basic one being willingness to pay. This provides an indication of the first layer of benefit, but it excludes other, facilitated benefits that using S-map might unlock.

[12] Importantly, the government-group relates to those departments and government employees that work with S-map. It is not an All-of-Government measure.

Figure 5: Frequency of Use



Bringing the frequency of use and the relative importance of S-map together, illustrates that:

- Private users make the most intensive use of S-map and it is an important input into their business processes. It is safe to assume that the private users are largely professional consulting businesses.
- Users access S-map to inform their processes but the level of use is concentrated into a few bursts of use throughout the year.

Respondents were also asked about

- the number of projects (or tasks) that used S-map as an input,
- the hours S-map was used for, and
- the average charge out rate for staff using S-map.

This information combined with the user profile provide a way to estimate the total (use) value of S-map. That is how much business activity it supports which reflect the direct user benefits derived from S-map.

Appendix 2 provides summary tables of selected datapoints.

2.2 Base Values

As the preceding indicates, S-map is used across New Zealand and by a range of different users. Using these observations enables us to estimate the current baseline value of S-map. This value is not the 'total benefit' of S-map. Instead, it reflects the use value and forms a starting point for exploring S-map's total benefit to New Zealand.

The analysis is based on several ratios derived from the survey. In addition to the frequency of use (discussed earlier), the charge out rates[13] reported by users are used. The charge out rates are based on the survey responses and Table 1 shows the range per user type.

[13] Charge out rates are rounded in the table.

Table 1: Charge out rates

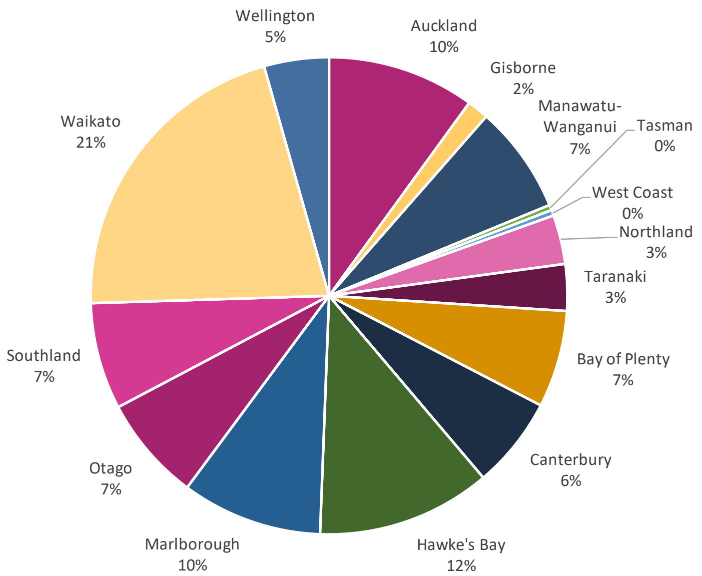
User type	$/h - Range		
	Min	Median	Max
I work for central government (ministry or department)	40	80	280
I work for local government (unitary authority, regional/district council)	25	130	560
I work for a research organisation	80	230	630
I work for a private business	25	180	200
I am a landowner (e.g. farmer or lifestyle property)	25	80	880
I belong to a special interest group (e.g. industry association)	25	130	450
I work or study at a university	25	40	630
I am a private person	0	0	0
I belong to a Māori organisation	80	200	630
Other (please specify)	40	80	130

The analysis is based on the 'trimmed' medians and 'cleaned' observations. Most responses appear realistic, but some were adjusted for outliers. For example, it is plausible for a student to return a $25/hour rate, but some responses were unrealistic >$1,000/h.

Combining frequency of use (hours spent using S-map), with charge-out rates, provides an 'at least' value for S-map. It assumes that individuals and/or businesses would not undertake the work (using S-map) if they did not get a return on that effort. The return is a function of the direct time-cost (charge out rate multiplied by time).

Using the spatial (regional) and sectoral distribution of users, the frequency of use and charge out rates, we estimate that the value of S-map related work (direct work) is **in the order of $54.6m**. As expected, most (73%) of this value is associated with the regions that have 'good' S-map coverage. A quarter (27%) of the value is associated with areas with low coverage. This highlights the link between the value users derive from S-map and availability. In areas where S-map availability (coverage) is limited, the use values are substantially lower. Figure 6 shows the regional distribution of direct user benefits. Important, the benefits are linked to where users are based, not to the areas that are investigated using S-

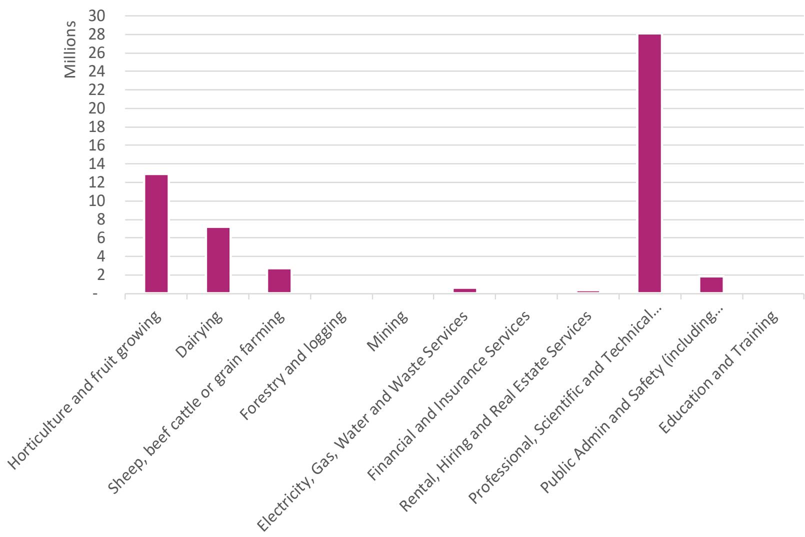
Figure 6: Spatial distribution of direct user benefits



map[14]. It shows that most of the benefits flow to large agriculture-based regions[15], like Hawke's Bay and Marlborough.

Different user groups derive different benefits (value) from S-map. Applying the estimated values across different users on a sectoral basis, provides an ability to estimate the sectoral distribution of values. Figure 7 shows the estimated value per main sector. The sectors are consolidated from the survey.

Figure 7: Value by main sector



It is very important to note that the sectoral classification used here shows the 'primary' user and not the 'secondary' user or the client. For example, if a consultancy uses S-map to collect data to run specialist software or models, then that value is recorded under professional, scientific and technical services. Intuitively, a large share of professional services is sold to agriculture. But there are links to non-agricultural activities like construction and planning related activities. These patterns suggest some disconnect between sectors that benefit indirectly from S-map and those using S-map in the first instance.

Professional, scientific and technical services have the highest level of direct use benefit, valued at $28.1m. This is followed by agricultural activities, specifically horticulture and fruit growing ($12.9m), dairying ($7.2m) and sheep, beef cattle or grain farming ($2.8m). Other sectors with smaller use value are:

- Forestry and logging $0.2m,
- Mining $0.06m
- Electricity, Gas, Water and Waste Services $0.6m,
- Financial and Insurance Services $0.03m,
- Rental, Hiring and Real Estate Services $0.3m,
- Public Admin and Safety (including government) $1.9m, and
- Education and Training $0.1m.

Combined, these sectors capture $3.3m[16] of the direct value and this equals 6% of the overall direct use values.

[14] This explains why Auckland receives a sizeable share of the benefit but reported as having low S-map coverage.
[15] There is a large drop in the share of use value accruing to Canterbury, compared with 2019, dropping from 25% to 6%. It was outside the scope of this report to delve into the reasons for the change. However, we note that Canterbury is the region where the Overseer tool is strongly linked to regulation, so many users would now get their info directly in that tool.
[16] Due to rounding the sum of individual components does not equal the reported total.

3 Wider roll-out of S-map

Manaaki Whenua Landcare Research are exploring options to expand S-map coverage across a wider area of New Zealand. The specific staging and prioritisation of such a roll-out are unknown. A scenario approach is used to estimate the present value (PV) of the potential use value. The section first provides a summary of the estimated use value of a wider roll-out of S-map, and then the present value of the opportunity is presented.

3.1 Potential value

The potential use value of expanding S-map assumes that the areas that are currently not covered by S-map will see the same use values as the currently covered areas. Appendix 1 reports the spatial distribution of S-map and the percentage of New Zealand's regions that are covered by S-map. The appendix shows the degree to which different farm-types are covered. This is based on a combination of the S-map coverages (GIS-mapping) and Statistics New Zealand's Business Demography Survey that reports the count of businesses, by sector at a meshblock level.

We assumed that if S-map is rolled-out across areas that are currently not covered, then the newly covered areas would see use rates (of S-map) mirroring those of the land-uses (specifically agriculture activities) in other, already covered areas. Using the spatial distribution of S-map across New Zealand as a basis for scaling up the benefits associated with the wider roll-out offers a reasonably firm foundation. Some users are not directly linked to S-map's spatial coverage and it is more difficult to put a definitive estimate on the use values across the non-agriculture sector. Therefore, the survey results are used to inform the scaling. For example, there is a link between professional, scientific and technical services and agriculture and other activities like planning and development (that are associated with public administration and local government) and these relationships were considered. The uplift was based on a weighted approach using both the change in S-map coverage (by region and by sector) and the sectoral relationships revealed in the survey. For sectors with a weak, or no, relationship to agriculture (e.g. electricity and utilities), it was assumed that the change in coverage would result in a shift that equates to a 90% coverage of S-map and the uplift was estimated as the change between the current coverage levels and this new level.

Based on these assumptions, rolling S-map out over the rest of New Zealand will translate into user activity (use values) that is **estimated at $19.6m per year**. Most of the gains are associated with areas that have some, but low, S-map coverage. Around 79% of the lift will be in these[17] areas. Currently, only Nelson has no coverage. Most of the gains will be in agriculture and professional services. This pattern is a function of land uses and the relationships between other activities (sectors) using S-map.

3.2 Potential value over time

Up to this point, the analysis considered S-map use and the associated values as a single, annual process. But in reality, S-map is an information asset that is used multiple times over consecutive years. Therefore, looking at the values as one-offs will understate the value of rolling out S-map across New Zealand. Using

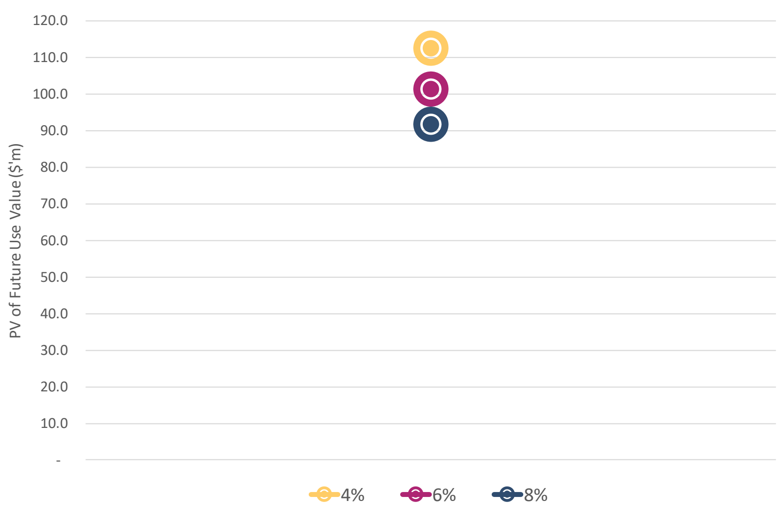
[17] Northland, Auckland, Gisborne, Manawatu-Wanganui, Tasman, West Coast and Taranaki.

a scenario, the present value of S-map value over time, is estimated. The scenario is based on several assumptions, including:

- The roll-out and uptake is spread out over five years and is linear,
- The potential value captures up to 80% of the 'new opportunity'. In other words, only 80% of the opportunity associated with the uncovered area is included in the assessment.
- The uptake is homogenous throughout New Zealand, i.e. we do not differentiate between regions and in all regions 80% of new opportunity is captured,
- The assessment considers a 10-year timeframe[18],
- Three discount rates are used. The three rates are 4%, 6% and 8% and they were selected to show the present value under different discounting rates.

The analysis suggests that the direct use value of rolling out S-map over the currently uncovered areas is between $91.7m and $112.6m.

Figure 8: Present Value of Future Use Values (Range); $m



3.3 Concluding remarks

It is very important to realise that the use values reported in this section are a proxy for the benefit that users derive from S-map. It is the direct benefit and is based on the value users get from the information in a direct sense. If users do not get 'at least' the stated values, then they would not use S-map. Therefore, these values can be regarded as minimums. It is also crucial to bear in mind that in addition to the use benefits, other benefits arise. These wider benefits are discussed in section 5. Quantifying these 'facilitated effects' and benefits are beyond the scope of this project. The next section presents a high-level comparison between the key metrics and results of the 2019 and 2024 assessments.

[18] This timeframe provides for a total period of 10-years, including an initial 5-year uptake period.

4 Comparison

The economic assessment shows a considerable uplift in the estimated potential value (benefit) of S-map, relative to the previous (2019) assessment. This can largely be ascribed to greater availability of information, i.e., wider S-map coverage, and a larger number of active users. It is not our intention to delve into every variable which have changed from the previous iteration of this assessment. Table 2 presents the key metrics and results of the 2019 and 2024 assessments. Some key observations follow below the table.

Table 2 - Comparison of key variables (2019 vs 2024)

Metric	2019	2024
Survey responses (sample)	1,014	581
Active S-Map users (population)	6,880	13,600
S-map coverage nationally (kha)	9,132	11,014
Share of NZ covered by S-map	34%	41%
Annual direct use benefit	$19.5m	$54.2m
Potential annual value from wider roll-out	$11.8m	$19.6m
Potential value over time*	$55.5m-$68.1m	$91.7m-$112.6m
Median charge out rates	$ per hour	
Government (central and local)	145-150	80-130
Private business	120	180
Landowner	88	80
Researcher	70-210	40-230
Other	60-150	80-130

** Present value of future cashflows (10 years) discounted at 4-8%.*

Key observations:

- While the response rate to the current survey was lower, the spatial distribution and user type distribution remained largely similar to the 2019 survey, suggesting similar assumptions and methodology were appropriate. It is noted, a smaller sample size introduces greater levels of uncertainty.
- Based on the information provided by LCR, the user base has nearly doubled (98% increase) and S-map coverage increased by 1,882 kha (+21%), nationally.
- The potential annual value increased by 65% and assumes that a wider roll-out would see similar use values as reported in areas where S-map information is currently used.
- According to survey results, median charge out rates for private business users, which accounts for 42% of users, have risen by 50%. This also contributes to the rise in use value (and potential use value). Median rates for landowners and government users have dropped slightly.

5 Wider benefits

As mentioned, the analysis in this report outlines the direct use values. Information dataset and tools, like S-map assist users to complete analysis to a deeper level. Intuitively, the outcomes of such analysis will deliver higher quality results, be more detailed and provide better contextual information. In turn this should lead to better decisions and improved outcomes. This assumes that decision-makers act on the available information – something that is not a guarantee.

5.1 Links to natural capital

Decision-makers are facing increased scrutiny about the impact of their decisions on the different capitals - natural, social, human and financial (and physical) capital. S-map is a good example of a tool that supports decision-makers. S-map provides information about soil use and management, which farmers and landholders, as well as other users access. S-map has a direct link to natural capital. As illustrated, S-map has very strong links to agriculture and land use. The top ten applications of S-map that get the most use (48%) across all user types, are grouped as follows:

Category	S-map application
Farm management	• Land use capability mapping • Crop/pasture production management decisions or planning (including modelling) • Environmental modelling research and reporting • Farm operational management and planning decisions • Effluent or wastewater management • Managing nutrient losses • Managing sediment erosion or sediment runoff • Fertiliser applications
Natural hazards	• Assessing soil erosion risk.
Planning and development	• Assessing the suitability of land for urban or rural residential development

This points to the fact that S-map is used as an input into many farm processes, directly and indirectly. While there is currently still a lack of research and case studies on measuring the value of information products, several authors have examined the value of making better farming decisions, from various perspectives[19], such as:

- increased productivity,
- reduced inputs (e.g. fertiliser),
- long-term gains through soil conservation, and the like.

Manderson & Palmer (2006) state that if soil information is useful for making better farming decisions, then it should have monetary worth. However, they point out that the value of soil information can be realised only when it is used. Having access to better information does not necessarily lead to better outcomes. For improved outcomes, the decision-maker must act appropriately on the available information. Though

[19] Giasson, Van Wambeke & Bryant, 2000

technology advances and farm practices have changed over time, the fundamentals of farm management remain the same, with decision making at its core. Effective decision-making is crucial for realising the monetary value of information.

A recent study[20] M.E conducted for the Ministry of Transport looked at the benefit of improved pasture management, reduced inputs (e.g. fertiliser) and improved yields. It cited Variable Rate Input Application (VRA) as one example of how costs can be better managed with improved information and applications. In the European context it is suggested VRA could reduce nitrogen application by between 2% and 6% and improve (reduce) nitrogen-leaching by 5% to 20%. In the NZ context, the saving from more efficient/better targeted fertiliser application was estimated to be in the order of $11m per year ($3,000-$3,900 per farm)[21], across all dairy farms in NZ. Assuming S-map can be applied in this context and that it adds to the change in farming practices, to reduce input costs, then it would deliver a series of benefits. Some of these benefits are linked to reducing input costs (less chemicals used). Over 10-years, the present value of such a saving is put between $84.8m and $100.2m[22]. In turn, this will have wider ecological benefits that will lift the total monetary (and non-monetary) values. Clearly, S-map's value is not the entire saving because it is not appropriate to attribute 100% of this value to S-map; but it can make an important contribution. Hypothetically, **attributing 5% of the gains to S-map suggests that it delivers $550,000 per year ($676,500 in 2024-dollars), or between $4.2m and $5.0m ($5.2m-$6.2m in 2024-dollars) over 10 years.**

S-map information enables other activities that deliver value, and the Overseer model is a high profile example. Overseer is widely used in farm nutrient budgeting and environmental management which helps farmers, industry professionals and regulators estimate nutrient flows and losses from farms, ensuring economic efficiency (lower input costs, improved productivity, etc.), while reducing environmental impact (reduced nitrogen loss, healthier soils, etc.). This benefits individual farms and strengthens the long-term sustainability of the entire agricultural sector. S-map plays a crucial role in supporting the Overseer model by supplying high-quality soil data – a core input. This integration benefits an estimated 15,000 farms, as farmers using Overseer no longer need to manually access S-map Online to retrieve soil information. The impact of S-map within Overseer extends beyond our survey of S-map online users, as it supports more widespread adoption of best-practice nutrient management. Several reports highlight the value of Overseer and, by extension, the facilitated benefits of S-map. Other research into these benefits show the extent of the facilitated benefits:

- A 2023 report[23] on Canterbury dairy farms found that nitrogen loss per hectare has decreased significantly over time. Between the 2016/17 and 2021/22 seasons, average nitrogen loss dropped from 63.8 kg N/ha to 46.2 kg N/ha, representing a 27% reduction across 1,269 farms covering approximately 302,000 hectares. If S-map information contributed to even 5% of this reduction, it would represent a substantial environmental benefit.
- A 2018 valuation[24] of the benefits of the OverseerFM upgrade, estimated the value of improved nutrient use efficiency across New Zealand from accelerated uptake of farm management practices associated with Overseer. The report quantified the economic benefits of better nutrient management ($44-69 million per annum), including potential savings for farmers and improved environmental outcomes. Hypothetically, attributing 5% of the gains to S-map suggests that it

[20] Drones: Benefits study. 2019. A report by Market Economics for NZ Ministry of Transport. Retrieved September 4, 2019, from https://www.transport.govt.nz/air/unmanned-aircraft-systems-or-drones/drone-benefit-study/

[21] 2019-dollars. Using CPI to express it in current dollars, suggests the value is around $13.5m per annum, i.e., $3,690-$4,800 per farm.

[22] $104.3m to $123.3m if expressed in 2024-dollars.

[23] Link to report

[24] Link to report

delivers $2.2-3.4 million per year. Attributing even 1% of the gains, suggests between $440,000 and $690,000 is delivered annually.

- An older valuation[25] (2016) of the benefits of Overseer estimated that the tool contributes $271 million per year to the agricultural sector, with a possible range of $153–400 million per year. Again, attributing 5% of value to S-map, suggests its contribution through Overseer could be valued at $13.5 million per year (1% equates to $2.7 million per annum).

What is clear from the literature is that soil use and management decisions that farmers make every day, ultimately determines the sustainability of agriculture, and soil survey information is a valuable tool in the decision-making process. Soil information is also required by those who influence or inform farm decision making, such as policymakers and consultants. But simply having access to the information is no guarantee that optimal outcomes/decisions will be achieved – the information must be used and acted upon.

Reliable information and data are important for environmental monitoring, geotechnical modelling (assessing erosion and flood risk) and the like. Erosion control is another example where S-map users can influence processes with wide benefits. To put the scale of this potential gain in context, the Ministry for Primary Industries states that erosion and its effects – lost soil, nutrients and production, damage to trees, houses, infrastructure, and waterways – in hill country areas alone are estimated to cost New Zealand's economy **$100 million to $150 million a year[26]. Over 10-years, this equals between $963.8m and $1.1bn. The potential of using S-map to better manage these costs is unknown, but if using S-map leads to a 1% saving, then S-map's value is between $9.6m and $11.4m per year.**

A separate study for the Ministry for the Environment[27] quotes research highlighting the annual cost of soil erosion and sedimentation. It emphasises the uncertainty associated with the modelling work. But, the authors have attempted to err on the conservative side with their estimates, so the value could be higher than the mean estimate of $127m. This figure is a 2001 estimate and updating it for inflation[28] to 2024 $-values, suggests that the value is in the order $229m. Furthermore, the highest component of costs is lost agricultural production, estimated at $66m (2024 value). Importantly, the savings reflect the outcome of a range of actions, and not just the availability and use of S-map. The Environment Aotearoa (2019) report[29] estimates the economic losses associated with soil erosion and landslides to be at least $250–300 million (2015 value) a year. Updating this for inflation, suggests the cost is in the order of $330-400 million (2024 value).

Looking forward, climate change will change the frequency and severity/intensity of storms in some areas and result in drier conditions in other areas. Both trends would increase lost agricultural production from mass movement in hill country and surface erosion, respectively. S-map has a role to play in responding to these pressures, protecting the natural capital and enhancing the response to climate change (i.e. lifting resilience).

Fresh water contributes to the economy and is valued by New Zealanders, but there is limited research outlining in $-terms (or non-monetary terms) what the value of freshwater quality is. It has cultural, social, economic and recreational values and maintaining and improving water quality are two key government priorities. The link between land use and freshwater quality is well researched.

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[25] Link to report
[26] MPI report. Accessed 23 December 2024
[27] Blaschke P, Hicks D, Meister A. 2008. Quantification of the flood and erosion reduction benefits, and costs, of climate change mitigation measures in New Zealand. Report prepared by Blaschke and Rutherford Environmental Consultants for MfE. Wellington: Ministry for the Environment. iv + 76 p.
[28] https://www.rbnz.govt.nz/monetary-policy/about-monetary-policy/inflation-calculator
[29] Link to report

S-map data has a natural fit with land-use management, and we understand that S-map makes an important contribution to land use management approaches. Unfortunately, there is limited information available about the benefits (in $-terms) that would arise from improved management on water quality values. This makes it difficult to put an illustrative value of S-map's potential role, but it is expected to be material.

Drawing on historic studies, the potential size of the values can be identified. An indicative example is Lake Taupo, where the community (through Central, regional and district public funding) have paid $89m to landowners to reduce nitrogen discharges[30] by 170 tonnes per year, with the aim to improve water quality in the lake[31]. This clearly illustrates the value the Taupo community assigns to water quality.

Work by Carrick, Vesely and Hewsitt (2010)[32] estimated the value of nitrogen removal at $21.80/kgN/yr (in 2010, so $30.90/kgN/yr in 2024 terms). The authors calculate nitrogen discharge from the different soil types[33], and they highlight the link with soil information as a key input that influences nitrogen discharge estimates. The Overseer model also recognises this link[34]. A hypothetical scenario is used to illustrate the value of soil information (from S-map) to nitrogen management. **Drawing from the Lake Taupo example, and assuming that soils information is used to (and contributes to) reduce nitrogen use and leaching, then reducing nitrogen discharge to water could be between $43m and $87m.** This is an avoided cost, so a benefit. That is based on[35] only half of current users (by area coverage) getting a saving of between 0.25kgN/ha/y and 0.5kgN/ha/y. The estimated $-values would increase if the underlying conservative assumptions are adjusted to reflect a less conservative position. **It is very important to note that the avoided cost reflect the nitrogen that is not discharged/leached, it does not reflect the value of better water quality arising from less nitrogen in the environment. There will be other improvements like enhanced eco-system services, improved cultural and societal values arising from better water quality.**

5.2 Concluding remarks

S-map is a valuable resource enabling users to undertake research and modelling work that would be difficult to undertake in the absence of the information. The survey illustrates the mix of users, with a large portion of private users – either a private business or landowners. This suggests that most of the immediate use benefits will accrue to private users. It is not difficult to foresee a situation where requests for additional funding are responded to by using user-pays arguments. But it is worth noting the wider benefits – facilitated benefits as well as avoided costs – of S-map are mostly public benefits, i.e. benefits that will accrue to the wider public and society. For example, reducing erosion and sedimentation has wider eco-system service effects that are not 'gained' by one specific entity, similar to the eco-system service benefits from improved water quality arising from reduced nitrogen leaching. Instead, those benefits accrue to New Zealand. While these public benefits are only covered at a very high level, they are likely to be substantial. But, linking S-map and soil information to these benefits and claiming that S-map is the 'only reason' for the benefits manifesting would be inappropriate and misleading. The true benefits arise from

[30] Nitrogen discharge is directly linked to water quality.

[31] Organisation for Economic Cooperation and Development. OECD Environment Policy Paper. The Lake Taupo Nitrogen Market in New Zealand. A review for policy makers. September 2015. No 4.

[32] Carrick, A. Vesely, E. Hewitt, A. 19th World Conference of Soil Science, Soil Solutions for a Changing World. Economic value of improved soil natural capital assessment: A case study on nitrogen leaching. 1-6 August. Brisbane.

[33] We understand that this was based on actual measurements of N-leaching from different soil types in Southland.

[34] OVERSEER Best Practise Data Input Standards. Version 6.2.0 April 2015.

[35] Information received from Landcare.

having the good quality information and acting appropriately on that information. The scale of the public benefits is evident and using the two examples[36] shows that the potential wider (non-user) benefits of S-map could be greater than $10m/year. If the potential gains arising from water quality is included, then the value will be even higher. Based on the lower estimate of $43m, suggests that the potential value could be up to $53m/year.

[36] Improved fertiliser management and lower erosion and sedimentation.

Appendix 1: Spatial coverage

Region	% of Region	% of farms				
		Horticulture and fruit growing	Dairy cattle farming	Sheep, beef cattle and grain farming	Forestry and logging	Poultry, deer and other livestock farming
Auckland	**32%**	22%	36%	34%	16%	19%
Bay of Plenty	**61%**	57%	79%	77%	53%	57%
Canterbury	**50%**	65%	86%	86%	74%	72%
Gisborne	**23%**	72%	79%	60%	39%	31%
Hawke's Bay	**100%**	100%	100%	100%	100%	100%
Manawatu-Wanganui	**25%**	39%	43%	40%	38%	30%
Marlborough	**28%**	84%	75%	80%	59%	63%
Nelson	**0%**	0%	0%	0%	0%	0%
Northland	**15%**	20%	25%	20%	16%	16%
Otago	**34%**	80%	88%	84%	62%	65%
Southland	**26%**	66%	84%	89%	78%	85%
Taranaki	**11%**	26%	29%	19%	12%	17%
Tasman	**31%**	50%	44%	57%	58%	51%
Waikato	**86%**	74%	88%	82%	57%	71%
Wellington	**78%**	60%	74%	86%	57%	50%
West Coast	**7%**	62%	51%	44%	47%	33%
Total NZ	**41%**	58%	69%	67%	50%	54%

Source: M.E calculations based on Manaaki Whenua Landcare Research; Business Demography Survey (Stats NZ)

Appendix 2: Survey Tables

Survey respondents by type and sector

User type	Horticulture and fruit growing	Dairying	Sheep, beef cattle or grain farming	Forestry and logging	Mining	Electricity, Gas, Water and Waste Services	Financial and Insurance Services	Rental, Hiring and Real Estate Services	Professional, Scientific and Technical Services	Administrative and Support Services	Public Administration and Safety (including government)	Education and Training	Other (please specify)	Total
I work for central government (ministry or department)	0	0	1	2	0	0	0	0	5	0	5	1	10	24
I work for local government (unitary authority, regional/district council)	1	2	1	0	0	2	0	0	32	2	12	1	18	71
I work for a research organisation	2	4	0	2	0	0	0	0	11	0	0	0	6	25
I work for a private business	32	22	13	9	2	6	1	1	116	2	1	0	37	242
I am a land owner (e.g. farmer or lifestyle property)	30	9	28	0	0	1	0	0	1	0	1	1	5	76
I belong to a special interest group (e.g. industry association)	5	2	2	1	0	0	0	1	1	0	0	2	2	16
I work or study at a university	8	3	2	1	0	0	0	1	8	0	0	18	7	48
I am a private person	2	1	1	1	0	0	0	0	5	1	0	1	6	18
I belong to a Māori organisation	0	3	0	0	0	0	0	0	3	0	0	0	2	8
Other (please specify)	5	5	5	0	0	4	0	2	7	1	0	9	15	53
Total	85	51	53	16	2	13	1	5	189	6	19	33	108	581
I work for central government (ministry or department)	0%	0%	4%	8%	0%	0%	0%	0%	21%	0%	21%	4%	42%	100%
I work for local government (unitary authority, regional/district council)	1%	3%	1%	0%	0%	3%	0%	0%	45%	3%	17%	1%	25%	100%
I work for a research organisation	8%	16%	0%	8%	0%	0%	0%	0%	44%	0%	0%	0%	24%	100%
I work for a private business	13%	9%	5%	4%	1%	2%	0%	0%	48%	1%	0%	0%	15%	100%
I am a land owner (e.g. farmer or lifestyle property)	39%	12%	37%	0%	0%	1%	0%	0%	1%	0%	1%	1%	7%	100%
I belong to a special interest group (e.g. industry association)	31%	13%	13%	6%	0%	0%	0%	6%	6%	0%	0%	13%	13%	100%
I work or study at a university	17%	6%	4%	2%	0%	0%	0%	2%	17%	0%	0%	38%	15%	100%
I am a private person	11%	6%	6%	6%	0%	0%	0%	0%	28%	6%	0%	6%	33%	100%
I belong to a Māori organisation	0%	38%	0%	0%	0%	0%	0%	0%	38%	0%	0%	0%	25%	100%
Other (please specify)	9%	9%	9%	0%	0%	8%	0%	4%	13%	2%	0%	17%	28%	100%
Total	15%	9%	9%	3%	0%	2%	0%	1%	33%	1%	3%	6%	19%	100%

Importance of S-map as input (by user type)

Importance of S-map as input	Not important		Neutral		Very important	
User type	**1**	**2**	**3**	**4**	**5**	**Total**
I work for central government (ministry or department)	-	1	7	2	1	**11**
I work for local government (unitary authority, regional/district council)	1	5	8	18	21	**53**
I work for a research organisation	1	2	2	10	2	**17**
I work for a private business	7	12	44	79	37	**179**
I am a land owner (e.g. farmer or lifestyle property)	11	5	16	16	6	**54**
I belong to a special interest group (e.g. industry association)	-	1	3	1	6	**11**
I work or study at a university	1	3	8	14	10	**36**
I am a private person	1	-	2	2	-	**5**
I belong to a Māori organisation	-	-	2	3	1	**6**
Other (please specify)	3	4	15	18	3	**43**
Total	**25**	**33**	**107**	**163**	**87**	**415**
	1	**2**	**3**	**4**	**5**	**Weighted ave**
I work for central government (ministry or department)	0%	9%	64%	18%	9%	3.3
I work for local government (unitary authority, regional/district council)	2%	9%	15%	34%	40%	4.0
I work for a research organisation	6%	12%	12%	59%	12%	3.6
I work for a private business	4%	7%	25%	44%	21%	3.7
I am a land owner (e.g. farmer or lifestyle property)	20%	9%	30%	30%	11%	3.0
I belong to a special interest group (e.g. industry association)	0%	9%	27%	9%	55%	4.1
I work or study at a university	3%	8%	22%	39%	28%	3.8
I am a private person	20%	0%	40%	40%	0%	3.0
I belong to a Māori organisation	0%	0%	33%	50%	17%	3.8
Other (please specify)	7%	9%	35%	42%	7%	3.3
Whole sample	6%	8%	26%	39%	21%	3.6

Users' level of soil expertise (by user type)

Soil expertise	Limited knowledge				Very experienced	
User type	**1**	**2**	**3**	**4**	**5**	**Total**
I work for central government (ministry or department)	5	6	8	3	2	**24**
I work for local government (unitary authority, regional/district council)	15	14	18	11	13	**71**
I work for a research organisation	6	5	6	7	1	**25**
I work for a private business	40	47	72	53	30	**242**
I am a land owner (e.g. farmer or lifestyle property)	26	16	20	9	5	**76**
I belong to a special interest group (e.g. industry association)	2	5	3	4	2	**16**
I work or study at a university	3	13	17	8	7	**48**
I am a private person	10	2	3	-	3	**18**
I belong to a Māori organisation	-	3	4	-	1	**8**
Other (please specify)	10	11	11	13	8	**53**
Total	**117**	**122**	**162**	**108**	**72**	**581**
	1	**2**	**3**	**4**	**5**	**Weighted ave**
I work for central government (ministry or department)	21%	25%	33%	13%	8%	2.6
I work for local government (unitary authority, regional/district council)	21%	20%	25%	15%	18%	2.9
I work for a research organisation	24%	20%	24%	28%	4%	2.7
I work for a private business	17%	19%	30%	22%	12%	2.9
I am a land owner (e.g. farmer or lifestyle property)	34%	21%	26%	12%	7%	2.4
I belong to a special interest group (e.g. industry association)	13%	31%	19%	25%	13%	2.9
I work or study at a university	6%	27%	35%	17%	15%	3.1
I am a private person	56%	11%	17%	0%	17%	2.1
I belong to a Māori organisation	0%	38%	50%	0%	13%	2.9
Other (please specify)	19%	21%	21%	25%	15%	3.0
Whole sample	**20%**	**21%**	**28%**	**19%**	**12%**	**2.8**

Frequency of use: Private sector users

Users who work for a private business (private sector)	Every week	1 to 3 times per month	Once every 2 months	Once every quarter	Once every 6 months	Once per year	Total	%	Every week	1 to 3 times per month	Once every 2 months	Once every quarter	Once every 6 months	Once per year
Assessing the suitability of land for urban or rural residential development	7	16	9	15	10	5	62	6%	11%	26%	15%	24%	16%	8%
Assessing soil erosion risk	2	12	10	8	11	8	51	5%	4%	24%	20%	16%	22%	16%
Catchment hydrological modelling	2	10	7	8	4	10	41	4%	5%	24%	17%	20%	10%	24%
Crop/pasture production management decisions or planning (including modelling)	3	9	13	8	8	4	45	4%	7%	20%	29%	18%	18%	9%
Data mining or deriving new information	0	3	0	4	1	2	10	1%	0%	30%	0%	40%	10%	20%
Economic modelling and studies	0	1	1	3	0	7	12	1%	0%	8%	8%	25%	0%	58%
Effluent or waste water management	8	10	14	9	10	8	59	6%	14%	17%	24%	15%	17%	14%
Environmental modelling research and reporting	3	14	8	4	6	7	42	4%	7%	33%	19%	10%	14%	17%
Fertiliser applications	4	10	8	3	4	10	39	4%	10%	26%	21%	8%	10%	26%
Flood protection or catchment works	1	6	4	5	7	4	27	3%	4%	22%	15%	19%	26%	15%
Training, teaching or educational purposes (academic and vocational)	1	0	1	0	1	3	6	1%	17%	0%	17%	0%	17%	50%
Geotechnical surveys	3	7	2	4	2	6	24	2%	13%	29%	8%	17%	8%	25%
Informing regulatory work or policy development (e.g. national policies, regulatio	5	13	2	12	9	4	45	4%	11%	29%	4%	27%	20%	9%
Informing land use change processes (e.g. irrigation)	1	4	2	4	4	2	17	2%	6%	24%	12%	24%	24%	12%
Informing planning processes (e.g. subdivisions)	0	7	7	6	9	6	35	3%	0%	20%	20%	17%	26%	17%
Infrastructure planning (e.g. transport, utility)	3	13	5	7	6	7	41	4%	7%	32%	12%	17%	15%	17%
Irrigation management	2	3	6	5	6	4	26	2%	8%	12%	23%	19%	23%	15%
Land and property sales (e.g. pre-purchasing assessments)	2	12	6	5	7	9	41	4%	5%	29%	15%	12%	17%	22%
Land use capability mapping	1	6	1	6	8	2	24	2%	4%	25%	4%	25%	33%	8%
Managing nutrient losses	6	17	4	9	13	8	57	5%	11%	30%	7%	16%	23%	14%
Managing sediment erosion or sediment runoff	4	16	6	3	8	7	44	4%	9%	36%	14%	7%	18%	16%
Official statistics (National Greenhouse Gas Inventory, National System of Enviro	2	11	5	10	8	4	40	4%	5%	28%	13%	25%	20%	10%
Farm nutrient budget or management models – e.g. OVERSEER®, MitAgator	0	2	1	1	0	1	5	0%	0%	40%	20%	20%	0%	20%
Farm operational management and planning decisions	6	15	5	9	3	6	44	4%	14%	34%	11%	20%	7%	14%
Preparing, updating or auditing farm environment plans	5	7	9	10	6	9	46	4%	11%	15%	20%	22%	13%	20%
Providing professional advice (excluding the models mentioned earlier)	7	6	5	7	3	9	37	4%	19%	16%	14%	19%	8%	24%
Research (experimental, fundamental or student level)	8	10	7	10	5	2	42	4%	19%	24%	17%	24%	12%	5%
Resource consent applications (preparing, auditing etc)	1	6	2	4	2	3	18	2%	6%	33%	11%	22%	11%	17%
State of environment monitoring	8	16	11	8	7	8	58	6%	14%	28%	19%	14%	12%	14%
Transport or utility infrastructure planning	0	3	3	4	1	0	11	1%	0%	27%	27%	36%	9%	0%
	95	265	164	191	169	165	1049							

Frequency of use: Landowners

Landowners (e.g. farmers or lifestyle property)	Every week	1 to 3 times per month	Once every 2 months	Once every quarter	Once every 6 months	Once per year	Total	%	Every week	1 to 3 times per month	Once every 2 months	Once every quarter	Once every 6 months	Once per year
Assessing the suitability of land for urban or rural residential development	1	1	0	0	2	3	7	3%	14%	14%	0%	0%	29%	43%
Assessing soil erosion risk	0	1	3	2	2	6	14	6%	0%	7%	21%	14%	14%	43%
Catchment hydrological modelling	0	1	0	0	1	5	7	3%	0%	14%	0%	0%	14%	71%
Crop/pasture production management decisions or planning (including modelling)	0	1	3	3	5	17	29	12%	0%	3%	10%	10%	17%	59%
Data mining or deriving new information	0	0	1	0	0	0	1	0%	0%	0%	100%	0%	0%	0%
Economic modelling and studies	0	0	0	0	0	0	0	0%	0%	0%	0%	0%	0%	0%
Effluent or waste water management	0	0	0	2	1	7	10	4%	0%	0%	0%	20%	10%	70%
Environmental modelling research and reporting	0	1	0	1	2	1	5	2%	0%	20%	0%	20%	40%	20%
Fertiliser applications	1	0	0	1	3	16	21	9%	5%	0%	0%	5%	14%	76%
Flood protection or catchment works	0	0	0	0	3	2	5	2%	0%	0%	0%	0%	60%	40%
Training, teaching or educational purposes (academic and vocational)	0	0	3	1	1	1	6	2%	0%	0%	50%	17%	17%	17%
Geotechnical surveys	0	0	0	0	0	1	1	0%	0%	0%	0%	0%	0%	100%
Informing regulatory work or policy development (e.g. national policies, regulatio	0	1	0	0	0	2	3	1%	0%	33%	0%	0%	0%	67%
Informing land use change processes (e.g. irrigation)	0	0	0	1	0	2	3	1%	0%	0%	0%	33%	0%	67%
Informing planning processes (e.g. subdivisions)	0	2	0	2	0	5	9	4%	0%	22%	0%	22%	0%	56%
Infrastructure planning (e.g. transport, utility)	0	0	0	0	0	2	2	1%	0%	0%	0%	0%	0%	100%
Irrigation management	0	1	0	0	0	3	4	2%	0%	25%	0%	0%	0%	75%
Land and property sales (e.g. pre-purchasing assessments)	1	4	0	1	1	4	11	5%	9%	36%	0%	9%	9%	36%
Land use capability mapping	0	1	0	1	0	2	4	2%	0%	25%	0%	25%	0%	50%
Managing nutrient losses	0	1	0	3	2	7	13	5%	0%	8%	0%	23%	15%	54%
Managing sediment erosion or sediment runoff	0	0	1	2	1	10	14	6%	0%	0%	7%	14%	7%	71%
Official statistics (National Greenhouse Gas Inventory, National System of Enviro	0	0	1	0	2	10	13	5%	0%	0%	8%	0%	15%	77%
Farm nutrient budget or management models – e.g. OVERSEER®, MitAgator	0	1	0	0	0	0	1	0%	0%	100%	0%	0%	0%	0%
Farm operational management and planning decisions	1	0	0	0	1	4	6	2%	17%	0%	0%	0%	17%	67%
Preparing, updating or auditing farm environment plans	2	1	1	1	4	13	22	9%	9%	5%	5%	5%	18%	59%
Providing professional advice (excluding the models mentioned earlier)	0	0	1	1	2	11	15	6%	0%	0%	7%	7%	13%	73%
Research (experimental, fundamental or student level)	0	0	1	1	0	1	3	1%	0%	0%	33%	33%	0%	33%
Resource consent applications (preparing, auditing etc)	0	1	0	1	1	0	3	1%	0%	33%	0%	33%	33%	0%
State of environment monitoring	0	1	0	0	0	4	5	2%	0%	20%	0%	0%	0%	80%
Transport or utility infrastructure planning	0	1	0	0	2	1	4	2%	0%	25%	0%	0%	50%	25%
	6	20	15	24	36	140	241							

Frequency of use: Government workers (local and central government)

Users who work for local and central government	Every week	1 to 3 times per month	Once every 2 months	Once every quarter	Once every 6 months	Once per year	Total	%	Every week	1 to 3 times per month	Once every 2 months	Once every quarter	Once every 6 months	Once per year
Assessing the suitability of land for urban or rural residential development	2	3	6	2	2	7	22	5%	9%	14%	27%	9%	9%	32%
Assessing soil erosion risk	4	7	8	3	6	5	33	7%	12%	21%	24%	9%	18%	15%
Catchment hydrological modelling	1	3	3	2	6	4	19	4%	5%	16%	16%	11%	32%	21%
Crop/pasture production management decisions or planning (including modelling)	0	4	1	1	1	4	11	2%	0%	36%	9%	9%	9%	36%
Data mining or deriving new information	0	0	4	0	2	1	7	2%	0%	0%	57%	0%	29%	14%
Economic modelling and studies	0	0	0	0	2	2	4	1%	0%	0%	0%	0%	50%	50%
Effluent or waste water management	2	6	2	0	3	3	16	4%	13%	38%	13%	0%	19%	19%
Environmental modelling research and reporting	2	5	1	5	4	7	24	5%	8%	21%	4%	21%	17%	29%
Fertiliser applications	0	3	0	2	0	5	10	2%	0%	30%	0%	20%	0%	50%
Flood protection or catchment works	0	4	4	0	5	1	14	3%	0%	29%	29%	0%	36%	7%
Training, teaching or educational purposes (academic and vocational)	0	1	1	1	1	2	6	1%	0%	17%	17%	17%	17%	33%
Geotechnical surveys	2	0	0	1	2	1	6	1%	33%	0%	0%	17%	33%	17%
Informing regulatory work or policy development (e.g. national policies, regulatio	2	8	5	1	2	6	24	5%	8%	33%	21%	4%	8%	25%
Informing land use change processes (e.g. irrigation)	2	4	3	5	4	4	22	5%	9%	18%	14%	23%	18%	18%
Informing planning processes (e.g. subdivisions)	1	7	3	1	3	3	18	4%	6%	39%	17%	6%	17%	17%
Infrastructure planning (e.g. transport, utility)	2	2	2	1	2	4	13	3%	15%	15%	15%	8%	15%	31%
Irrigation management	0	1	1	1	3	2	8	2%	0%	13%	13%	13%	38%	25%
Land and property sales (e.g. pre-purchasing assessments)	1	4	1	1	0	2	9	2%	11%	44%	11%	11%	0%	22%
Land use capability mapping	0	0	0	0	0	1	1	0%	0%	0%	0%	0%	0%	100%
Managing nutrient losses	4	11	4	3	4	2	28	6%	14%	39%	14%	11%	14%	7%
Managing sediment erosion or sediment runoff	0	7	4	1	2	2	16	4%	0%	44%	25%	6%	13%	13%
Official statistics (National Greenhouse Gas Inventory, National System of Enviro	0	10	5	3	2	1	21	5%	0%	48%	24%	14%	10%	5%
Farm nutrient budget or management models – e.g. OVERSEER®, MitAgator	0	0	0	1	0	3	4	1%	0%	0%	0%	25%	0%	75%
Farm operational management and planning decisions	0	5	2	2	1	2	12	3%	0%	42%	17%	17%	8%	17%
Preparing, updating or auditing farm environment plans	1	5	6	1	1	1	15	3%	7%	33%	40%	7%	7%	7%
Providing professional advice (excluding the models mentioned earlier)	4	3	3	2	2	3	17	4%	24%	18%	18%	12%	12%	18%
Research (experimental, fundamental or student level)	0	2	7	2	2	2	15	3%	0%	13%	47%	13%	13%	13%
Resource consent applications (preparing, auditing etc)	1	3	0	2	4	3	13	3%	8%	23%	0%	15%	31%	23%
State of environment monitoring	3	4	1	0	4	3	15	3%	20%	27%	7%	0%	27%	20%
Transport or utility infrastructure planning	0	5	1	2	4	6	18	4%	0%	28%	6%	11%	22%	33%
	34	117	78	46	74	92	441							