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**AUSTRALIAN GRAINS PEST INNOVATION PROGRAM**

**SEED FUNDING SCHEME GUIDELINES**

# ABOUT THE AUSTRALIAN GRAINS PEST INNOVATION PROGRAM

The Australian Grains Pest Innovation Program (AGPIP) is a research collaboration between the Grains Research and Development Corporation (GRDC) and The University of Melbourne’s (UoM) School of Biosciences - Pest and Environmental Adaptation Research Group (PEARG). The GRDC has a key investment target to develop and implement management options to minimise the cost of effectively and sustainably managing invertebrate pests in Australian grain crops. The AGPIP aims to use novel pest suppressive technologies such as endosymbionts and forecasting approaches for the management of invertebrate pests, to provide innovative solutions, insecticide resistance management and grower tools to reduce the impact of pests, decrease disease transmission, and increase farmer/grower certainty on pest management.

The Program includes seed funding opportunities for research teams specifically outside of the AGPIP to harness cross-UoM capabilities to open up new approaches to managing pests in the grains industry. This call focuses on these seed funds which are administered through an INVERTEBRATE MANAGEMENT RESEARCH SEED FUNDING SCHEME (referred to as the SCHEME in this document).

# ABOUT THE INVERTEBRATE MANAGEMENT RESEARCH SEED FUNDING SCHEME

The SCHEME is available to engage researchers and research groups from across the UoM in an exploration of non-traditional or less traditional approaches that might tackle previously intractable pest management issues currently facing Australian grain growers. This year, the nominated constraining issues are outlined in the Appendix, and are summarised as:

* Detection of soil-borne pests
* At-scale, economic pest detection/monitoring such as using novel optical imagery or robotics
* Prediction of pest/viral disease outbreaks
* Technologies to facilitate and enhance invertebrate (pest) identification

The SCHEME focuses on solutions to these constraints to help initiate step-changes in the grains industry. The SCHEME encourages novelty compared to more traditional ‘entomological’ approaches, with solutions aiming to reduce farmer input costs and reduce the industry’s reliance on a small group of broad-spectrum insecticides. In doing so, new ideas, knowledge, research collaboration, funding opportunities and impact can be created.

# THE SEED FUNDING SCHEME

On an annual basis, the AGPIP leadership team, in consultation with the GRDC Manager, Pests (Crop Protection), will identify the intractable or constraining issues, advertise these within the UoM community and complete an evaluation process of submissions to select the successful proposals.

Individuals or multidisciplinary teams are encouraged to propose a 10-12 month project that establishes the proof-of-concept of a potential solution to a constraint. Example project methodologies for establishing the proof-of-concept are pilot laboratory studies, field experimentation or desktop modelling.

As part of the contractual agreement between the UoM and GRDC, at least one or two projects per year (up to $50,000 excluding GST) will be funded. A Final Report on the project is required by 30 June of the following year.

# THE SELECTION PROCESS

In March each year, AGPIP will advertise the SCHEME across the University, along with a current list of industry constraints and of the nature of the outcome(s) sought. The opportunity will be advertised through the UoM’s RIC Research Professional Bulletin, through the Faculty Deans’ circulars and with assistance of the UoM’s Business Development Office.

The proposals must describe a proof-of-concept solution and commensurate project methodologies that are:

* at least in part novel or innovative (not part of current practice) and scientifically plausible,
* offering a step-improvement (not incremental) in addressing the constraint,
* potentially amenable to be developed to a field-ready solution through a future additional RDE investment,
* being offered by a credible UoM researcher or team.

# RELATIONSHIP WITH OTHER FUNDING SCHEMES

Applications which request funds to supplement another current internal University grant, external grant or research contract will *not* be excluded from consideration. It is the responsibility of the applicants to ensure funding rules of the supplemented projects are followed.

# ELIGIBILITY

Applications are expected to be developed by a proposing team, and each application must nominate a Chief Investigator (CI) (20% fte).

The CI must hold a salaried academic appointment at the UoM for the duration of the project. If the CI leaves the employment of the University, this responsibility will be transferred to another member of the team. Applications from early- and mid- career researchers are particularly encouraged.

AGPIP team members will not be eligible to apply. There are no other restrictions on other members of the proposed project team, including external and international team members.

A simple signoff process will be used. It will be assumed that in submitting an application, all project team members have consulted appropriately with their Heads and Deans and have the time and basic infrastructure resources to pursue the project concerned within the context of existing research, teaching and higher degree supervision responsibilities.

There are no limits to the number of proposals made.

# FUNDING RULES

All requests for funding are to be made through the [official application form](https://research.unimelb.edu.au/__data/assets/word_doc/0006/3315750/AGPIP-Seed-Funding-Application.docx) and associated process. Projects should be costed in line with University policy and are subject to final approval by the Scheme Coordinator within AGPIP, Dr Garry McDonald.

Funds may be used for:

* Research assistance and technical support;
* Consumables for laboratory work;
* Purchase of materials and specialised software.

Funds may NOT be used for:

* Salary top-ups to existing UoM staff for additional workload;
* The extension of contracts for UoM contract staff;
* Extensive overseas travel by UoM staff;
* Retainer fees for consultants;
* Teaching relief;
* Conference attendance;
* Non-research activities.

# PAYMENT SCHEDULES

The payment schedule will be agreed between the CI and the AGPIP Administrative office prior to the commencement of the project. The final payment (25%) will be made after an acceptable Final Report is delivered by the due date.

# APPLICATION PROCESS

Individuals or teams wishing to apply for the SCHEME should use [this official application form](https://research.unimelb.edu.au/__data/assets/word_doc/0006/3315750/AGPIP-Seed-Funding-Application.docx) and submit via email to the AGPIP Administrative Convener (pearg-queries@unimelb.edu.au) by the due date. Other processes and expectations on receiving internal UoM grants are spelt out [here](https://research.unimelb.edu.au/support/funding/internal/manage-your-grant).

Applications must include supporting documentation including CVs of the CI and other team members. CVs should provide a statement of no more than two pages in total including (a) current position, (b) expertise relevant to the proposed role in the current proposal, including track record of prior collaboration, and (c) a representative list of grants and/or publications in areas relevant to the proposal.

The proposal should also identify one acceptable mid-project milestone to be completed by 1 December 2021.

The application should be limited to 5 pages and be prepared in sufficiently plain language to be assessed by panel members outside your discipline. Once completed, applicants must convert the application form to PDF (maximum 5 pages) and add CV attachments as additional PDF pages.

Applications close 5pm AEDT, Friday 30 April 2021. Late applications will not be accepted.

# ASSESSMENT CRITERIA

Applications will be shortlisted by the AGPIP leadership team according to the following criteria. The shortlisted applications will then be submitted to external referees for evaluation using the same criteria.

# Project Quality (50%)

* 1. Is it clear how the project addresses one of the nominated industry constraints?
	2. Does the proposal describe a proof-of-concept solution and commensurate project methodologies that are:
* at least in part novel or innovative (not part of current practice) and scientifically plausible, and
* offer a step-improvement (not incremental) in addressing the constraint?
	1. Does the proposal demonstrate innovation in at least one of the following areas: methodology and design; area of focus; conceptual approach and analysis; potential impact and engagement?
	2. What are the intended short- and long-term impacts of the project? Is the proposal likely to generate new research activities?
	3. Are the project outcomes potentially amenable to be developed to a field-ready solution through a future additional RDE investment?
	4. Does the application adhere to word and space limits as outlined in the application form?

# Feasibility and Outcomes (30%)

* 1. Is the proposed project budget aligned with the claimed outcomes?
	2. Has the project identified and engaged with key target audiences for the project outcomes?

# Suitability of the project team (20%)

* 1. Does the proposal involve a team of academic staff with appropriate and complementary expertise for the proposed project?

# KEY DATES

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| --- | --- |
| Call for Applications | Fri 12 March 2021 |
| Applications close | 5pm AEDT Fri 30 April 2021 |
| Successful projects announced | Wed 2 June 2021 |
| Projects contracted and commence | Thu 1 July 2021 |
| Report briefly on project progress by  | 1 December 2021 |
| Final project report due no later than | 30 June 2022 |
| Present the findings to the AGPIP Leadership Team | 13 July 2022 |

# CONDITIONS OF THE SCHEME

1. Scheme offers must be accepted in writing by the CI and their Head of Department/School.
2. Successful applicants must provide appropriate acknowledgement of AGPIP, GRDC and the UoM when communicating project outcomes.
3. The Chief Investigator –
	1. Will be the **contact person** for all administrative matters to do with the project and is responsible for internal reporting requirements.
	2. Will be required at the commencement of the project to register **Background and/or Third-Party Intellectual Property** (IP) that may be called on during the project.
	3. Must ensure that the research is conducted in accordance with **University policy**, including compliance with the Code of Conduct for Research and policies on human research ethics, animal experimentation ethics, requirements of the Office of Gene Technology Regulator, health and safety and intellectual property. No project may proceed unless the appropriate ethical or other required clearances have been obtained.
	4. Must comply with any **instructions or conditions in the Offer** relating to approved items of expenditure. This includes entering into a Collaboration Agreement with external parties involved in the project.
	5. Must declare any **conflict of interest**, any risk of a conflict of interest and any apparent conflict of interest arising through a party engaging in any activity, participating in any association, holding any membership or obtaining any interest that is likely to conflict with or restrict that party participating in the Project.
	6. Is responsible for ensuring that the **expenditure of the funds** is broadly in accord with the budget presented in the application and is consistent at all times with the nature and aims of the specific project approved and the objectives of the Scheme.
	7. Will be required to provide **reports and presentations** on the progress and outcomes of the project at the times and in the form requested by AGPIP, with a formal final report (below) required by the project completion end date. Summaries of project findings and project final reports may be published.
	8. Will be required to submit a **final report** that describes the proof-of-concept, the lessons learnt, and how the solution could be further developed to achieve field-ready application. The completed report should be signed off by the appropriate head of department, and a copy made available to collaborators.
4. The AGPIP –
	1. will arrange project kick-off meetings, a mid-term review and an end of project review with the CI. Other members of the team who wish to attend are most welcome, and
	2. will report project findings to GRDC for promotional purposes, including publications on their website and in other communication methods.
5. Final 25% payment of the grant will only be made if the Final Report is delivered in full by the due date.

# PROJECT OUTPUTS

The rules and conditions relating to Background IP, Third Party IP, Project Outputs and Commercialisation are detailed in Section 9 of the two party Research Agreement for the AGPIP between the GRDC and the UoM (see generic [GRDC Standard Two Party Research Agreement 2019](https://protect-au.mimecast.com/s/0vnQC3Q8MvCppGzY6hg521w?domain=grdc.com.au)). In summary:

* Background and Third Party IP needs to be specified and approved at the beginning of the project.
* Project outputs (including student IP created through the project) will be owned jointly by the GRDC and the UoM. Commercialisation is encouraged, but only as a secondary consideration to that of producing a benefit to the Australian grains industry.

# KEY CONTACTS

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| --- | --- |
| Scheme coordinator: | Dr Garry McDonald (gmcd@unimelb.edu.au) |
| Scheme administration | Mr Nicholas Bell (belln@unimelb.edu.au) |

**Appendix 1:**

INVERTEBRATE MANAGEMENT RESEARCH SEED FUNDING SCHEME

**RDE constraints in invertebrate pest management - 2021**

Four intractable/constraining issues in sustainable and [integrated pest management](https://ipmguidelinesforgrains.com.au/) (IPM) that require an RDE intervention are listed below. Embedded hyperlinks and references provide more context.

1. **Detection of soil-borne pests**

Some insect pests, particularly an array of beetle and caterpillar pests, spend at least part of their lifecycle in the soil where they feed at or below the soil surface. These insect pests feed on emerging seed, germinating plant roots or new shoots and leaves; this damage can seriously constrain or kill the plant and can cause extensive crop loss.

Typical pest species in this group are the beetle pests: wireworms and false wireworms (Families Elateridae and Tenebrionidae e.g., [*Pterohelaeus alternatus*](http://cesaraustralia.com/sustainable-agriculture/pestnotes/insect/Eastern-false-wireworm)); numerous weevils (Family Curculionidae, e.g., [*Steriphus diversipes*](http://cesaraustralia.com/sustainable-agriculture/pestnotes/insect/Spotted-vegetable-weevil)*);* the scarabs/cockchafers(Family Scarabaeidae e.g*.,* [*Adoryphorus coulonii*](https://cesaraustralia.com/pestnotes/beetles/redheaded-pasture-cockchafer/)). There are also a few caterpillar pests that occur in similar circumstances such as the cutworms (Family Noctuidae e.g., [*Agrotis* spp](http://cesaraustralia.com/sustainable-agriculture/pestnotes/insect/Cutworm).) and the pasture tunnel moth (Family Oecophoridae, [*Philobota productella*](http://cesaraustralia.com/sustainable-agriculture/pestnotes/insect/Pasture-tunnel-moth)*)*. These caterpillars live in the soil profile, but feed on the surface at night.

Detecting and counting these pests, and monitoring the size and distribution of their populations, are vital steps that inform decisions on the need for interventions to reduce crop loss. It is difficult and laborious to manually detect and count these pests and for this reason, farmers often resort to the prophylactic use of in-soil (in-furrow) applications of chemicals.

The population size of these soil-borne pests often varies greatly from year to year. Depending on the species, eggs might be laid in the soil in the previous spring, late summer or autumn. After hatching, the small larvae may initially feed on organic matter in the top few centimetres of soil and will switch to seed or root feeding when seeds germinate.

There are basic techniques currently available for [detecting these pests](https://ipmguidelinesforgrains.com.au/pests/soil-insects/#monitor). Direct sampling relies on the use of a spade to dig through the soil, allowing the soil to be visually scanned and insects counted. Alternatively, baits comprising small bags of moistened seed can be placed in the soil; the germinating seed attracts the pest insects which are then counted after several days.

**Outcome sought.** A technology or technique that provides a more efficient, reliable and sustainable approach for detecting and measuring the distribution of these soil pests in a paddock, and thereby reducing the need or use of prophylactic insecticides.

1. **At-scale, economic pest detection/monitoring such as using novel optical imagery or robotics**

In the grains industry, crops are generally assessed for pests using [manual techniques and tools](https://ipmguidelinesforgrains.com.au/ipm-information/making-informed-control-decisions/monitoring/monitoring-tools-and-techniques/) such as sweep netting, beat sheets and visual counts. Monitoring is often superficial because of large paddock sizes, the length of time required to detect and monitor the size of pest populations, high labour costs, and high availability of cheap, broad-spectrum chemistries and uncertainty in pest identification.

This type of surveillance often does not provide estimates of pest (and [beneficial/natural enemy](https://ipmguidelinesforgrains.com.au/ipm-information/biological-control/)) populations for effective [integrated pest management](https://ipmguidelinesforgrains.com.au/ipm-information/making-informed-control-decisions/) (IPM) decisions, which require standardized and objective measures. How can we increase the scalability, cost-effectiveness, and standardisation of current invertebrate monitoring techniques, without resorting to labour intensive methods? There are promising technologies that may improve the efficiency of crop monitoring, thereby enhancing the prospects for more sustainable approaches to pest management. See review of Al Kindi et al. (2017) and examples of [gas detection sensors](https://www.farmmanagement.pro/farming-revolution-the-use-of-sensors-in-crop-pest-detection/) and multispectral remote sensing (Bhattarai et al. 2019).

In monitoring invertebrates, many groups of pests and [beneficial insects](https://grdc.com.au/__data/assets/pdf_file/0017/210815/beneficial-insects-southernwestern-regions-the-back-pocket-guide-grdc526.pdf.pdf) need to be considered, to allow farmers to weigh up the need for pest control under an IPM framework. The largest groups are:

* soil-borne pests (as above),
* soil surface pests (such as [earth mites](https://grdc.com.au/__data/assets/pdf_file/0029/209198/grdc-bpg-cropmites.pdf), [slugs](http://cesaraustralia.com/sustainable-agriculture/pestnotes/insect/grey-field-slug), [earwigs, millipedes, slaters](https://cesaraustralia.com/pestfacts/challenges-with-earwigs-millipedes-and-slaters-in-broadacre-crops/)) that attack plant seedlings,
* pests attacking the vegetative foliage (e.g., aphids such as the [green peach aphid](http://www.cesaraustralia.com/sustainable-agriculture/pestnotes/insect/Green-peach-aphid), caterpillars such as the [armyworm](http://www.cesaraustralia.com/sustainable-agriculture/pestnotes/insect/Armyworm), beetles such as the [sitona weevil](http://www.cesaraustralia.com/sustainable-agriculture/pestnotes/insect/sitona-weevil)),
* pests attacking the flowering and seeding plant parts (such as [Rutherglen bug](http://www.cesaraustralia.com/sustainable-agriculture/pestnotes/insect/Rutherglen-bug), [diamondback moth](http://www.cesaraustralia.com/sustainable-agriculture/pestnotes/insect/Diamondback-moth), and [native budworm](http://www.cesaraustralia.com/sustainable-agriculture/pestnotes/insect/Native-budworm)).

A good pest management system should identify potential problems in the paddock before economic damage is imposed. The technology should assist growers and their advisers to achieve early detection and make decisions about treatments, to reduce their workload involved in monitoring, and to reduce the need for prophylactic use of insecticides.

**Outcome sought.** Proof of concept of a technology or approach that allows for at-scale, economic pest detection and monitoring of one of the groups or pests above.

1. **Prediction of pest/viral disease outbreaks**

Reliable spatial and/or temporal predictions of damaging pest occurrences (and/or outbreaks of viral diseases transmitted by pests) would be valuable for growers and the industry and reduce their reliance on prophylactic control measures. There are a few disparate examples of pest modelling designed to help manage outbreaks, but they are relatively rare and many are infrequently applied. It is anticipated that future practical models may use downscaled climatic data and related information in developing predictions.

Early warning systems to predict the outbreak of *Barley yellow dwarf* *virus* in wheat (Thackray *et al.* 2009) based on a sophisticated simulation model, and a system to detect [*Turnip yellows virus* (TuYV) in canola](https://www.agric.wa.gov.au/news/media-releases/grains-research-updates-2019-early-warning-system-help-protect-crops-canola), transmitted by green peach aphid and that makes use of Loop-mediated isothermal AMPlification (LAMP) technology, have been developed in WA. Some farming system level models have been developed in Australia that interface crop models with population modelling platforms to predict the impact of crop/ pest interactions (e.g., stripe rust impacts in wheat (Whish et al. 2015; Donatelli et al. 2017)). However, there are few models that predict outbreaks of invertebrate pests sufficiently accurately to allow growers to prepare for outbreaks prior to them occurring.

**Outcome sought.** Modelling approaches that make use of technologies at the frontier of knowledge (e.g., artificial intelligence, machine learning, advanced statistical techniques, biophysical approaches) to predict pest and associated virus outbreaks at a regional level. The models should have the capacity to predict outcomes that can be validated through monitoring across regions and seasons.

1. **Technologies to facilitate and enhance invertebrate (pest) identification**

Many invertebrates found on farm can be classed as either pests or beneficials (sometimes both); they vary widely in their impact on the cropping enterprise. Accurate and timely species identification is essential for grain growers that are keen to make the right judgment on pesticide use: whether to spray, when to spray and what to spray. That is, the importance of identifying pests and beneficial invertebrates is foundational to the success of IPM.

Traditional approaches to pest identification rely on some form of identification (or taxonomic) key, where certain morphological / physical attributes are used to distinguish the organism. This can be challenging at the best of times in the field because of factors such as small size, complexity around differences in appearance between life stages, and getting adequate magnification of detailed features e.g. hairs.The challenge becomes even more demanding with cryptic species, invertebrates that have low morphological, but considerable genetic, disparity. For example, many farmers and their agronomists recognise key pests or beneficials by their broad appearance, but this can be problematic with certain pest groups like [blue oat mite (*Penthaleus* spp.)](https://cesaraustralia.com/pestnotes/mites/blue-oat-mite/) or [false wireworm larvae (Tenebrionidae)](https://thebeatsheet.com.au/do-i-have-a-wireworm-true-or-false/) where the individual species may require different management responses. In addition, while the key pests that appear annually on farm may be easily recognised, many other pests and beneficials appear much less commonly, and are easily confused even by experienced operators. Most pest and beneficial invertebrates can be identified to either species or genera level using traditional taxonomic approaches.

**Outcome sought.** A proof-of-concept technology that allows for the timely and accurate, offline identification of pest and beneficial invertebrates that are likely to be encountered in Australian grain cropping systems.

**References**

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