Grains Convo

Date: June 2024

Contents

DPIRD scientist's research journey to revolutionise soil management

Project name and GRDC Code

Recognising and Rewarding Excellence: DAW2307-003AWX

Research recognised

In 2023 the Grains Research and Development Corporation (GRDC) presented principal research scientist from the Department of Primary Industries and Regional Development (DPIRD) Dr Gaus Azam with a successful travel scholarship, called the Recognising and Rewarding Excellence Award (for the western region).

The annual awards celebrate the grains sector's most committed researchers and innovators by offering them an international travel bursary.

This can be used to extend their professional networks and conduct collaborative research for the benefit of the wider grains industry.

A soil scientist with more than 20 years' experience in Australia and overseas, Dr Gaus Azam grew up in a small

village in Bangladesh which inspired him to study agricultural sciences in tertiary education.
He has been involved in agricultural research in the areas of soil and plant interactions for improving soil water and nutrient use efficiencies.

Dr Azam is the lead researcher on a $22 million project, supported by GRDC, to define grain yield potential in the absence of soil constraints, with a view to developing the most profitable and long-lasting strategies.

The project focuses on 12 million hectares of arable land covering diverse soil types in the low to high-rainfall areas of WA, where subsoil compaction, subsoil acidity, sodicity and water repellence regularly occur in combination.

Outcomes from the project are hoped to have an impact across Australia.

Previously, Gaus successfully managed the DPIRD/GRDC-funded project, Innovative approaches to managing subsoil acidity in the wheatbelt of Western Australia.

Germany

Dr. Azam's international research journey began last month with a visit to the University of Bonn in Germany, a leading institution in agricultural machinery development.

Dr Azam said during the visit he discovered that we need to build a soil mixing implement that will fix the subsoil while minimum disturbance to the topsoil. Topsoil is very important for successful establishment of the crop.

“Our topsoils are generally good as we have fixed soil water repellence and acidity in the topsoil. We need to improve our subsoil, so the machine for the future should focus on fixing subsoil while minimum intervention to the topsoil. German scientists are also thinking in the same way,” Gaus understood.

There is opportunity to work with German engineers to build such a machine.

German soils are more fertile than the soils of WA.

Their soil has high organic matter and clay contents.

Given they get rainfall all year round, they can crop throughout the year.

Their winter barley can yield as high as 12 t/ha, but obviously need inputs such as 300 kg of nitrogen per cropping cycle.

USA and Canada

In September, Dr. Azam will travel to Canada and the USA to collaborate with top crop and soil researchers.

His itinerary includes visits to the Agriculture and Agri-Food Canada Swift Current Research and Development Centre and the United States Department of Agriculture in Raleigh, North Carolina.

These institutions are at the forefront of technologies such as soil mapping, breeding crops with optimal root systems, in situ imaging of root architecture, and precision application of fertilisers and soil amendments.

Dr. Azam aims to bring back practical insights into machinery development and new agronomic practices to maximise soil reengineering benefits, which he looks forward to sharing with colleagues and stakeholders in the Western Australian grains industry.

Funding partners / project collaborators

Grains Research and Development Corporation (GRDC)

More information

Read more about Dr Gaus Azam here

Read Dr Gaus Azam' research papers here

Contact

Dr Gaus Azam
DPIRD Principal Soil Scientist
E: **Gaus.Azam@dpird.wa.gov.au**
P: (08) 9690 2159

Disease monitoring improves WA grain health

Project name
Disease surveillance and related diagnostics for the Australian grains industry (Western region)

GRDC code
DAW2104-003RTX

Western Australian effort to monitor foliar diseases
Staff from the Department of Primary Industries and Regional Development (DPIRD) in the Crop Protection portfolio are continually conducting surveillance and monitoring for foliar diseases of cereal, oilseeds, and pulses in WA cropping zones.

This project, Disease surveillance and related diagnostics for the Australian grains industry (Western region) was conducted from 2021-2024, with support from the Grains Research and Development Corporation (GRDC).

It's part of a national disease surveillance program to monitor the changes in endemic foliar diseases of cereals, oilseeds and pulses including their incidence and severity.

The project had staff allocated from 5 DPIRD offices (Geraldton, Northam, Perth, Albany, and Esperance), conducting surveillance through all WA port zones on an annual basis. The knowledge gained from the surveillance data, in association with changes in farming practice and other factors (such as climatic trends) is a key source of information about the disease risk for the Australian grains industry.

Results from this project will assist in identifying RD&E (Research, development, and extension) investment priorities across Western Australia's grain growing regions.
This work contributes to demonstrating the absence of exotic diseases to meet market requirements.

Endemic disease surveys

Over 3-years, DPIRD staff conducted 1341 disease reports, including 707 ad hoc reports and 634 structured spring survey reports.
The surveys showed that in 2021 and 2022, higher rainfall led to increased disease prevalence and severity.

Then in 2023, lower rainfall resulted in reduced foliar disease severity, though significant root fungal and nematode issues were identified in some locations.

Stubble-borne diseases such as Stagonospora nodorum blotch and yellow spot in wheat, net blotches (net and spot forms) in barley, septoria blotch in oats and blackleg in canola were common across all regions and seasons.

Prevalence was favoured by the abundance of host stubble each season, however impact of these diseases varied according to seasonal conditions, farming system (crop rotation and sowing date) and resistance of the varieties being grown.

Sclerotinia stem rot is now widespread in medium and high rainfall zones, regularly affecting canola and increasingly impacting grain legumes like lupin, particularly in favourable seasons, with no resistant varieties available.

Wheat powdery mildew occurred in each year of the project, with greatest prevalence in the Esperance port zone, encouragingly fungicide resistance was not found in samples submitted for testing by the project.

Surveillance reports from this project were also reported to PestFacts and made available through Pestfacts map.

Exotic disease surveillance

The project monitors for presence of any exotic diseases and specifically reports absence of 5 high-priority pathogens: wheat stem rust UG99, wheat blast, barley stripe rust, canola verticillium wilt, and lentil anthracnose.

DPIRD staff submitted 1063 reports confirming the absence of these pathogens, with data uploaded to the National Grains Disease Surveillance program through AusPestCheck.

New pathogens detected

- Red leather leaf of oats: Detected in 2021 in Narrogin, WA, and confirmed in 2022, a significant concern for oat producers.

- Ascochyta leaf scorch: Found for the first time on barley in WA in 2021, previously detected in wheat but not considered a major concern for crop production.

- Pathotype surveillance: Over 80 samples of cereal rust were sent to Sydney University for pathotype identification in the Australian Cereal Rust Survey, with no new or exotic pathotypes found.

The project also contributed samples to national variety disease screening projects, identifying changes in virulence in barley scald and barley powdery mildew.

Diagnostic activities

The project collaborated with DPIRD diagnostic laboratory services, submitting 105 samples for diagnosis.

The samples resulted in confirmation and submission of isolates to the WA culture collection of Neospermospora avenae and Neoascochyta graminicola in 2021.

Further investigation of pathogenicity and host range for these isolates will be a priority for future projects.

Project staff regularly provided one-on-one diagnostic and management advice to growers or grower advisers through face-to-face meetings, phone calls or email/electronic messaging.

Funding partners / project collaborators

Grains Research and Development Corporation (GRDC)

More information

Read DPIRD webpage Disease surveillance and related diagnostics for the Australian grains industry (Western region) here

Contact

Geoff Thomas
DPIRD principal research scientist
E: **Geoff.Thomas@dpird.wa.gov.au**
P: (08) 9368 3262

DPIRD team up with collaborators to unlock the long-term profitability of soil amelioration practices

DPIRD Principal Research Scientist, Dr Stephen Davies

Project name

Prolonging profitability and longevity following soil amelioration
Grains Research and Development Corporation (GRDC) Update Papers, 26 Feb 2024

Project code

DAW1901-006RTX

Addressing soil constraints

The Department of Primary Industries and Regional Development (DPIRD) Principal Research Scientist, Dr Stephen Davies, co-authored a research paper alongside Peter Newman, Rob Sands, Ben Curtis, Kelly Ryan and Hilary Bunny, with the findings presented at the 2024 the Grains Research and Development Corporation (GRDC) Research Updates.

This research highlighted GRDC-supported soil amelioration work in Western Australia (WA) reporting increases in productivity over the past 15 years.

The study focused on the main soil constraints of water repellence, soil acidity at depth (20–50cm) and soil compaction at depth (20–60cm).

Leading growers in WA have adopted the “lime, flip, and rip” approach with great success. Lime, often sourced as coastal limesand or alternative on-farm lime, is applied to reduce soil acidity.

Soil inversion, using tools like rotary spaders, mouldboard ploughs, or modified discs, mixes the soil to improve water infiltration and incorporate lime.

Over the past 15 years, growers have adopted deep rippers that can rip to 500mm or deeper to correct compaction created by the ever-increasing weight of modern farm machinery.

Current research has shown increased production, however its impact on overall farm profitability has been less clear.

Research method

Researchers identified growers with long-term records of soil amelioration and compared their data to that of farmers in similar rainfall regions who did not use these practices.

All data was presented on a per-hectare basis, and all data different regions was combined to provide an overall view of the financial impact of soil amelioration.

The key financial metrics compared between businesses included:

- Estimated plant available water.
- Average crop yields of major crops (wheat, barley, canola)
- Water use efficiency
- Operating profit
- Operating profit per millimetre of effective rainfall
- Total operating costs per hectare
- Total machinery value per hectare
- Total plant ownership, maintenance, and labour (TPML) costs
- Return on assets managed (ROAM).

Profitability

The average farm size and crop area for WA farms in 2022 were used to demonstrate whole farm profitability.

The scale of farms differed between the amelioration group and the standard group, with the former generally being larger.

Despite receiving less rainfall on average, the amelioration group had higher crop yields and used water more efficiently.

Over 10 years, the amelioration group had an annual operating profit of $292 per hectare compared to $192 per hectare for the standard group.

This difference in profit resulted in an average increase of $3.76 million in extra profit over 10 years for an average crop area of 3765 hectares.

Operating costs were $59 per hectare higher for the amelioration group, partly due to the costs associated with higher yields.
Machinery investment was similar between the two groups, with total machinery value increasing significantly over 10 years.

Total plant ownership, maintenance, and labour costs were slightly lower for the amelioration group as a percentage of income.

The amelioration group had a higher return on assets managed (ROAM), indicating better overall financial performance.

Immediate yield and soil benefits

Farmers who used soil improvement methods like adding lime, mixing, or inverting the soil, and deep ripping achieved higher yields and profits, even with less rainfall.

While skilled farming practices also contributed, soil amelioration played a significant role. Current soil amelioration methods first started being adopted by growers around 2009, and many farmers saw immediate benefits.

The last 3-years of the study showed the highest profits and yields, indicating ongoing improvements.

Dr Stephen Davies said the study confirms soil amelioration practices are profitable when conducted correctly and soil constraints are well understood.

Funding partners / project collaborators

Grains Research and Development Corporation (GRDC)
Planfarm
Farmanco

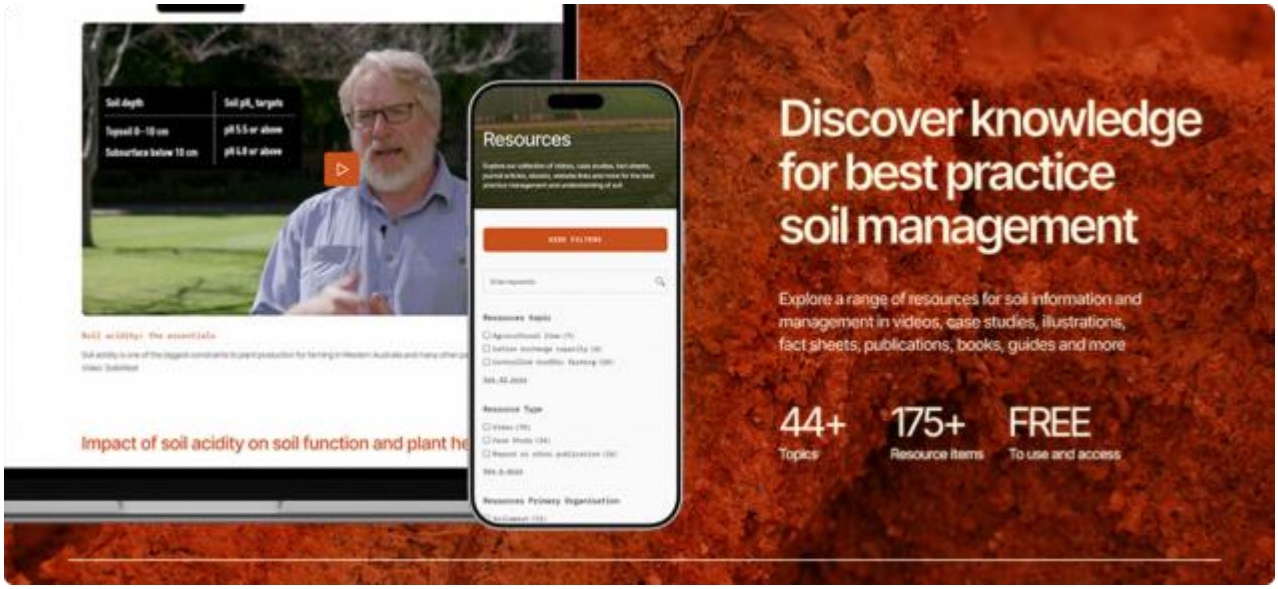
More information

Click here to read the GRDC webpage **Soil amelioration increases profit by $100/ha per year over 10 years**

Contact

Dr Stephen Davies
DPIRD Senior Principal Research Scientist
E: **Stephen.Davies@dpird.wa.gov.au**
P: (08) 9956 8515

Soil science resource website launched



Up-to-Date Research Insights

A new website aimed at supporting farmers, researchers, advisors, and students in understanding soil science and management is now live.

This innovative platform seeks to enhance knowledge and application of soil science, crucial for sustainable agriculture and environmental stewardship.

The resource, called the Soil Quality Knowledge Base, was developed by SoilsWest with support from Murdoch University and the Department of Primary Industries and Regional Development (DPIRD).

This collaborative effort underscores the importance of soil health and its impact on agricultural productivity and environmental sustainability.

The website contains comprehensive sections of soil information, illustrated through a variety of engaging formats such as videos, case studies, publications, illustrations, fact sheets, and other resources.

These diverse materials are designed to cater to different learning preferences, ensuring accessibility and understanding for a wide audience.

SoilsWest plans to keep updating the website with more information and insights from ongoing research.

This commitment to continuous improvement means that users will always have access to the latest findings and recommendations in soil science.

Curated learning experience

Visitors to the website can easily filter the library of resources, accessing a range of evidence-based sources tailored to their specific needs.

This feature allows for a curated learning experience, making it easier for users to find relevant information quickly.

There are three main areas to explore on the website:

- Soil attributes (separated into biological, chemical, and physical properties)
- Soil management
- Soil analysis and testing

More specifically, soil attributes focus on different topics within soil biology, physics, or chemistry.

Detailed pages within these topics present an overview of the current state of knowledge, explaining the principles and properties of different soil attributes.

They also highlight insights from research and resources like case studies, providing a rich context for understanding complex concepts.

The soil management section contains practical advice and guidelines to improve soil management practices.

This information discusses how soil management integrates into different farming systems and considers various options available to improve soil quality.

By applying these guidelines, farmers and advisors can make informed decisions that enhance soil health and agricultural productivity.

Finally, the soil analysis and testing pages contain comprehensive information on how soil attributes and properties are measured and tested.

This section provides valuable guidance on how to analyse and interpret soil test results, set up effective soil sampling and monitoring programs, and utilise this data to make informed management decisions.

This practical approach ensures users can apply scientific principles to real-world situations, enhancing the effectiveness of their soil management practices.

Funding partners / project collaborators

Grains Research and Development Corporation (GRDC)
Murdoch University
SoilsWest
South-West WA Drought Resilience Adoption and Innovation Hub Regional Soil Coordinator project

More information

Click here to visit the website

Contact

Chris Gazey
Manager Soil Science and Crop Nutrition
E: **Chris.Gazey@dpird.wa.gov.au**
P: (08) 9368 349

Meet the entomology team

Costly pest and weed control

Insects, pests, and weeds cost Western Australian grain growers more than $1 billion each year due to reduced yields, product downgrades, and control costs.

Many growers spend about $70 per hectare or a fifth of their entire input costs on insecticides, pesticides, and herbicides each season.

Chemical control is the second largest on-farm expense after fertiliser.

The Department of Primary Industries and Regional Development's (DPIRD) grains entomology team is focused on reducing chemical usage on farms and identifying non-chemical control methods for integrated pest management systems.

The key researchers in pest management

Senior Research Scientist Dustin (Dusty) Severtson leads the team in monitoring key pests such as native budworm, and diamondback moth using both traditional and automated traps.

Dusty has worked on various entomology projects over the years, including the PestFacts WA service for insect identification and communications, trapping native budworm and

diamondback moth, and exploring new crop scouting methods using remotely piloted aircraft systems (RPAS).

Dusty also developed the CropScout app, which aids crop inspectors in applying insect spray thresholds in the field and recording and mapping results.

Another key researcher in the team is Svetlana Micic, who leads broadacre pest management R&D projects statewide.

She participates in several national collaborative projects, including coordinating surveillance for the Australian plague locust to predict areas at risk of spring hatchings.

In high rainfall areas, she investigates conical snails, which can lead to grain downgrades due to contamination.

By understanding snail survival and reproduction, Svetlana develops practical management options for growers and promotes integrating pest management into farming systems rather than treating it as an additional activity.

Christiaan Valentine focuses on developing innovative insect and disease traps. Smart traps are being installed in the grainbelt as part of a project to develop remote surveillance technology for better pest and disease management across large farming properties.

These traps use sensors and cameras to transmit live data on pest populations to a server or website.

Christiaan, along with Jean Galloway, is also developing and testing automated spore collection units to quickly diagnose and manage various fungal diseases in grain crops. These traps collect airborne fungal spores on sticky microscope slides.

Amber Balfour-Cunningham, a research scientist with 6-years of experience in the Western Australian grains and horticulture industry, focuses on insect pest monitoring and management strategies.

She is currently completing a PhD at UWA on the impacts and monitoring techniques for natural enemies of key invertebrate pests of Australian grain crops.

Bec Severtson works part time supporting research projects and communications in the PestFacts WA team, providing growers with pest information during the season.

She is dedicated to finding out as much as possible about the Dongara weevil, which is attacking canola in the mid-west.

Andrew Phillips joined the team in 2023 and is currently working on the Dongara weevil project funded by the GRDC.

Prior to that, he worked on his PhD at Murdoch University on the chemical ecology of natural enemies of the green peach aphid.

Completing the team are technical officers (TO's) Rachel Golledge, Surya Dhakal, and Danae Warden.

Rachel Golledge started with the former Department of Agriculture and Food Western Australia (DAFWA) as a Technical Officer trainee, working in horticulture, and is now a Technical Officer with the Entomology team, assisting Senior Research scientist Svetlana Micic.

Surya Dhakal, assists Senior Research scientist Ciara Beard in research activities.

Prior to this, as a Field Surveillance Officer, he inspected plants and trees for the polyphagous shot hole borer, set up traps to monitor it and took samples.

Danae Warden assists Research scientist Christiaan Valentine in research activities.

Contact

Dusty Severtson
DPIRD senior research scientist
E: **Dustin.Severtson@dpird.wa.gov.au**
P: (08) 9690 2160

Svetlana Micic
DPIRD research scientist
E: **Svetlana.Micic@dpird.wa.gov.au**
P: (08) 9892 8591

NFACR investment to boost AEGIC's China barley engagement

New investment from the Australian Government through the National Foundation for Australia-China Relations (NFACR) will allow AEGIC to continue building relationships in China to support the enhanced use of Australian barley by the Chinese malting and brewing industries.

On behalf of the Australian barley industry, AEGIC supports Chinese customers by providing technical information and support to help them optimise the value of Australian barley.

With NFACR investment, AEGIC will coordinate Australian barley industry seminars in China, host a 10-day industry delegation from China to showcase the Australian barley supply chain, and deliver market briefings to Australian growers aimed at building China literacy and capability, among other activities.

AEGIC will collaborate with Grains Australia and other industry participants, including breeding companies, brewers, maltsters, growers and educational institutions to deliver the project, which will support and further deepen the relationships between the Australian and Chinese barley industries for long-term mutual benefit.

AEGIC Executive General Manager Courtney Draper said China is a significant market for Australian barley exports.

"Chinese customers prefer Australian barley because of its excellent quality and performance for malting, beer brewing, distilling and animal feed," she said.

"Having access to timely technical information from the Australian barley industry is highly appreciated by Chinese customers and increases the likelihood they will choose grain from Australia."

While tariffs affecting barley exports to China were in place, AEGIC continued to engage with Chinese maltsters and brewers and provide information on new varieties, accreditation developments and industry updates to help maintain relationships and help pave the way for Australian barley to smoothly re-enter the market.

When tariffs were removed in August 2023, trade immediately resumed, and by the end of 2023, Australia exported nearly 3 million tonnes of barley worth $1.2 billion to China. AEGIC is an initiative of the Western Australian State Government and Grains Australia.

About AEGIC

The Australian Export Grains Innovation Centre (AEGIC) is an independent organisation that helps position Australian grain as the preferred choice in international markets.

AEGIC does this by:

Understanding the needs of grain customers.

Identifying and supporting grain market opportunities.

Educating customers on the benefits of Australian grain.

Innovating to develop new solutions and high-value uses.

This helps the Australian grains industry breed, classify, grow and supply grain that markets prefer.

AEGIC's primary beneficiaries are Australian grain growers, and the impact of AEGIC's work spans the whole grains supply chain: from the grower in Australia, whose grain is valued internationally, to the consumer who enjoys excellent noodles, baked products and beer made from Australian grain.
