



UK Crop Nutrient Management Partnership

Handbook

November 2024

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1 Introduction

This handbook is a reference document outlining the purpose, membership criteria and expectations for the Crop Nutrient Management Partnership, which is convened by the Agriculture and Horticulture Development Board (AHDB). It provides information on how the [AHDB Nutrient Management Guide \(RB209\)](#) is updated.

The two main sources of information on crop nutrient management in the UK are the AHDB Nutrient Management Guide (RB209) and SRUC's Technical Notes. Farmers, growers and agronomists use this information to plan crop nutrient management.

Farmers and FACTS (Fertiliser Advisers Certification and Training Scheme) Qualified Advisers (FQAs) rely on RB209 as an independent and trusted source of information on crop nutrient management. In 2023, 56% of farms in England had a nutrient management plan ([Defra Farm Practices Survey 2023](#)), 72% of which were produced either with professional advice or by a contractor. Over half of farms (57%) with a nutrient management plan use RB209 as the source of recommendations (Defra Farm Practices Survey 2023).

There are around 3,600 FQAs in the UK, and each holds a professional qualification on crop nutrient management and environmental protection. Importantly, each FQA is taught, examined and re-examined on the contents of the Nutrient Management Guide (RB209).

Since its first publication in 1973 as MAFF Reference Book 209, the guide was revised eight times before AHDB took over responsibility for producing RB209 from Defra in November 2014. The ninth edition of RB209 was published by AHDB in May 2017, seven years after the previous edition. From 2017 to 2023, annual updates to RB209 were published, following research led by AHDB.

The Crop Nutrient Management Partnership was established in 2014, when RB209 was transferred to AHDB. This followed a period from the summer of 2012 until autumn 2014, when AHDB worked with the Agricultural Industries Confederation (AIC) to build a partnership between UK government departments, industry stakeholders and other organisations committed to collaborate on crop nutrient management research and knowledge transfer. An overarching aim of this partnership is to increase the quality and uptake of nutrient management planning.

In 2023 AHDB stopped collecting levy from the horticulture and potatoes sectors, and a strategic review of RB209 was carried out in 2024. Part of that review was to renew the remit and membership of the Crop Nutrient Management Partnership. AHDB continues to convene the Crop Nutrient Management Partnership and publish the Nutrient Management Guide (RB209).

Revision of RB209 is based on soil and nutrient management. Coordination of new research is managed by AHDB in partnership with other organisations and government departments meeting biannually as a Steering Group and supporting Technical Working Groups.

2 Structure of the Crop Nutrient Management Partnership

AHDB is responsible for establishing and maintaining groups of partners who fund research and/or knowledge exchange (KE) on crop nutrient management.

The structure of the UK Crop Nutrient Management Partnership is shown in Figure 1.

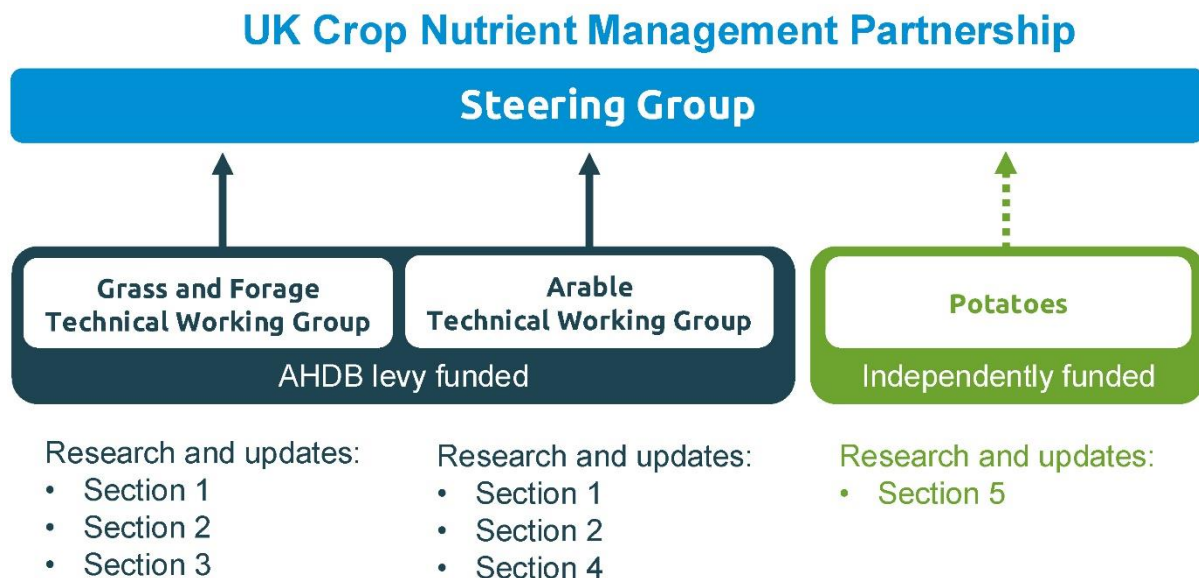


Figure 1. Structure of the UK Crop Nutrient Management Partnership

Technical Working Groups have responsibility for specific sections of RB209, with the AHDB-levy-funded groups also leading on Sections 1 and 2 of the guide. GB Potatoes convenes an industry group to lead on research and updates to RB209 Section 5 (Potatoes), with representation on the Steering Group (2024 onwards). Horticultural crop associations or other relevant organisations may liaise with the Steering Group as required for crop-specific nutrient management research and updates to RB209 Sections 6 and 7.

A key objective of the partnership is to oversee the updates to the AHDB Nutrient Management Guide (RB209). RB209 has a reputation as an independent and trusted source of information on crop nutrient management, and it is expected that partners, contractors and group members will uphold this reputation.

All members of the Steering Group and Technical Working Groups are expected to maintain an active involvement in the Crop Nutrient Management Partnership and participate fully in the meetings and decision-making processes. Other contributions may include sharing data, where appropriate, or providing other in-kind support for research or KE. AHDB reserves the right to remove members from the partnership where engagement is repeatedly lacking.

3 Steering Group

3.1 Purpose

The Steering Group is convened by AHDB and is chaired by an individual appointed by AHDB (independent farmer or consultant).

The Steering Group:

- Is responsible for encouraging collaboration and steering the development and uptake of crop nutrient management planning
- Supports the development, management and dissemination of the AHDB Nutrient Management Guide (RB209)
- Supports revisions of RB209 put forward by AHDB-levy-funded Technical Working Groups, ensuring the “Guidelines for crop nutrient management field trials” have been followed
- Liaises with independently funded groups (potatoes and horticultural crops) to support revisions to Sections 5, 6 and 7 of RB209
- Coordinates knowledge exchange and communications on crop nutrient management

Research and knowledge transfer may also inform development of SRUC Technical Notes.

3.2 Membership

Membership of the Steering Group is by invitation from AHDB as follows:

- AHDB – convenor
- FACTS
- Defra
- DAERA
- Scottish government
- Welsh government
- Environment Agency
- AICC
- AIC
- AFBI
- NFU
- NFU Cymru
- NFU Scotland
- Ulster Farmers Union
- PGRO
- BBRO
- MGA
- Potatoes sector representative
- Independent farmer/farm manager (x3; cross-sector representation)

The Chairs of the Technical Working Groups will also be invited to the Steering Group meetings. Representatives from other organisations may be invited to meetings at the discretion of the Steering Group Chair.

Appointment of Steering Group Chair

- AHDB will appoint a Chair for the Steering Group for a fixed three-year term
- The Chair will ideally be an independent farmer, farm manager or consultant with good working knowledge of RB209 and an interest in crop nutrition research.
- Existing members of the Steering Group may be selected for the Chair role, and a previous Chair may retain their membership of the Steering Group once their term has finished

- No more than two consecutive terms should be served as Chair of the group; this may be reviewed at the discretion of AHDB
- It is the Chair's responsibility to ensure that members of the group participate fully. The Chair reserves the right to request another representative from member organisations if individuals repeatedly fail to attend meetings or contribute as expected

Remuneration

- AHDB will fund the time and expenses of the Chair of the Steering Group, as well as expenses of any independent farmer members, in line with the AHDB expenses policy. Should independent farmer members repeatedly fail to attend meetings or contribute as expected, AHDB reserves the right to withhold the payment of expenses
- Other participants of the Steering Group provide their time in kind and fund their own travel expenses

3.3 Meetings

- Meetings will be convened and hosted by AHDB either at the AHDB main office, online or in person at another venue where required
- Steering Group meetings are held biannually in April and November; the frequency of these meetings will be reviewed as necessary
- Decisions and actions will be recorded at each Steering Group meeting

Substitutes

- If a participant is unable to attend a Steering Group meeting, it is preferable to arrange a substitute and inform the convenor
- Substitutes should have some knowledge of RB209 and/or SRUC Technical Notes

4 Technical Working Groups

4.1 Purpose

Technical Working Groups are responsible for relevant discrete sections of the Nutrient Management Guide (RB209). Responsibility for Section 1 (Principles of Crop Nutrient Management) and Section 2 (Organic Materials) is shared by the AHDB-levy-funded Technical Working Groups.

Each Technical Working Group is responsible for:

- Identifying and prioritising knowledge gaps for respective crops
- Agreeing and deciding the scope of new research calls. For AHDB-levy-funded sections of RB209, decisions on new research calls will be in line with the AHDB research commissioning processes and the priorities identified in the AHDB Crop nutrition research and knowledge transfer plan
- Identifying sources of public and/or private sector funding, including in-kind contributions from industry
- Appointing an appropriate organisation to publish a call for research and manage the resulting project(s)
- Ensuring research data and evidence proposed to update RB209 is collected in an independent and robust way, following the “Guidelines for crop nutrient management field trials”
- Making recommendations to the Steering Group for revisions of relevant sections of the Nutrient Management Guide (RB209)
- Developing knowledge transfer strategies for respective crops/sectors

4.2 Technical Working Group decision making

Before the Technical Working Group makes a decision on revision of the Nutrient Management Guide (RB209), the research team should draw firm conclusions.

- The existing position should be clearly explained
- Conclusions should state whether to revise RB209 or not
- It should be clear what the revision(s) will require
 - Changes to existing text and/or tables
 - Addition of new material
- New text and/or tables should be set out
- All associations should be considered and discussed

Once conclusions are agreed, the researcher should present them to the appropriate Technical Working Group. The Technical Working Group should discuss the conclusion and may:

- Support the conclusions and make an appropriate recommendation to the Steering Group
- Request further information
- Not support the conclusions and make an appropriate recommendation to the Steering Group – in which case the grounds must be clearly described

If, at any stage, consensus cannot be achieved by an individual Technical Working Group, or if Steering Group support is not granted, special resolution meetings will be held. These will be hosted by AHDB and attended by the relevant parties.

4.3 Arable Technical Working Group

The Arable Technical Working Group is responsible for Section 1, Section 2 and Section 4 of RB209, covering the principles of nutrient management and fertiliser use, organic materials and crops, including cereals, oilseeds, peas, beans, sugar beet, and biomass/energy crops.

4.3.1 Membership

The Arable Technical Working Group is convened by AHDB and chaired by an individual appointed by AHDB (independent farmer or consultant).

Membership of the Arable Technical Working Group is by invitation from AHDB as follows (individual representatives from member organisations must have appropriate crop nutrition expertise):

- AHDB – convenor
- FACTS
- Independent farmer/farm manager (x3)
- Independent agronomist/consultant (x3)
- Agronomy company (x3)*
- Analytical laboratory*
- SAC consulting (Scottish Technical notes)
- Catchment Sensitive Farming
- Potash Development Association
- PGRO
- BBRO
- Bio Capital Ltd. (AD)*
- Fertiliser manufacturers (x3)*

** Commercial organisations represented on the Arable Technical Working Group may be members on a rotational basis, for a fixed three-year term. This may be reviewed at the discretion of AHDB.*

Representatives from other organisations may be invited to meetings at the discretion of the Chair.

Appointment of Technical Working Group Chair

- AHDB will appoint a Chair for the Arable Technical Working Group for a fixed three-year term
- The Chair will ideally be an independent farmer or consultant, with technical knowledge of RB209 and arable crop nutrition research
- Existing members of the Arable Technical Working Group may be selected for the Chair role, and a previous Chair may retain their membership of the Technical Working Group once their term has finished
- No more than two consecutive terms should be served as Chair of the group; this may be reviewed at the discretion of AHDB
- It is the Chair's responsibility to ensure that members of the group participate fully. The Chair reserves the right to request another representative from member organisations if individuals repeatedly fail to attend meetings or contribute as expected

Remuneration

- AHDB will fund the time and expenses of the Chair of the Arable Technical Working Group, as well as expenses of any independent farmer members of these groups, in line with the AHDB expenses policy. Should independent farmer members repeatedly fail to attend meetings or contribute as expected, AHDB reserves the right to withhold the payment of expenses
- Other participants of the Arable Technical Working Group provide their time in kind and fund their own travel expenses

4.3.2 Meetings

- Meetings of the Arable Technical Working Group will be convened and hosted by AHDB either at the AHDB main office, online, or in person at another venue where required
- Arable Technical Working Group meetings are held biannually in February and September; the frequency of these meetings will be reviewed as necessary
- Decisions and actions will be recorded at each Technical Working Group meeting

Substitutes

- If a participant is unable to attend a Technical Working Group meeting, it is preferable to arrange a substitute and inform the relevant convenor
- Substitutes should have some knowledge of RB209 and/or SRUC Technical Notes and the particular technical expertise if attending a Technical Working Group

4.4 Grass and Forage Technical Working Group

The Grass and Forage Technical Working Group is responsible for Section 1, Section 2 and Section 3 of RB209, covering the principles of nutrient management and fertiliser use, organic materials, grass and forage crops.

4.4.1 Membership

The Grass and Forage Technical Working Group is convened by AHDB and chaired by an individual appointed by AHDB (independent farmer or consultant).

Membership of the Grass and Forage Technical Working Group is by invitation from AHDB as follows (individual representatives from member organisations must have appropriate crop nutrition expertise):

- AHDB – convenor
- FACTS
- Independent farmer/farm manager (x3)
- Independent agronomist/consultant (x3)
- Agronomy company (x2)*
- Feed company (x1)*
- SAC consulting (Scottish Technical notes)
- Analytical laboratory*
- Catchment Sensitive Farming
- Potash Development Association
- Fertiliser manufacturers (x3)*
- British Grassland Society
- Bio Capital Ltd.

* Commercial organisations represented on the Grass and Forage Technical Working Group may be members on a rotational basis, for a fixed three-year term. This may be reviewed at the discretion of AHDB.

Representatives from other organisations may be invited to meetings at the discretion of the Chair.

Appointment of Technical Working Group Chair

- AHDB will appoint a Chair for the Grass and Forage Technical Working Group for a fixed three-year term
- The Chair will ideally be an independent farmer or consultant, with technical knowledge of RB209 and grassland and forage crop nutrition research
- Existing members of the Grass and Forage Technical Working Group may be selected for the Chair role, and a previous Chair may retain their membership of the Technical Working Group once their term has finished
- No more than two consecutive terms should be served as Chair of the group; this may be reviewed at the discretion of AHDB
- It is the Chair's responsibility to ensure that members of the group participate fully. The Chair reserves the right to request another representative from member organisations if individuals repeatedly fail to attend meetings or contribute as expected

Remuneration

- AHDB will fund the time and expenses of the Chair of the Grass and Forage Technical Working Group, as well as expenses of any independent farmer members of these groups, in line with the AHDB expenses policy. Should independent farmer members repeatedly fail to attend meetings or contribute as expected, AHDB reserves the right to withhold the payment of expenses
- Other participants of the Grass and Forage Technical Working Group provide their time in kind and fund their own travel expenses

4.4.2 Meetings

- Meetings of the Grass and Forage Technical Working Group will be convened and hosted by AHDB either at the AHDB main office, online or in person at another venue where required
- Grass and Forage Technical Working Group meetings are held biannually in March and October; the frequency of these meetings will be reviewed as necessary
- Decisions and actions will be recorded at each Technical Working Group meeting

Substitutes

- If a participant is unable to attend a Technical Working Group meeting, it is preferable to arrange a substitute and inform the relevant convenor
- Substitutes should have some knowledge of RB209 and/or SRUC Technical Notes and the particular technical expertise if attending a Technical Working Group

4.5 Other Technical Working Groups

A representative from the membership organisation GB Potatoes liaises with the Crop Nutrient Management Partnership Steering Group for proposed updates to Section 5 of RB209. GB Potatoes separately convenes a wider stakeholder group that collaborates on a range of areas to support the potato industry, including potato crop nutrient management. New research and technical updates to Section 5 of the Nutrient Management Guide (RB209) will be led by this group. AHDB maintains the right for publication of Section 5 of RB209, with updates and publication costs to be agreed with the stakeholder group convened by GB Potatoes.

The horticultural sector does not have a unifying body for overseeing horticultural crop nutrient management research. Representative crop/grower associations and other organisations with an interest in horticultural crop nutrient research may liaise with the Steering Group for proposed updates to the technical content of Section 6 and Section 7 of RB209. AHDB maintains the right for publication of Sections 6 and 7 of RB209, with updates and publication costs to be agreed with appropriate groups.

Technical Working Groups covering horticultural crops and potatoes will be convened independently and meet as required. Expenses of Technical Working Groups covering horticultural crops and potatoes will be funded independently, at the discretion of the convenor(s) of those groups.

5 Confidentiality

Members of the Steering and Technical Working Groups must sign the attendance register and confidentiality agreement at the beginning of each meeting (Appendix 1). For online meetings, attendance and a verbal agreement of confidentiality will be noted by the AHDB convenor.

Partners and third parties may provide information for research purposes. Technical Working Groups must ensure that any intellectual property provided as, or believed to be, Commercial in Confidence is managed appropriately. Some of this information may never be in the public domain and must be kept confidential; other information will eventually be published and must be kept confidential until publication.

6 Conflicts of interest

Steering and Technical Working Group participants, including the Chair, will satisfy high standards of impartiality, integrity and objectivity:

- They will take decisions and make choices objectively on merits, taking into proper account the industry and public interests. They will not do so in order to gain financial or other material benefits for themselves or their family or friends
- They are accountable for their decisions and actions and will be as open as possible about these. They should give reasons for their decisions and restrict information only when this is demanded on grounds of confidentiality or the wider public interest
- They will not place themselves under any financial or other obligation to outside individuals or organisations that might influence them in the performance of their

duties. They shall declare any private interests relating to their duties and take steps to resolve any conflicts

6.1 Annual register of interests

- All participants will complete the register of interests form (Appendix 2) to record any interest which might influence their judgment, or which could reasonably be perceived to do so. If participants have any doubt about the relevance of an interest, this should be discussed with the relevant group convenor
- The Chairs of the Steering and Technical Working Groups shall periodically remind members of their responsibilities
- In particular, participants should register:
 - relevant, personal, direct and indirect pecuniary interests
 - relevant, personal, non-pecuniary interests, including those which arise from membership of clubs and other organisations
- A “relevant” interest means any interest which might influence the judgment of a participant or which could be perceived (by a reasonable member of the public) to influence his judgment in the exercise of his duties
- An “indirect pecuniary interest” means an interest which arises from connection with bodies which have a direct pecuniary interest or from being a business partner of, or employed by, a person with such an interest, including if:
 - they, or their nominee, are a director of a company or other body, not being a public body, which has a direct pecuniary interest in the matter under consideration
 - they are partner of, or in the employment of, a person who has a direct pecuniary interest in the matter under consideration
- A participant shall not be treated as having a pecuniary interest in a matter by reason only:
 - of his membership of a company or other body, if he has no beneficial interest in any securities of that company or other body
 - of an interest in any company, body or person which is so remote or insignificant that it cannot reasonably be regarded as likely to influence a participant in the consideration or discussion of, or in voting on, any question with respect to that matter
- The register of interests is intended to provide a balance between information which should be publicly available and the proper degree of privacy to which participants are entitled. They are not required to disclose the amount of any remuneration or benefit
- It is left to the discretion of the individual participants to give the required information. Each participant is responsible for what is recorded, and each is answerable for the content
- The register of interests will be updated annually and will be provided to the Chair of the related Technical Working Group and the Steering Group

6.2 Declaring conflicts of interest

- Before or during Steering and Technical Working Group meetings, participants will be required to complete a declaration of interests form (Appendix 3). From these declarations, a summary of the declared conflicts of interest will be prepared, a copy of which will also be attached to the decision and action notes for each meeting
- The Chair of each Steering and Technical Working Group shall exclude a participant from a meeting while any matter in which that participant has a relevant pecuniary interest is under consideration
- If any conflict of interest is established during the course of a meeting, the participant concerned shall withdraw from the meeting and shall play no part in the relevant discussion or decision. This action shall be recorded

6.3 Concerns regarding breaches on conflict

- If any person present at a Steering or Technical Working Group meeting has a concern about a conflict of interest, they shall contact the group convenor and Chair. The convenor will promptly inform the person about whom the concern exists
- The convenor and Chair will consider the concern taking into consideration such evidence as it deems appropriate to obtain and shall determine the matter and its potential impact. The decisions of the convenor and Chair on the concern will be final

7 Guidelines for crop nutrient management field trials

It is essential that data used for updating the Nutrient Management Guide (RB209) and SRUC Technical Notes are soundly based technically and are supported by sufficient information to ensure their widespread acceptance. New calls for research should stipulate that the “Guidelines for crop nutrient management field trials” are followed – see Appendix 4. The Steering and Technical Working Groups are responsible for ensuring that research has been conducted according to these guidelines.

8 Publication of the Nutrient Management Guide (RB209) and SRUC Technical Notes

Revisions of RB209 are based on data sets relating to specific crops. This enables more frequent revision of RB209 and means that it is kept up to date.

Crop nutrient management project proposals – with the intention of updating guidance in RB209 – should be discussed with the convenor and Chair of the relevant Technical Working Group. They will advise on the best way to proceed.

8.1 Publication of research funded by AHDB

AHDB will continue to fund crop nutrient management research relevant to the sectors from which it receives levy. Findings from AHDB levy-funded research can be used to update Sections 1–4 of RB209, following the due process outlined in this handbook.

8.2 Publication of research not funded by AHDB

Increasingly, crop nutrient management projects will be funded, in part or solely, by other organisations, particularly where updates are needed for Sections 5–7 of RB209. To ensure all stakeholders have a voice in the update of RB209, it is important to maintain transparency of research; transparency means that the way in which research is conducted should be clear to all, to the standards expected by AHDB. Importantly, it also means that all research methods and results can be published in the public domain for free access.

AHDB will continue to provide a publication platform for all major crops via RB209, but only with appropriate support and funding from non-levy sectors can updated research and current best practice be included.

8.3 Formats for publication

It is crucial to make the results of research available and accessible to all users. However, users of information on crop nutrient management are diverse and, for perfectly acceptable, practical reasons, need access to the information in different formats.

At the first level, the Nutrient Management Guide (RB209) and SRUC Technical Notes provide guidance on the best use of fertilisers and organic materials: they are sources of information. AHDB and its partners will regularly revise the Nutrient Management Guide (RB209). AHDB maintains the right to publish all sections of RB209 on its website. The Scottish government will decide when to revise and publish SRUC Technical Notes.

At the next level, users are provided with a range of different crop nutrient management planning tools, such as Tried & Tested, PLANET, MANNER-NPK and commercial or free-to-use software.

Tried & Tested is a paper- or Microsoft Excel-based tool produced by the Professional Nutrient Management Group. RB209 can be used as a source of information with which to complete the Tried & Tested nutrient management plan.

Freely available software such as PLANET and MANNER-NPK can also be used to create crop nutrient management plans. Commercially available software works in a similar fashion, some by integrating a PLANET dynamic-link library (DLL).

The advantage of using these tools is that the information from the Nutrient Management Guide (RB209) and SRUC Technical Notes is embedded in the software, and calculations such as crop requirement and nutrient content are performed automatically by feeding in some basic information.

AHDB has developed the RB209 API (application programming interface) as a resource for third-party digital access to the guidance and recommendations in the Nutrient Management Guide (RB209), and also includes the Scottish Technical Notes (2025 onwards). All users of the API are required to sign the 'RB209 API Terms of Use and License Agreement', and commercial users may be subject to an annual access fee fully at AHDB's discretion. Commercial users are defined as those who seek to use the RB209 API for commercial gain irrespective of whether the information derived is supplied to the end user free of charge. The API is updated periodically in line with RB209 publication updates. Further details on the AHDB RB209 API can be found here: <https://rb209-api-v1.ahdb.org.uk/>

Appendix 1: Attendance register and confidentiality agreement

AHDB RB209 Steering and Technical Working Group Meetings

Location:

Time and date:

Attendance register and confidentiality agreement

Attendee PRINT NAME	I undertake to maintain confidentiality of all sensitive information* SIGN	Notes

* If in doubt about the sensitivity of information, please speak to the group convenor.

Appendix 2: Register of interests form

Crop Nutrient Management Partnership membership

Register of interests

Name:		
Personal Interests		
1	Consultancies and/or direct employment: Any consultancy, other employment, partnership, directorship or position or work for an industry or relevant body held by you and which attracts regular or occasional payments in cash, recognition in any other form, or other benefit.	
2	Fee-paid work: Any commissioned or fee-paid work for which you are paid in cash or kind by an industry or other relevant body.	
3	Shareholdings: Any shareholding or other beneficial interest in industry shares that you have (this does not include shareholdings through unit trusts or similar arrangements where you have no influence on financial management of the shares).	
4	Clubs and other organisations: Any membership role or affiliation that you have to clubs or organisations with an interest or involvement in the work of AHDB.	
5	Other relevant personal interests:	
Non-personal interests		
6	Fellowships: Any fellowship that you hold and which is endowed by an industry or other relevant body.	
7	Indirect support: Any payment or other form of support or sponsorship from industry or other relevant body that benefits an organisation in which you have an interest (for example, a grant or sponsorship of an academic post).	
8	Trusteeships: Any investment in industry held by a charity for which you are a trustee.	
9	Other public appointments: Membership by you of local authorities, health authorities and trusts, relevant voluntary sector bodies and other public sector bodies.	
10	Other non-personal interests:	

Appendix 3: Declaration of interests form

AHDB RB209 Steering or Technical Working Group Meetings

Location:

Time and date:

Declarations of interest in research calls under consideration

Name (print): _____ Signature: _____ Date: _____

Please tick this box if you have no conflicts of interest to declare

If there is a possibility that you will have a pecuniary interest in any of the calls for research under discussion at this meeting, please tick the relevant box in the table below. If there are any additional reasons that you think you may have a conflict of interest, or that your conflict is very tentative, please note this in the comments box and speak to the Chair.

Call reference	Title	Partner	Collaborator	Co-funder

Comments:

NB. Depending on the level of your involvement, you may be asked to leave the room while discussions and/or decisions take place.



UK Crop Nutrient Management Partnership

Guidelines for crop nutrient management field trials

October 2024

*These guidelines have been agreed and endorsed by the following:
AHDB, AIC, BBRO, PGRO, FACTS, Tried & Tested,
DAERA, Defra, Scottish government, Welsh government*

1. Background

The AHDB Nutrient Management Guide (RB209) and SRUC Technical Notes are updated at intervals as agronomic practices change or new crop response data become available. It is essential that data used for updating nutrient management guidance are soundly based technically and are supported by sufficient information to ensure their wide acceptance. These guidelines for the conduct of field trials outline the minimum standards required.

2. Accreditation and standards

Accreditation schemes have been developed or extended to cover field trials conducted for the evaluation of pesticides, e.g. Good Experimental Practice (GEP) and Official Recognition of Efficacy Testing Organisations and facilities (ORETO). Compliance with these schemes is not a requirement for updating guidance on crop nutrient management, but those submitting data for updating RB209 and SRUC Technical Notes should be aware of these standards.

Crop nutrition trials carried out with the intention of updating guidance in RB209 may be carried out by any UK-based organisation, providing that the methodology and principles described in this guidance document are followed.

3. Trials staff

Staff involved in the conduct of trials, including trial design and statistical analysis, should be qualified, adequately trained and experienced to carry out their roles competently. This should be confirmed by staff training records. Records also should be maintained, for every trial, of the identity of individuals who carried out key actions such as treatment application, crop harvesting and assessments. Temporary staff should work under the supervision of suitably experienced, trained and qualified permanent staff.

4. Treatments

The purpose of trials should be to evaluate individual nutrients, not commercial products or nutrient mixtures. Nutrients might occasionally be combined in a treatment, but, if this is done, trial design must allow the separate effects of individual nutrients to be identified. Interactions between nutrients and how they may affect crop yield and quality should be considered where nutrients are combined in a treatment.

Treatments should include a control to which the nutrient under evaluation is not applied. Unwanted effects of deficiencies of nutrients that are not under evaluation should be avoided by appropriate applications of these nutrients. For example, where response to applied nitrogen is being measured, adequate supplies of phosphate, potash, magnesium, sulphur and all essential nutrients should be ensured by uniform application if necessary.

Where nutrients are applied, whether as treatments or base dressings, etc., their physical and chemical forms should be declared in addition to their rates, timing(s) and methods of application.

The nutrient concentration in treatment materials used in the trial should be measured by analysis. Standard concentrations (for example, 46% P₂O₅ declared for triple superphosphate) should not be relied on. Exceptions are ammonium nitrate and urea where there is insignificant variation around the declared concentration.

If the nutrient source is a waste, the trials must be compliant with all relevant regulatory requirements, and permissions and permits must be in place. If required, an exemption should be sought and approval gained (for exemption) from the relevant enforcing body prior to the trial commencing.

5. Trial design

Most trials are analysed by Analysis of Variance (ANOVA) and have replicated randomised block, factorial or Latin square designs. However, any robust recognised design is acceptable, providing results are statistically valid. Optimum number of replicates will depend on crop species and will be inversely related to the number of treatments. Trials with fewer treatments and more replicates (4–6) should be used, where circumstances allow. Trials with many treatments may require incomplete block designs. In these cases, other forms of analysis that take into account imbalance, such as mixed linear models, might be more appropriate.

Factorial designs are more common in nutrient trials than in pesticide trials. A factorial design should not be confused with block design. The statistical test for degrees of freedom can be used to help with effective trial design.

If the purpose is to define a relationship between two variables (for example, nitrogen rate and yield), a large number of treatments with little or no replication might be suitable as statistical treatment can be via regression analysis.

6. Statistical analysis

The method of statistical analysis should conform to the trial design. Appropriate statistics should always be used and the method agreed between the statistician and the lead researcher before the trial is designed. The conventional probability threshold (P) of <0.05 is taken as the threshold of statistical significance. Raw data must also be tabulated in the trial report.

Cereals and oilseed rape

For nitrogen response experiments, linear plus exponential curves should be fitted to yield data.

7. Number of trials

Crop responses to applied nutrients vary with site and weather conditions. It is rare that any significant conclusions can be drawn from a single trial. Data that are as representative as possible for a crop are needed for updating RB209, so a series of similar trials covering different sites (covering different geographic locations and soil types) and years almost invariably is required. Design over trials is as important as the within-trial design.

Where several trials with identical design and treatments are conducted, all data should be used in a combined statistical analysis to identify treatment differences that are significant across all trials.

8. Protocol

Every trial or series of similar trials should be described by a protocol which should include:

- Trial identity
- Objective of the trial or series of trials
- Details of the treatment materials
- Test crop species
- Site conditions required (for example, soil type, pH or indices)
- Treatments to be applied (rate, timing and method of application)
- Uniform treatments to be applied
- Trial design and randomisation
- Area of individual plots and of the whole trial
- Assessments to be made on the crop
- Crop and soil samples and chemical analyses required
- Duration and location of data retention
- Details of the previous crop grown in the field and its fertiliser, manure and agrochemical treatments, with rates, and its offtakes, with yields. Overwinter management and any treatments should also be recorded if the trial is to be established in the spring
- Monitoring external factors such as precipitation and temperature during the trial

Where standard operating procedures (SOPs) are used, the protocol should refer to these. Any deviations from the protocol during the course of the trial should be recorded in the trial report. The protocol should be signed and dated by the appropriate manager.

9. Trial site

Sites should be selected to suit the specification given in the protocol. It is important that the site is as uniform as possible, not only in terms of fertility but also in other aspects such as weed and disease infestation. Site uniformity results in greater statistical sensitivity, so small differences between treatments are more likely to be detected.

The trial should be sited away from field margins as this will avoid effects of headlands, trees, gateways and water troughs. Former features such as manure heaps or hedges also should be avoided.

Once an area within a field has been selected, it should be checked for uniformity of soil type. Soil should be sampled at least for pH and P, K and Mg indices, with at least 16 and preferably 25 cores or sub-samples being required for each amalgamated soil sample analysed. For trials occupying sites greater than 2,500 m², more than one amalgamated sample should be analysed, each representing not more than 2,500 m², in order to determine that the site is likely to have a sufficiently uniform nutritional and pH status. If the focus is on a specific nutrient, then this should be sampled in the trial area. Once results from trials are finalised, the field process will be evaluated by the appropriate Technical Working Group in deciding whether to update technical information in RB209.

Soil mineral nitrogen plus testing (mineralisable N) should be included as a standard prior to application in any nitrogen trials in addition to standard soil testing.

Nitrogen use efficiency based on grain analysis should be measured as a standard post-harvest assessment in all cereal trials. Nitrogen use efficiency should be a metric measured in all nitrogen trials.

10. Monitoring

Trials should be visited at intervals during the season and any visible treatment effects or crop damage recorded.

11. Reporting

A report should be produced for every trial or series of similar trials. It is essential that all results obtained are reported and that there is no selection or discarding of some. Where apparently anomalous results are found, these should be included with an explanatory note.

The report should include the following and be sufficiently comprehensive to allow an independent assessment of all these components:

- Objective of the trial or series of similar trials
- Treatments applied
- Trial design
- Details of the treatment materials, including nutrient concentration
- Details of the site (geographical location, soil type, pH and indices)
- Site plan showing location of the trial in the field
- Trial plan showing arrangement of blocks, plots and treatments
- Trial diary showing dates for all activities
- Supporting photographs
- Statistical methodology
- Tabulated results with relevant statistics
 - The basis of soil and plant results should be reported, i.e. air-dry
 - Grain yields should be reported on an 85% dry matter basis
- Discussion of results with conclusions
- Copy of the protocol and explanatory notes for any deviations

12. Retention of information

All information collected for the trial, including raw data, should be retained in an accessible form. This information should be available on request to those assessing data for updating RB209.