

ASPAC Digest – October 2016

8th Edition, October 2016

Contents

Greetings from the Chair	2
The Laboratory Proficiency Committee	3
ASPAC Inter-laboratory Proficiency Programs – are they ‘delivering the goods’?.....	3
The Methods Committee	6
Contamination of plant samples during grinding.....	6
Member Contributions	6
Phosphorus availability in relation to soil pH in cane belt areas of Fiji.....	6
Fertcare Accredited Advisor System Auditor Changes.....	7
Travel Awards 2016	7
2016 Plant Nutrition Trust award.....	7
ASPAC NEWS	11
Impact Fertilisers and Dr Ken Peverill recognised in Fertilizer Industry Environment Awards.....	11
Conferences.....	12
Committee Contacts	13

Greetings from the Chair



Craig Newman – Chairman ASPAC Executive, Tasmanian Representative

The most recent ASPAC Plant Testing workshop was held in Adelaide recently and was a tremendous success with over 20 attendees representing labs from all over the country and a number of representatives from Fiji. Among the many presentations were topics ranging from sap analysis, alternative digestion methods, quality control and determination of measurement uncertainty. Our gratitude goes out to Janice Trafford, Paul Kennelly and Ryan Walker for putting the program together and organising the venue. Special thanks also goes to all our presenters and APAL Laboratories who were kind enough to invite the participants into their laboratory for a visit. These workshops are put on regularly for the benefit of all ASPAC members, if you haven't had the opportunity to attend, it is a great opportunity to meet other lab rats and share techniques and tricks of the trade. I look forward to seeing you at the next one.



2016 is an election year for ASPAC. ASPAC cannot exist without the tireless unpaid and frequently unacknowledged efforts of our many volunteers on the Executive, and across the many committees that make ASPAC function. In short. We need all the help that we can get so, please feel free to get involved in the executive if you feel that you have something important to contribute. A strong ASPAC is in everyone's interest.

At the upcoming AGM on the 14th November members will also be asked to vote on proposed changes to the ASPAC rules of association. Amendments have been proposed for a number of reasons:

- to bring ASPAC into compliance with changes that have occurred in relevant legislation around the formation of associations
- to make the operation and administration of ASPAC more flexible in today's digital environment.
- to reflect ASPAC's role in the wider Australasian environment.

Copies of the changes will be circulated to all members and I would encourage you all to come along to the AGM if possible to have your say.

The AGM in November will mark the end of my tenure as chairperson of ASPAC, I would like to thank the committee and members of ASPAC for giving me the opportunity to act in this role. It has been an interesting and fulfilling experience.

The Laboratory Proficiency Committee

ASPAC Inter-laboratory Proficiency Programs – are they ‘delivering the goods’?

Introduction:

A principal reason for the formation of ASPAC in 1990 was to improve the overall performance of soil and plant testing laboratories in Australia. The key mechanism to achieve this was to provide inter-laboratory proficiency programs (ILPP's). The ASPAC Executive made this an early priority, and appointed what is now the ASPAC Laboratory Proficiency Committee (LPC) to establish and oversee inter-laboratory proficiency programs (ILPPs) covering both soil and plant chemical tests that continue to this day.

ASPAC's ILPP's commenced in 1992 with operational responsibilities undertaken by the then State Chemical Laboratories, Werribee, Victoria. The first Soils' Program Report was released in 1993. From then until 2003, separate soil and plant ILPPs were offered once every 12–18 months, and the results reported back some months later.

Following a documented review, both soil and plant ILPPs were upgraded in 2004, with operational arrangements contracted to Proficiency Services Limited (now Global Proficiency Limited) in Hamilton, NZ. Changes included an increase from 6 to 12 “test” samples per program, with a frequency upgrade from one to three rounds per program year. Moreover, participating laboratories now receive round-by-round feedback within two weeks following the due-date for result submissions. This allows laboratories to utilise the ILPPs more effectively to identify and address any measurement-performance issues they may have. There are published reports (or reports in preparation) for all annual programs since 1993. Copies of completed annual reports can be downloaded from the ASPAC web site. There are also a multitude of reports, newsletter items and scientific papers in the public domain that describe ASPAC's ILPPs with examples of measurement performance and improvement. A few examples can be sourced “Further Reading”.

A major initiative in 2006 was publishing on the ASPAC website those laboratories that had been certified as proficient for particular methods or elements. Until then, certification only involved the issuing of hardcopy certificates to successful laboratories, separately for soils and plants. Laboratories could publicise ASPAC certification by displaying their contemporary certificates. Publicity via the ASPAC website provided further incentive for laboratories to improve their measurement performance.

Recently, the ASPAC Executive asked the question of the LPC members: “Have we actually seen an improvement across Australasia in the performance of our soil and plant testing labs?” This article provides a response to that question.

How to assess performance improvement?

The most effective way is to look at whether variations or trends in submitted results for specific methods or total elements have widened or narrowed over time. For the examples provided herein, the LPC collated Percent Robust Median Coefficients of Variation (% CV's), after removal of outliers and stragglers, for all soil and plant tests from 2005 to 2015. This is a lot of data (for soils, 32 tests x 11 years; for plants, 20 tests x 11 years). To

simplify this, a cross-section of 10 commonly performed tests from each program were selected and compared with corresponding grand median % CVs. Groupings were made for the initial three years (2005-8), the middle period (2009-11) and the last three years (2013-15).

A limitation of such a study is that percent robust CVs are known to vary with test level or concentration in reasonably predictable ways, with highest CVs typically occurring as test levels decline to very-low values. By using grand median data across the 12 test samples in each year, it is assumed that the concentration effect on % CV values across years is minimal.

Another source of variation is the number, and capability, of laboratories participating each year. Some well performing labs have closed down, and there have been periods when a significant number of relatively inexperienced laboratories have participated (e.g., government sponsored programs for Asian and South Pacific laboratories). These data were included though the resulting ‘noise’ limits this evaluation; nevertheless, LPC members see much merit in providing this summary of trends in measurement performance across the decade.

Results:

The 10 selected tests for each Program were collated and graphed (see Figures 1 and 2). It is clear that downward movements in robust % CV values have consistently occurred across the selected tests, supporting the contention that variations in results reported by participating laboratories have narrowed across the decade. (A similar trend was also observed in all analyses undertaken.) The magnitude of improvements (lower values) in robust % CV values are 25-40%.

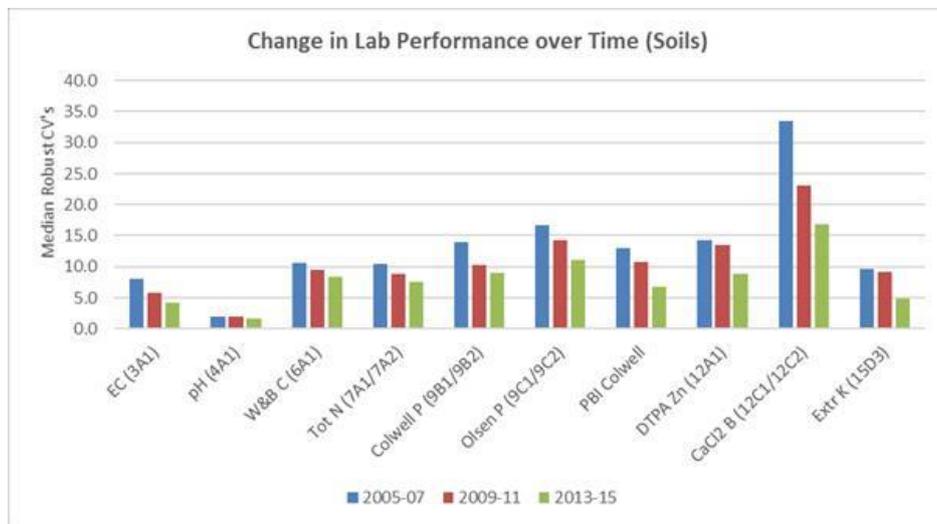


Figure 1. Trends in grand median robust % CVs obtained from ASPAC ILPPs from 2004-05 to 2014-15, inclusive, arranged into three time groupings by selected soil test methods.

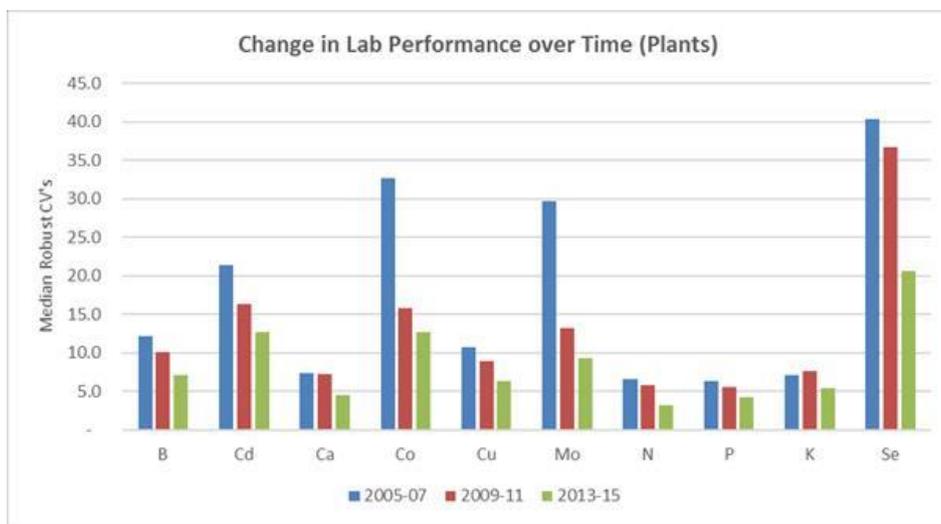


Figure 2. Trends in grand median robust % CVs obtained from ASPAC ILPPs from 2004-05 to 2014-15, inclusive, arranged into three time groupings by selected total plant tests.

Reasons for the apparent measurement improvements cannot be deduced from the statistical assessments performed. It is reasonable to speculate, however, that the increased frequency and more rapid reporting back to participating laboratories since 2004-05 has had the intended effect, namely, to make the programs a more useful tool to identify analytical problems. Publically stating who has achieved ASPAC Certification may also have prompted participants to work harder at improving their performance. Technical training workshops on methodology offered by ASPAC and presentations at international Symposia no doubt have also contributed.

These improvements were not all achieved in the first few years since 2004-05, as these data show that significant improvements were still observed in the most recent years. The LPC still review the programs annually and look for ways to achieve further improvements.

One recent initiative was with the challenging measurements of ultra-trace elements (Mo, Co, Se, Cd, Pb) in plant material. The statistical treatment for the ILPP is now limited to the results determined by ICP-MS, recognised to be the most reliable method used by the participants, and then all results are evaluated against the performance of this sub-set. Prior to this, results from alternative techniques such as ICP-OES were also included in the statistical treatment and invariably were the stragglers and outliers, leaving all ICP-MS results as 'good data'. The new "assessment" approach means that precision should further improve. However, laboratories not using ICP-MS for the measurement of ultra-trace elements in dried plant samples can still achieve Certification if they are performing well.

Conclusions:

ASPAC ILPP's are delivering value to the participants and to the marketplace. This study shows significant improvements in overall performance, typically 25–40%, over the last eleven years. There are still opportunities to further refine the programs, and to introduce more targeted programs, such as the recently introduced Acid Sulfate Soils program.



Further Reading:

There is available on the ASPAC website ([link here](#)) a reasonably comprehensive list of reports, newsletter items and scientific journal papers that relate to ASPAC's ILPPs and the on-going evaluation of method measurement performance, including annual program reports since 2004-05.

The Methods Committee

Contamination of plant samples during grinding

All laboratories grind client's samples before analysis and ASPAC has long debated how much this may influence the results of analysis and how to assess the effects. There are several aspects to this question, one of which, contamination during grinding, is emerging as laboratories expand their testing to include trace and ultra-trace elements in plant digests. Most grinders are of steel/stainless steel or tungsten carbide construction; consequently the likely potential impacts include Fe, Mn, Ni, Cr, Mo and Co.

This is a heads up that the Methods and Proficiency Committees have put their heads together and come up with a simple proposal for laboratories to test how much their grinders may be contaminating plant samples. The proposal is designed to encourage as many participants as possible. If the assessment of the proposal is feasible it will be additional to proficiency testing rounds, the cost will be borne by participants, and the usual level of confidentiality will be assured.

Member Contributions

Phosphorus availability in relation to soil pH in cane belt areas of Fiji

Abstract

Sugarcane (*Saccharum officinarum* L.) is an economically important crop in Fiji since the 1880's. It is an important source of income and employment for the farming communities of the country. Sugarcane is cultivated in tropical and sub-tropical regions of the world, in a range of climates from hot dry environment near sea level, to cool and moist environment at higher elevations. It is a heavy feeder of nutrients such as nitrogen, phosphorus and potassium, hence, soils have to be continuously tested for its available nutrient contents for its potential to produce optimum cane and sugar yields. Phosphorus is an essential nutrient required for growth and development of sugarcane plants. Availability of phosphorus is primarily dependent on the pH through interaction of minerals; iron, aluminium, and calcium with phosphorus in the soil. Three hundred and seventy six (376) soil samples from sugarcane growing fields were collected for analysis of available phosphorus and soil pH. The results of the samples were grouped into 50 soils from each soil reaction category and the correlation between soil pH and available phosphorus were calculated. The study revealed that there is not any strong positive correlation between the soil pH and available phosphorus. The correlations were positive in all soil reaction categories, however, all were non-significant.

If you are interested to find out more about this subject, then please contact the author below.

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Fertcare Accredited Advisor System Auditor Changes

Media Release supplied by Fertcare

The Fertcare Accredited Advisor (FAA) program ensures that high standards are met by both individuals providing advice, and the decision support systems that underpin the process. A key part of this is a detailed independent audit of the decision support systems every two years.



Dr Cameron Gourley

The current FAA System Auditor, Dr Ken Peverill has indicated his intention to retire. The Victorian Department of Economic Development, Jobs, Transport and Resources will now undertake this role and Dr Cameron Gourley will be the auditor.

Commenting on the changes, Jeff Kraak, the Fertcare Program Manager, said "the FAA program has enjoyed significant benefits from Dr Peverill's 9 years of involvement." This role provides assurance that nutrient decision systems, which many agronomists rely on to develop soil and plant nutrition programs, follow sound practices, use laboratories which provide reliable results and interpretations are based on accepted science in Australia. Dr

Peverill's previous experience running soil laboratories, his leadership roles in ASPAC, co-authoring the key industry reference "Soil Analysis: an Interpretation Manual" and significant role in a number of national agricultural industry projects such as Better Fertiliser Decisions in Crops and Pastures, have positioned him well for the System Auditor role. In addition, he has provided valuable guidance on the development and ongoing improvements to the FAA program. Dr Peverill was the inaugural FAA Systems Auditor.

"Dr Gourley's experience puts him in a strong position to undertake the System Auditor role," said Mr Kraak. He has worked for more than 30 years in soil, pasture and fertiliser research, extension and policy development. His contributions include improving our understanding of nutrient requirements, cycling and environmental losses from animal production systems, soil test development and interpretation, and the development of farm-based tools for improved fertiliser decisions. Dr Gourley has led a number of important national programs involving industry and government partners such as Phosphorus for Dairy Farms, Better Fertiliser Decisions for Pastures, Accounting for Nutrients, and Nitrogen for Greater Profit. He has published over 50 scientific papers and is also on the national executive of the Australian Soil Science Society.

The purpose of the FAA program is to provide farmers and other stakeholders with confidence that farm managers are receiving soil management and fertiliser advice based on soil and or plant testing of a high standard. There are currently 255 accredited advisors listed at www.fertcare.com.au

Travel Awards 2016

2016 Plant Nutrition Trust award

These grants are provided on a competitive basis to enable graduate students and early career scientists to attend international meetings or to perform research in overseas labs. Successful applications need to be relevant to some aspect of plant nutrition or soil fertility. The amount of each grant will vary depending on the activity

being proposed and the potential for other support. Most grants range from \$200 to \$2,000. The following are reports from this year's recipients of the award.

Albina Ilyasova, PhD Student, School of Plant Biology, UWA

I was privileged to be granted a PNT award. Together with other travel grants, it allowed me to visit the Max Planck Institute of Molecular Plant Physiology (MPI-MPP) in Potsdam-Golm, Germany, as well as attend the Plant Biology Europe EPSO/FESPB 2016 Congress in Prague, Czech Republic.



Dr Rainer Hoefgen's group (Albina in stripy T-shirt)

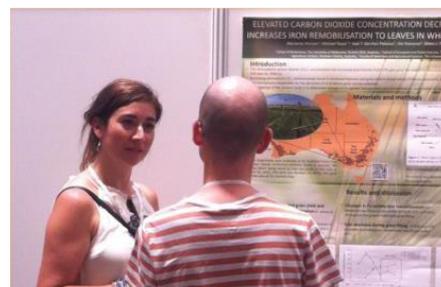
Access to the highly specialised and world-leading expertise, instrumentation and methodologies for studying plant biochemistry and molecular biology at MPI-MPP allowed me to obtain critical metabolite data that adds greatly to the value of the data-sets that I am generating as part of my research program at University of Western Australia. The travel provided me an unprecedented opportunity for advanced training with a specific focus on mineral assimilation and carbon metabolism. In collaboration with Dr Rainer Hoefgen's group, I determined various metabolites in my samples including thiols, S-adenosyl methionine, ascorbate, numerous ions, amino acids, sugars, total protein, starch, and organic acids. The high-end techniques used for these analyses included high performance liquid chromatography (HPLC), gas- and liquid-chromatography mass spectrometry (GCMS, LCMS), ion chromatography (IC) and spectrophotometry. Some assays are still in progress due to the time-consuming nature of the analysis and machine availability. Besides excellent research facilities, there is a good scientific life at the Institute. Seminar series are the most noticeable and important part of it. Interesting presentations are given twice a week by outstanding local researchers like Mark Stitt, Arun Sampathkumar, Joachim Kopka, as well as external speakers. This year as a part of celebration of the Institute days, MPI-MPP invited a range of scientists from University of Melbourne. Staffan Persson, Tony Bacic, Joshua Heazlewood and other brilliant researchers shared their fascinating discoveries with the grateful audience. Interacting and networking with distinguished scientists and PhD students at the institute definitely benefited me as a researcher. The data obtained at the MPI-MPP adds greatly to my previous findings here at UWA and will result in a scientific paper to be used as a chapter in my thesis. Some practices learned at MPI will be transferred here to our lab and equipment to achieve better results and maintain a good working environment.

The PNT award also facilitated my attendance at an international congress in Prague, as it contributed to my travel to Europe. At the conference, I presented a poster that summarised my work to date on leaf development in *Hakea prostrata*, with special emphasis on the extremely high phosphorus-use efficiency of this plant. My goal was to convince researchers that the Australian native plant *H. prostrata* is an excellent model for identifying traits that might be used to increase phosphorus-use efficiency in crops. Listening to plenary and keynote speakers as well as PhD students gave me understanding of recent advances in plant nutrition and plant productivity. Also at the Congress I met and talked to various researchers in my field. These interactions have given me an opportunity to establish new collaborations for the future and expand my area of expertise.

During this trip I lived nearly two months in a bewitching German village and I had never been to Europe before. The time spent there allowed me not only to do good research, but also to explore the history of this place in my spare time and simply enjoy the beauty of European nature. Finishing the research travel with a conference in gorgeous Prague with its old-time architectural gems just added to my impressions overall. I would like to sincerely thank the PNT for the funding that assisted me to obtain important data for my studies and to have an excellent work experience.

Marianne Weisser, PhD candidate, School of BioSciences, University of Melbourne

My Plant Nutrition Trust Award allowed me to attend the 2016 ISINIP (International Symposium on Iron Nutrition and Interactions in Plants) conference at the Universidad Autónoma de Madrid in Spain and communicate my research findings to an international audience. It was an incredible experience for me to attend, for the very first time, an international conference and establish connections with other researchers from around the world on topics related to my PhD.



Marianne explaining her research findings to a conference attendee

My PhD project is focused on the effects of elevated atmospheric carbon dioxide concentrations on the distribution and metabolism of iron (Fe) in wheat plants. Attending ISINIP helped me to not only broaden my understanding of Fe metabolism in plants, but also to connect my research findings to other areas of plant biology associated with Fe such as agronomic practices to correct Fe deficiency in plants, Fe chemistry and dynamics in soil, plant physiology related to Fe and biofortification of crops with Fe. Without a doubt, the conference gave me a more comprehensive and global view of the effects of the environment and human population on Fe nutrition in plants.

My conference poster entitled “Elevated carbon dioxide concentration decreases iron uptake and increases iron remobilisation to leaves in wheat during grain filling” won the prize for best ISINIP 2016 poster! With more than 340 posters at the conference, it was an unexpected yet happy surprise when Dr Juan Jose Lucena (chairman of the organizing committee) called my name as the poster winner at the conference dinner. Winning this award has boosted my confidence in my ability to structure and communicate research findings.

Overall, attending the ISINIP 2016 conference was a great experience that allowed me to meet and learn from researchers presenting the latest knowledge about iron nutrition in plants. It also helped me to improve my confidence and communication skills within the scientific community. I am very grateful to the Plant Nutrition Trust Award for giving me this amazing opportunity and helping me to step up as a scientist. I am now eagerly looking forward to my next international conference!

Allison Pearson, Post-doctoral research fellow with Salt Group, ACPFG (Australian Centre for Plant Functional Genomics), University of Adelaide.

I was fortunate to receive a Plant Nutrition Trust Award to attend the 2016 “Salt and water stress in Plants” Gordon Research Conference in May/June 2016.



The conference is held every two years in a different country which is voted on by members of the previous Gordon Conference. This year's conference was held in Les Diablerets, Switzerland which is a beautiful village and ski resort located in the municipality of Ormont-Dessus. The conference was held at the beginning of their summer so although there wasn't enough snow to ski there was still snow at the top of the Alps which made for a spectacular view in conjunction with the cow bells that could be heard all around the meadows.

The conference consists of about 200 scientists from around the world who specialise in salinity and water stress of agricultural crops and model plant species. Each of the sessions over the four and a half days consisted of a different topic. The first night of our arrival was a keynote session on the topic of 'Climate Change and Food Security' with a number of speakers talking in this session. The first day of the conference covered 'Stress and Development' in the morning session followed by 'Natural variation of stress resistance' in the afternoon session which covered things such as Mechanisms of salt tolerance, hydrotropism and natural variation of genes in root system architecture which confers drought and salt avoidance. In between these sessions Poster sessions were held where all of the people who weren't able to give a presentation could still showcase the excellent work that they have been doing and also get any feedback from experts in the field on any advice or suggestions that they may have.

There were many sessions over the course of the week but a couple of my favourite sessions were the 'Signalling' session on the Tuesday which had a number of speakers talking about a wide range of topics in plants such as Arabidopsis, rice and the session on Thursday 'From Genes to the Field' which showcased all of the great work which has been performed by some excellent speakers and their research projects in crop species and has been able to show the development and improvement of crops not only in the glasshouse but out in the field as well. This session covered multiple agricultural crops such as wheat, barley, maize and rice.

This conference allowed me to see all of the great research that is happening all around the world in the field of salinity tolerance and all the excellent advances that are being made in our understanding of the mechanisms involved and how we can continue to improve our agricultural crops to this increasing global issue. All of the great research that has taken place could have potential use in some of my own research and I could see applications of this work in the future in Australia. I had the chance to meet a lot of fantastic people and to make some great connections for the future. I would like to thank the Plant Nutrition Trust, the Australian Centre for Plant Functional Genomics and the Grains Research and Development Corporation for making this trip possible and enabling me to attend this international conference.

ASPAC NEWS

Impact Fertilisers and Dr Ken Peverill recognised in Fertilizer Industry Environment Awards.

Impact Fertilisers and Dr Ken Peverill were presented with Environment Awards, by Yvonne Harz-Pitre from the International Fertilizer Association at the Australian Fertilizer Industry Conference gala dinner in Cairns. The Platypus Award recognises Impact Fertilisers leadership role in the successful north Queensland fertilizer bag recovery pilot project. Dr Peverill from K I P Consultancy Services received a Snapper Award for his career contributions that helped drive national agricultural productivity and nutrient use efficiency while assisting in minimising environmental impacts.



L to R: Jack Ellice-Flint, Impact Fertilisers, Yvonne Harz-Pitre, International Fertilizer Association and Dr Ken Peverill, K I P Consultancy Services.

The fertilizer bag recovery trial operating last season, resulted in the removal of over 72,000 one tonne bags from the environment through a new independent entity Farm Waste Recovery (FWR). The plastic recovered was sufficient to manufacture over 1,200 park benches or similar products.

Commenting on the project, Mr Jack Ellice-Flint, Impact Fertilisers Agronomy Services Manager said, “the pilot project exceeded our expectations.” The project was supported by organisations such as Incitec Pivot Fertilisers, Queensland Department of Environment & Heritage Protection, local Governments, growers, resellers, Canegrowers Magazine and Plastic Recyclers. The pilot project has led to the planned roll-out in 2016 of an industry wide program for eastern Australia.

A major part of Dr Peverill’s work has been aimed at improving soil and plant analysis as a tool to fine-tune fertilizer and soil amendment recommendations. Reflecting on lab improvements, Dr Peverill recalls, “In comparing soil and plant labs in the late 1980’s, it became clear that there was considerable variation in the analytical results, types of analysis reported and lab procedures employed.” Through the efforts of Dr Peverill and others, the organisation which is now known as the Australasian Soil and Plant Analysis Council (ASPAC) was created in 1990 and has played a key role in soil and plant testing to this day. He became the inaugural Chairperson and later the State representative for Victoria. He also chaired the Laboratory Proficiency Committee, seen by many as the most important role of ASPAC.

In 1999, Dr Peverill, along with Leigh Sparrow and Doug Reuter published a key industry reference “Soil Analysis an Interpretation Manual” which is highly regarded by industry.

More recently Dr Peverill played key leadership roles in a number of national agricultural industry projects, including Better Fertiliser Decisions for Pastures, Accounting for Nutrients on Dairy Farms and Making Better Fertiliser Decisions for Cropping Systems in Australia. The Better Fertiliser Decision projects both delivered comprehensive collations and summaries of soil test calibration studies for pasture and grain production every



undertaken in Australia. These databases and the ASPAC proficiency program provides strong reference points for the Fertcare® program.

Dr Peverill has also provided valuable guidance on the development and ongoing improvements to the Fertcare Accredited Advisor (FAA) program. This program provides confidence to farmers that fertilizer advice flowing from soil and plant analysis is based on sound sampling and laboratory practices, interpretation are based on accepted science in Australia and recommendations are complete. Until recently, Dr Peverill has been the inaugural FAA Systems Auditor.

Fertcare underpins the significant contribution of the fertilizer industry to the development and implementation of good public policy to deal with issues associated with the use of fertilizer products.

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Conferences



The joint conference of the New Zealand Society of Soil Science and Soil Science Australia can be explored at the following web site <http://www.nzssconference.co.nz/>



<http://isspa2017.csp.escience.cn/dct/page/1>

Important Dates: Deadline for Submission of Abstracts: Jan. 16, 2017; Abstract Acceptance Notification: Feb. 28, 2017; Deadline for Early Bird Registration: March 15, 2017

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