

Salinity Inquiry
Submission No. 25



**Submission to the
House of Representatives Standing
Committee on Science and Innovation
Inquiry into coordinating the science to
combat the nation's salinity problem**

17 October 2003

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Executive summary

Based in Australia and the US, Agrilink Holdings Pty Limited (Agrilink) is Australia's only full service water monitoring company. Leading the field in this area, we uniquely offer a complete range of integrated products and services for water monitoring for wide ranging agricultural applications for domestic and irrigation purposes. Our solutions are innovative, flexible, cost effective and based on solid and contemporary science.

While acknowledging our interests, Agrilink's solutions are discussed in this Submission in an objective scenario where it is acknowledged that current systems and arrangements for monitoring salinity are inadequate and incomplete for determining the future extent of salinity across Australia. We believe that a central forward thrust in the Government's role in salinity management, and relevant to each of the terms of reference in this Inquiry, should be to give greater recognition to the role of accurate and reliable water monitoring and that water monitoring must be a basis for all future salinity management planning. An expanding science base and new technologies in this area can now assist in this role to a greater extent than ever before.

Agrilink is encouraged by and has benefited from programs previously established and co-ordinated by the Commonwealth Government including the Natural Heritage Trust and the National Action Plan for Salinity and Water Quality. We are also encouraged by the outcomes of the August 2003 COAG meeting and optimistic that there appears to be growing awareness of the role the private sector can play in sustainable land and water management.

Three of Agrilink's products and services that represent new technologies in water monitoring are:

- (a) Agrilink's value-added solution to salinity monitoring - integrating a salinity sensor with geospatial technologies;
- (b) AgWISE - Agrilink's proprietary Internet based software capability; and
- (c) Agrilink's monitoring expertise.

(a) Agrilink has patented a soil moisture, salinity and temperature sensor that tracks both water and salt together and informs on trends in salt presence and movement over time. Agrilink's salinity sensors are currently being used in a range of on-farm and government initiatives. This sensor can be integrated with geospatial technologies that are already currently being utilised, to enable the collection of continuous 'live' and comprehensive information on both the location of salt and how salt is mobilised over time, including in remote areas. This represents a unique, and strategic, turnkey monitoring solution.

(b) Agrilink has also designed and developed a proprietary Internet based software system – AgWISE - for the collection, management, production, assessment and distribution of agronomic and environmental data relating to the weather, irrigation, salinity and the environment. AgWISE is an analytical, risk management and advanced decision support tool for users. It uses the world's leading agricultural and environmental risk management software and is the benchmark information and decision management system for agricultural producers, consultants and environmentalists interested in sustainability and profitability.

(c) Once data has been collected in AgWISE, Agrilink employs its particular expertise in assessing, converting, customising and distributing the knowledge derived.

In our view these product/service offerings impact on each of the terms of reference of this Inquiry.

In relation to the Inquiry's term of reference (a), Agrilink believes that there are gaps in the way that salinity science and research data is being used to manage, co-ordinate and implement salinity programs and these gaps compromise effective management, coordination and implementation of salinity programs. The gaps relate particularly to salinity monitoring, the use of new scientific, technical and engineering knowledge and the lack of a consistent national approach to co-ordinating and implementing salinity solutions. Agrilink believes its products and services can contribute to alleviating these problems.

In relation to the Inquiry's term of reference (b), in Agrilink's view there are significant problems in managing and co-ordinating links between researchers and solution implementers. Links are either non-existent or ineffective and knowledge is not being effectively distributed across jurisdictions, agencies and decision-makers. Through working with its products and services with a large number of land holders (growers and irrigators) where salinity occurs, Agrilink believes it is in an excellent position through its AgWISE technology to contribute to providing some improved solutions in this regard. Agrilink is also in an excellent position to also thereby co-ordinate and disseminate comprehensive and holistic data across jurisdictions, agencies and decision-makers to contribute to a consistent national approach to salinity monitoring and assessment.

In relation to the Inquiry's term of reference (c), Agrilink also contends that existing technology can be improved in important ways to support the application of salinity management options.

We make several policy-related recommendations in the body of this Submission for the consideration of the Committee.

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Recommendations are presented throughout this submission and are highlighted.

1. Introduction

1.1 Who is Agrilink

Based in Australia and the US and having recently expanded our product and service range, Agrilink Holdings Pty Limited (Agrilink) is Australia's only full service water monitoring company. Our customers include several state governments and agencies and some of Australia's major winegrape, cotton and horticultural producers. Our management board comprises people credentialed nationally and internationally in the fields of agricultural science and economics.

Leading the field in this area, we uniquely offer a complete range of integrated products and services for water monitoring for wide ranging agricultural applications for domestic and irrigation purposes. Our solutions enable users to make improved and informed decisions on water use which results in improved productivity and environmental management.

Our solutions are innovative, flexible, cost effective and based on solid and contemporary science. We are currently enjoying unprecedented growth and are committed to forming constructive and long-term relationships with public policy makers and their advisory bodies and agencies.

Our solutions are offered in the marketplace, and discussed in this Submission, in an objective scenario where it is acknowledged that current systems and arrangements for monitoring and assessing the severity, impacts and likely future costs of salinity are inadequate and incomplete for determining the future extent of salinity across Australia, or for assessing the effects of any remedial or preventative management responses¹. Current systems are manual and labour-intensive (where they should be automated), periodic (where they should be continuous), rely on predictive modelling (which without verification can be inaccurate) and expensive. They fail to accurately determine salinity risk. We believe that a central forward thrust in the Government's role in salinity management, and relevant to each of the terms of reference in this Inquiry, should be to give greater recognition to the role of accurate, reliable and cost effective water monitoring and that water monitoring must be a basis for all future water management planning. An expanding science base and new technologies in this area can now assist in this role to a greater extent than ever before.

Agrilink is encouraged by and has benefited from programs previously established and co-ordinated by the Commonwealth Government to improve agricultural productivity and environmental outcomes in Australia - such as the Natural Heritage Trust (NHT) and the National Action Plan for Salinity and Water Quality (NAPSWQ). We are also encouraged that the outcome of the August 2003 COAG meeting appears to pave the way for improved coordinated action between the Commonwealth and states for ongoing water management. We are also optimistic that there appears to be growing awareness of the role the private sector can play in sustainable land and water management, both in relation to direct service provision for domestic and export purposes as well as in the public policy process. Your Committee's own report of June 2003, *Riding the Innovation Wave*, is encouraging evidence of this awareness.

Agrilink appeared before your Committee in February 2003 after having been awarded in September 2000 an R & D Start Grant (GRA 01601) for the development of our 'Multi-purpose Soil Probe for Agricultural Monitoring'. This probe has become an important tool

¹ This is referenced in studies undertaken as part of the Salinity Audit referred to in the Australian Natural Resources Atlas (as part of the National Land and Water Resources Audit). In summing up this point, the Audit states, "We have limited capability to predict salinity trends with confidence".

in Agrilink's approach to salinity monitoring, and is described in context later in this submission.

1.2 Relevance of Agrilink's product and service range to salinity management by way of context for responding to this Inquiry

Three of our products and services are particularly relevant to the terms of reference of this Inquiry. They are mentioned as evidence of new salinity science knowledge technology capable of assisting in the management, co-ordination and implementation of salinity programs; as tools capable of permitting improved linkages between researchers and solution implementers; and as tools permitting improved technical support in applying salinity management options.

They are:

- (d) Agrilink's value-added solution to salinity monitoring - integrating its salinity sensor with geospatial technologies.
- (e) AgWISE - Agrilink's proprietary Internet based software system designed for Weather, Irrigation, Salinity and Environmental monitoring and information, decision and risk management; and
- (f) Agrilink's monitoring expertise.

These are now briefly explained.

(a) Value-added solution to salinity monitoring – integration of salinity sensor and geospatial technologies

As mentioned in the previous section, current salinity monitoring systems tend to be manual and labour-intensive, periodic, based on rather than capable of verifying predictive modelling, and expensive in practice. They fail to determine salinity risk or to accurately distinguish between salinity hazard (the presence of salinity) and salinity risk (where salt risks damaging the environment)².

Agrilink's unique solution is to combine its newly patented salinity sensor with geospatial technologies to arrive at a methodology which adds value to existing technologies and provides a missing link in current monitoring solutions.

Salinity sensor

Agrilink has patented a soil moisture, salinity and temperature sensor that can be deployed as a multilevel soil and environmental monitor for use in irrigation management and environmental monitoring including salinity monitoring. It is this product that resulted from Agrilink's award of the R & D Start Grant in 2000 referred to above.

The sensor tracks both water and salt together and informs on trends in salt presence and movement over time. Agrilink's salinity sensors are currently being used in a range of on-farm and government initiatives³.

² It is a fact that salt is present everywhere in the environment. The presence of salt itself is not a problem, it only becomes a problem when it is mobilised and makes its way into, eg, the root zone or infrastructure foundations. Current monitoring systems do not accurately measure this.

³ There is a variety of salinity sensors on the market but the great majority of these are not suitable for agricultural or environmental purposes because they are unable to accurately determine salinity risk.

The unique features of the Agrilink salinity sensor is that it:

- Can simultaneously and continuously monitor salinity and soil moisture and multiple depths;
- Can monitor salinity where it will have an impact, ie, in the root zone of plants between the soil surface and water table within the top five metres of soil where plants grow and where there is the greatest impact from tree clearing;
- Can be installed in remote locations enabling remote sensing;
- Can undertake continuous monitoring at a particular point; and
- Can provide a complete soil profile through tracking dynamic changes to salinity in the ground over time rather than providing incomplete profiles through being limited to only spot measurement.

Geospacial technologies

Programs such as the NHT and NAPSWQ are currently funding projects that utilise remotely sensed geospacial technologies to provide information on where salinity is located, however these studies do not provide information on salinity trends at these locations and therefore in themselves fail to accurately determine salinity risk. Accurate determination of salinity risk requires the presence of trend and temporal information using point in time ground truthing and sampling to verify modelling .

Value-added solution

While Agrilink's sensor in itself does not provide information on where salinity is located, Agrilink's value added solution is to integrate the use of remotely sensed geospacial technologies with the Agrilink salinity sensor to enable the collection of continuous 'live' and comprehensive information on both the location of salt and how salt is mobilised over time, including in remote areas. This combined technology is therefore able to accurately deduce significant trends in water and salinity mobilisation to accurately determine salinity risk. The solution is automated, cost-effective and adds value to predictive modelling. It represents a unique, and strategic, turnkey monitoring solution which equips users with reliable quality data capable of assisting in informed decision-making regarding investments in salinity management, and the effectiveness of those investments.

(b) Decision management system - AgWISE

Agrilink has designed and developed a proprietary Internet based software system – AgWISE - for the collection, management, production, assessment and distribution of agronomic and environmental data relating to the **Weather, Irrigation, Salinity and the Environment**. The principal features of AgWISE are as an analytical tool, risk management tool and advanced decision support tool to users.

AgWISE uses the world's leading agricultural and environmental risk management software and is the benchmark information and decision management system for agricultural producers, consultants and environmentalists interested in sustainability and profitability.

AgWISE enables:

- Collection of continuous data over the Internet from a range of near and remote sources;
- Real time Internet access to this data by multiple users;

- Access to combinations of data on a range of environmental and agricultural conditions from a wide range of environmental sensors and utilising and linking a range of templates, models, dimensions and interpolated data;
- Integration of this data range in the one system;
- Conversion of this data into knowledge capable of being relevant at a number of levels including at a catchment scale and also through aggregation at regional and national scales;
- Sufficient good quality data for knowledge to be transferred from well-studied areas to less familiar areas;
- Customisation of data for a broad range of targeted purposes;
- Ready communication and presentation of knowledge derived to support efficiency and certainty in decision-making;
- Dynamic functionality at the same time ensuring data integrity and assimilation;
- The ongoing generation of new software models to suit specific requirements.

AgWISE enables a complete in-depth picture of agricultural and environmental conditions which:

- Is readily understood and interpreted;
- Represents continuous and unambiguous data;
- Allows more accurate decisions to be made enabling more efficient and cost effective management;
- Enables vastly improved environmental and agricultural management in a dynamic environment;
- Allows comparison of (like) areas irrespective of jurisdictional and/or agency boundaries and interpolation of data across regions to inform on trends;
- Enables earlier and more accurate prediction of trends and events;
- Permits reduced risk in managing environmental and agricultural management;
- Is able to contribute to the promotion of national consistency in programs and policies.

(c) Agrilink salinity monitoring expertise

Once data has been collected in AgWISE, Agrilink employs its particular expertise in:

- Assessing the data and converting it into scientifically credible and meaningful knowledge;
- Customising the data for targeted purposes to eg, illustrate trends, assist in defining agricultural and environmental objectives, provide definitive information on agricultural and environmental operations;
- Delivering and presenting the knowledge derived to support efficiency and certainty in decision-making.

The capacity of these three product/service offerings impacts on each of the terms of reference of this Inquiry. We will explain this and also generalise some of our observations into policy-related recommendations – mainly supporting the need for improved monitoring to lead to more accurate and improved information – for the Committee's consideration.

2. Commentary on the specific terms of reference

a) Use of the salinity science base and research data (including the development of new scientific, technical and engineering knowledge) in the management, coordination and implementation of salinity programs

Agrilink believes that there are gaps in the way that salinity science and research data is being used to manage, co-ordinate and implement salinity programs. These gaps relate to salinity monitoring, the use of new scientific, technical and engineering knowledge and the lack of a consistent national approach to co-ordinating and implementing salinity solutions.

For instance, currently:

- There is insufficient and discontinuous salinity monitoring (equipment, resources, expertise and technology) to enable the collection of up-to-date reliable data;
- There are major deficiencies in the design, performance parameters and coverage of monitoring technology systems to adequately evaluate current and future salinity management responses;
- There is no consistent national approach to data collection and salinity monitoring which have largely been developed on a project by project basis at the local level resulting in ad hoc and inconsistent rules and practices;
- Monitoring sites are often not strategically placed in the landscape or based on adequate knowledge of flow systems being monitored;
- Where data have been collected, there are major gaps in the length and frequencies of measurements and inconsistencies in analyses carried out thus limiting the interpretations that can be made and trends over time;
- No formal monitoring system exists for changes in land use or land management and therefore for tracking changes to water balance.

These gaps in the salinity science base and research data compromise the ability to effectively manage, coordinate and implement salinity programs.

The Agrilink products and services described earlier can contribute to alleviating these problems.

- Agrilink's unique turnkey solution of integrating geospatial technologies with the Agrilink salinity sensor to enable accurate live salinity measurement and monitoring and comprehensive information on the location of salt and its temporal mobilisation would enable a more research-focused science to be employed in the implementation of salinity management.
- Through Agrilink's unique AgWISE decision management system, by being able to bring information derived from the abovementioned measurement methodology into one place where it can be combined, value-added and delivered in an integrated, usable and understandable way for all stakeholders (including untrained users), salinity science and research data may be better deployed in the management, coordination and implementation of salinity programs.

- Through Agrilink's unique AgWISE decision management system, by being able to deliver through the Internet information to multiple users simultaneously or different users in customised form as required, it vastly improves the potential to manage, co-ordinate and implement salinity programs.

We recommend the Government:

- Recognises the importance of accurate and reliable salinity monitoring as a basis for all future salinity management planning;
- Recognises the role that ongoing monitoring has in validating modelling in order for credible knowledge to be captured and distributed between key stakeholders in salinity management;
- Recognises the need for long term funding to be directed towards catchment scale salinity monitoring rather than just modelling;
- Recommends the implementation of a consistent national approach to salinity monitoring;
- Recognises the benefits of automated data collection and monitoring;
- Recommends that standardised product specifications for monitoring are adopted across jurisdictions and agencies;
- Recommends the establishment of nationally consistent design and standards for data collection and salinity monitoring;
- Establishes clearly defined roles for those responsible for monitoring salinity; and
- Recognises the benefits of outsourcing the monitoring capacity to permit greater efficiency, expertise, cost effectiveness and independence in the monitoring function.

b) Managing and co-ordinating linkages between those conducting research and those implementing salinity solutions, including the coordination and dissemination of research and data across jurisdictions and agencies, and to all relevant decision makers (including catchment management bodies and land holders)

In Agrilink's view there are significant problems in managing and co-ordinating links between researchers and solution implementers. Links are either non existent or ineffective and knowledge is not being effectively distributed across jurisdictions, agencies and decision-makers.

These problems include:

1. Lack of awareness by land holders regarding the presence and significance of salinity in order to be able to contribute relevant and specific local knowledge to researchers and solution implementers to inform conceptual models of salinity management, improve systems capability and return on salinity management investments, and generate improved knowledge about salinity management processes.

2. Lack of a dynamic central repository/ national audit of currently existing programs, knowledge gaps and solutions across Australia in order to capture and maintain quality information, define the extent of planning, service and implementation gaps required over time, co-ordinate activities in designing systems, and report regular assessments.
3. Lack of systemic co-ordination and dissemination of data across jurisdictions, agencies and decision-makers in order to promote information sharing and improve both systems capability and return on salinity management investments.
4. Lack of real-time universal multi-stakeholder access to live up-to-date salinity information and solutions in order to promote problem resolution and rationalise, plan and implement contemporary salinity management programs.
5. Lack of independence in undertaking monitoring functions at the local level which is acting to inhibit productive working relationships amongst stakeholders in implementing solutions.

In relation to 1 above

Through working with a large number of land holders (growers and irrigators) where salinity occurs, Agrilink is in an excellent position through its AgWISE technology to:

- Make land holders more aware of the consequences of their actions;
- Enable the practices of innovative land holders to contribute to improved salinity monitoring and management models;
- Aggregate land holders' data over time to upgrade and test new research models of salinity monitoring;
- Develop new software programs to improve data transformation incorporating both land holders' findings and new research models; and thus:
- Bridge the gap between:
 - Land holders' current awareness and practices;
 - Government's role in determining policy and implementing solutions; and
 - Researchers' vision in devising new management models.

We recommend the Government:

- Recognises the potential for Internet-based technology to engineer improvements in solution implementation through better links with land holders, programs and researchers;
- Recognises the potential for Internet-based technology to permit widespread, flexible and customised information dissemination to improve linkages between researchers and solution implementers;
- In making research grants, specifies the use of common technology and software to enable these technology linkages to occur.

In relation to 2 above

While the National Land and Water Resources Audit (NLWRA) has gone some way towards providing a central repository of information for overall environmental management, it is static, it contains gaps and is not continuously updated. There is an opportunity to upgrade the NLWRA to enable it to become a dynamic central repository to

capture real-time data as it occurs on the effects of a variety of dynamic conditions (eg, seasonal variations; other weather conditions) on salinity to enable more effective investments in salinity management.

The benefits of a dynamic central repository are huge and growing in importance as new technology comes on stream capable of feeding into or combining with an existing national database.

We recommend the Government:

- Recognises the NLWRA as the single national audit of salinity management in Australia;
- Provides recurrent funding to the NLWRA to make it an appropriate and efficient living, dynamic audit; and
- Requires each state and territory to recognise the NLWRA as the single national repository of salinity management.

In relation to 3 above

With our AgWISE information and decision-management system, Agrilink is in an excellent position to co-ordinate and disseminate comprehensive and holistic data across jurisdictions, agencies and decision-makers to enable a consistent national approach to salinity monitoring and assessment.

We recommend the Government:

- Recognises the potential for an independent Internet-based technology engine to deliver salinity data across jurisdictions, agencies, decision-makers and land holders either via the NLWRA or independently;
- Undertakes market testing in relation to the most efficient and effective service provider in this regard; and
- If relevant, considers outsourcing this function to the most efficient and effective service provider.

In relation to 4 above

We recommend the Government recognises the potential for Internet-based technology to provide information simultaneously to wide ranging stakeholders to speed up the process of information, planning and solution implementation.

We refer to the above recommendation in this regard.

In relation to 5 above

Through our work with numerous land holders across Australia we are aware of the potential for tension to exist between them and solution implementers, including government, where:

- a. On the one hand land holders may need to demonstrate to solution implementers that they are following guidelines in water usage and salinity management. To do this, water usage and salinity impacts must be monitored.
- b. On the other hand solution implementers need to gain the trust of land holders in relation to support and effectively implement their solutions. To do this, programs need to be monitored.

Given these potentially divergent interests, mutual distrust can ensue or be exacerbated where one or the other party conducts the monitoring.

If however an independent third party conducts the monitoring, reliability is theoretically more likely to be accepted by the stakeholders or at least more easily questioned without exacerbating existing tensions.

We recommend the Government:

- Recognises that a relevant linkage between research and implementation can be the presence of reliable and accurate data through independent third party collection and monitoring; and
- Considers the potential to formally recognise and outsource this function in fostering links between researchers and solution implementers in relevant circumstances.

c) The adequacy of technical and scientific support in the management and co-ordination of applying salinity management options

We hope we have demonstrated in this submission that technology can play a powerful, efficient and cost-effective role in:

- Improving the salinity science base and research data (including providing new scientific, technical and engineering knowledge) in the management, co-ordination and implementation of salinity programs; and
- Creating links between researchers and solution implementers including in relation to co-ordinating and disseminating research and data across jurisdictions, agencies and decision-makers (including catchment management bodies and land holders).

In addressing this last term of reference, we therefore contend that existing technology can be improved in important ways and utilised to initiate effective data collection and monitoring activities where none currently exist or rationalise and replace existing time consuming and resource intensive data collection and monitoring activities.

We recommend the Government:

- Recognises the importance of accurate measurement through monitoring to applying salinity management options;
- Recognises the inadequacy of the current resource intensive and costly manual data collection methods and practices in applying salinity management options;
- Recognises the improvements that technology can offer to applying salinity management options;

- Recognises the improvements that Internet-based technology such as Agrilink's AgWISE capability can offer to applying salinity management options; and
- Gives funding preference to technology with the capability of Agrilink's AgWISE system to permit greater efficiencies, cost effectiveness and improved decisions in applying salinity management options.

*Submitted
for review
21/10/03*