

NVT PROTOCOLS

SORGHUM



NVT PROTOCOLS



Version 1.12

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Version Control Table

Version Number	Date	Description
1.12	12/07/2024	<ol style="list-style-type: none"> 1. 1.2.1 (b) updated – TSP attendance requirement at TSP meeting updated to specify 1 attendee per geographical region managed 2. 1.3.2 added - expectation of TSP presentation at NAC meetings 3. 1.5 updated - reference to Nominating level and Affiliated personnel level 4. 2.3.1 updated – definitions of pre-commercial, commercial, unreleased, released 5. 3.1.4(d & e) added – co-operator agreement to include publication of data collected from site and publication of co-operator details 6. 5.3. added – definition of operational filler 7. 5.6.5(a) added – sowing outside of germination window approval process and breeder consultation 8. 5.7.2 added – sowing outside of germination window and dry sowing 9. 5.10 updated – GPS data collection changed to KML file collection. Updated data entry requirements 10. 5.14 removed - Onsite Documentation 11. 5.14 added – QR Codes and instructions for generating and checking in at sites 12. 5.15.6 added – standard of fertiliser application 13. Appendix B added – commercialisation date. 14. Appendix D added – Material Transfer Agreement 15. Appendix K added – NVT engagement with breeding companies on NVT social media 16. Appendix L added – Notice of Commercialisation form updated 17. Appendix M added – Fence Signs 18. Appendix N added – NVT Brand Style Guide 19. Appendix O added – NVT QR Codes 20. Appendix P added – NVT Participation Agreement

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1. GENERAL INFORMATION

1.1 GRDC NVT Management Team

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For the purpose of this document, the terminology “NVT Manager” may refer to any one of the above mentioned NVT Management Team.

1.2 Summer NVT Management Committee

- 1) It is a requirement for all Trial Service Provider organisations to participate in the Summer NVT Management Committee. The Summer NVT Management Committee comprises:
 - (a) GRDC NVT Management representative.
 - (b) At least 1 delegate from each of the NVT Trial Service Providers
- 2) The Summer NVT Management Committee meets once each year, the venue being determined by the Regional Manager. The meeting is chaired by a GRDC NVT Manager or their nominee. The cost of travel and accommodation for Trial Service Provider delegates is covered by the Trial Service Provider and delegates are expected to attend in person

1.3 Regional NVT Advisory Committees (NACs)

- 1) NVT Trial Service Providers may be asked to participate in the relevant regional NVT Advisory Committee (NAC) to advise on trial locations, regional best practice, and support around agronomic expertise for trial execution.
- 2) NVT Trial Service Providers are required to present a summary of the environmental and management factors affecting trials and the actions taken to avoid these issues occurring in the future
- 3) Trial Service Providers are required to meet their own costs for participating in NAC meetings.
- 4) The committees are to be comprised of both leading farmers and agronomists.
- 5) The committees’ recommendations should be supplied to regional NVT Managers
- 6) Trial Service Provider may use NAC members for advice or information on suitable trial locations, sowing opportunities, and season conditions in local areas.
- 7) The regional NVT Advisory Committee will not report to the Trial Service Provider, nor the Trial Service Provider report to the committee.

1.4 Breeders and Participating Companies

- 1) Any Breeder, Breeding Company, Breeder or Identity wishing to submit material for NVT testing will be known as Breeder/s from this point forward in this document.
- 2) Breeders submitting material into NVT testing must be signatory to the NVT Breeder Participation Agreement.
- 3) GRDC/NVT assess all participating parties on a case-by-case basis to ensure they qualify for participation in NVT. GRDC reserve the right to decline Breeder participation.

1.5 Access to the NVT Data base & Affiliated Personnel

- 1) To be considered a Participating Breeder, the Breeder must have an active NVT Breeder Participation Agreement and be submitting cultivars for testing into NVT in the current season.
- 2) The signatory for the Participating Breeder Agreement will be provided “Authorised Representative” level access to the NVT database.
- 3) The Participating Breeder’s Authorised Representative can provide:
 - (c) A list of Affiliated Personnel who will be given the same database access rights as the Participating Breeder (see 1.6 for Participating Breeder data access rights).
 - (d) A list of Affiliated Personnel to be granted “Advanced User” database access.
 - (e) A list of Personnel to be granted Authorised Representative database access.
- 4) The Affiliated Personnel list will be maintained in an NVT register.
- 5) The Participating Breeder’s Authorised Representative will be required to ensure that all Affiliated Personnel are abiding by all NVT data terms of use covered by the NVT Breeder Participation Agreement and the NVT Protocols.
- 6) The Participating Breeder’s Authorised Representative will be responsible for ensuring the register of Affiliated Personnel is up to date and maintained at all times (i.e. staff leaving, changes to business arrangements with third company providers etc.).
- 7) All Affiliated Personnel (including Advanced Users) will be revoked annually on June 30th each year. Authorised Representative Breeders will be required to supply an updated Affiliated Personnel Nomination Form (APPENDIX P – NVT PARTICIPATION AGREEMENT - AFFILIATED PERSONNEL NOMINATION FORM) prior to June 30th each year to be implemented on July 1st.
- 8) NVT database access rights are summarised in the following table:

	Public	Affiliated Person	Affiliated Person - Advanced User	Authorised Representative for the Breeder*
Activity		Person nominated by a Participating Company Signatory (can be from the same company or third party organisations working with the Participating Breeder).	The Participating Breeder Signatory can assign themselves, and Affiliated Personnel, as Advanced Users for additional access rights to the NVT database.	Company Signatory with a current NVT Participation Agreement (PA), can nominate Authorised Personnel to receive data under their PA.
Access to published trial results (NVT website, single site trial reports, LTRY, Harvest Reports, pathology results).	✓	✓	✓	✓

	Public	Affiliated Person	Affiliated Person - Advanced User	Authorised Representative for the Breeder*
Access to NVT trial sites and provide trial feedback.	✓	✓	✓	✓
Ability to provide feedback on NVT Protocols.	✓	✓	✓	✓
Access to mud maps and GPS locations (received directly from NVT).	X	✓	✓	✓
Participate in operational and strategic NVT meetings (pre-season meeting, pre-harvest meeting).	X	✓	✓	✓
Access to NVT database, raw data, Unreleased cultivars and pathology results for trials where the Breeder is participating.	X	✓	✓	✓
Nominate cultivars into NVT trials via the online database portal and commit to any costs associated with entry in those trials.	X	X	✓	X
Edit cultivar information and flag a cultivar as “released”.	X	X	✓	X
Ability to nominate Affiliated Persons & Advanced Users.	X	X	X	✓

*A duly authorised person that is signatory to either the NVT Breeder Participation Agreement or the Affiliated Personnel Nomination Form.

1.6 Breeder Data Access

- 1) Breeders who are party to a NVT Breeder Participation Agreement will have access to NVT data and information that is not otherwise available to the public.
- 2) A Breeder will only be granted access to data that relates to the crop type and cultivars of which have been entered by that Breeder in NVT.
- 3) Following harvest, Breeders with Pre-commercial cultivars entered in NVT can access and use NVT trial data under the terms of the Participating Breeder NVT Data Licence Agreement.
- 4) Breeders will be able to use trial data for internal analysis and breeding decision making. The use of trial data is for internal Breeder use and not for external publication.

2. ENTRY REQUIREMENTS

2.1 NVT Cultivar Nominations and Acceptance Criteria

- 1) Breeders are invited to nominate cultivars for inclusion in the NVT program in accordance with the terms of the NVT Protocols and Breeder Participation Agreement.
- 2) Nominated Cultivars must have also demonstrated adaptation in nominated regions and have the potential to fulfil a grower's requirements in their farming system.
- 3) Breeders are required to identify the maturity class of each entry based on the days from sowing to 50% flowering, referenced against a commonly known Cultivar and identified to industry scale of Quick, Medium Quick, Medium, Medium Late and Late.
- 4) Breeders may be required to provide information regarding their pre-commercial cultivar entries and how they may differ from the accepted range of Cultivars in any trial series. This applies to trial management factors such as seedling vigour, tillering ability and harvest sensitivity
- 5) The onus is on the Breeders to ensure the suitability of cultivars within the nominated NVT region and trial series. GRDC may provide feedback to Breeders regarding the suitability of nominated cultivars, however, the responsibility of suitability of material is that of the Breeder.
- 6) GRDC reserves the right to remove any pre-commercial cultivar from a trial if it is determined by GRDC that the pre-commercial was nominated in an unsuitable trial.

2.2 Nominating Cultivars

- 1) Breeders must nominate Pre-commercial cultivars for entry in the upcoming NVT season by the Nominations Close date specified in [APPENDIX B – NVT NOMINATION AND SEED DELIVERY DATES](#). This will allow the NVT team to compile regional seeding lists and to review the total number of entries in each seeding list.
- 2) Each cultivar must be nominated in all trials within an NVT region, or as directed in the NVT nomination information.
- 3) Any seed remaining after NVT trial requirements have been met must either be returned to the breeder (if requested) or destroyed by confounding into a common container and delivered for rubbish disposal.
- 4) A Chain of Custody (CoC) must be adhered to at all points of transfer and be available for scrutiny upon request by authorised representatives of the NVT Program. All details declared by the Breeder relating to seed must be accurate and reflective of seed quality at time of delivery to TSP, including, but not limited to germination % and seed weight (1000 seed weight).
- 5) Each Cultivar must have a unique name/number when nominated to NVT. Cultivars will be assigned a unique CultivarID in the NVT system that is fixed to that genetic material.
 - (a) A breeding company must not nominate the same genetic material under different names and/or test codes.
 - (b) Name changes to cultivars are permitted, but unique genetic materials must remain fixed to their specific and unique CultivarID in the NVT system.

- i. Breeders are required to notify NVT whenever a name change occurs
- ii. This includes slight changes to names such as prefixes, suffixes, and spelling.

2.3 Cultivar Release and Commercialisation

1) Released and Unreleased cultivars in NVT

- (a) All information on current and past cultivars tested in the NVT Program is managed through the NVT database.
- (b) The following terms are used to describe cultivars tested in the NVT Program based on the availability of their NVT data to Australian grain growers.
 - i. Unreleased – cultivar does not have NVT data publicly available.
 - ii. Released – cultivar has NVT data publicly available.
- (c) A Breeder may “release” a cultivar at any stage prior to commercialisation, and under any naming convention they choose (i.e. as either a test code or a commercial name).
- (d) NVT data and information relating to Unreleased cultivars is confidential.
 - i. Data on Unreleased cultivars in the NVT system remains confidential and cannot be published or distributed. This applies to all cultivars, including a Breeder’s own Pre-commercial cultivars, as there is no opportunity for claims to be cross-checked, ratified, or publicly verified by the general public, GRDC, or other participating companies.
 - ii. All Unreleased cultivars are Pre-commercial, however not all Pre-commercial cultivars are Unreleased.
 - iii. Breeders will have two (2) years of visibility of all cultivar results for the specific crop and the specific trials that they have cultivars actively nominated for.
- (e) NVT data and information relating to Released cultivars is considered public information.

2) Cultivar “release” process

- (a) It is the responsibility of Advanced User Breeders to “release” their cultivars through the NVT database.
- (b) Requests for NVT to “release” a cultivar on a Breeder’s behalf will be approved only if made by an Advanced User Breeder for that cultivar.
 - i. Breeders should inform an NVT Manager immediately if they have initiated the promotional use of a commercial name for an NVT cultivar and are unable to “release” the cultivar through the NVT database.
- (c) By “releasing” a cultivar (or requesting NVT to “release” a cultivar on their behalf), a Breeder understands and accepts that:

- i. NVT data will become public information.
 - ii. The cultivar will appear in NVT online public reports within 48 hours.
 - iii. The cultivar will appear in NVT Harvest Reports, as outlined below (3)).
 - iv. It is the Breeder's own responsibility to ensure the cultivar's information is recorded accurately in the NVT database.
 - v. Breeders do not have the ability to "unrelease" cultivars. Requests to "unrelease" a cultivar must be sent in writing to an NVT Manager.
- (d) Upon cultivar "release", Breeders should provide a brief cultivar description in the comments section for that cultivar on the NVT database.
- i. The description should consider the following points: Commercial Name, Cultivar maturity (i.e. early-mid), Preferred growing regions, Plant physiological traits (i.e. height, growth habit), Potential cultivar replacement, Comment on grain quality or cultivar classification, and Commercialisation partner or seed distributor.
 - ii. Cultivar descriptions should not reference yield potential, disease ratings nor should they list competitors' cultivars as replacement options.
 - iii. GRDC may edit this information to ensure it is fit for purpose.
 - iv. The description of a Released cultivar may be published in NVT publications such as sowing guides, harvest reports, and on the NVT website, to give users additional information on traits and characteristics not specifically measured in NVT.
- (e) NVT reserves the right to "release" a cultivar and update the cultivar name if:
- i. a Breeder has initiated the use of a commercial name for a cultivar for the purposes of industry promotion via any source or format of promotional media, and
 - ii. the Breeder has neither requested cultivar "release" through an NVT Manager or themselves "released" the cultivar in the NVT Database within two (2) business days of promotional commercial name usage, and
 - iii. an NVT Manager has made an unsuccessful attempt to engage the Breeder in the "release" process.
- 3) Cultivars in NVT Harvest Reports
- (a) NVT's Harvest Reports ("Harvest Reports") are published each season to provide Australian grain growers with the NVT Program's latest independent varietal information. These reports are published as soon as possible after harvest, and on a region-by-region basis, so that Australian grain growers have access to the most up-to-date and relevant information for cultivar selection in the upcoming season.
 - (b) Breeders should consider the timing of cultivar "release" and cultivar information updates in conjunction with the following information on cultivar inclusion in Harvest Reports.
 - (c) Released cultivars are included in Harvest Report yield performance tables.

- i. NVT trial performance data becomes publicly available on a MET-by-MET basis, five (5) days after the MET review period begins.
 - ii. To have NVT trial performance data included in yield performance tables for a MET, a cultivar must be Released at the time of publication of that MET.
 - iii. Cultivars are named in yield performance tables according to their “Variety Name” recorded in the NVT database at the time of publication of each MET.
 - 1. Editing a Released cultivar’s name between MET publications will result in inconsistent naming of that cultivar.
 - (d) Newly Released cultivars are included in Harvest Report new variety tables.
 - i. New variety tables are finalised on a Harvest Report-by-Harvest Report basis, after all METs included in a Harvest Report are published.
 - ii. A cultivar will be included in the new variety table provided it is present in at least one (1) yield performance table within the Harvest Report and has not been previously included in any new variety table in a Harvest Report.
 - 1. To be included in a new variety table a cultivar must be Released, at latest, five (5) days after the MET review period begins for a Harvest Report’s final MET in which the cultivar is included.
 - 2. To maximise Harvest Report exposure of newly Released cultivars, it is recommended to “release” a cultivar before MET publication begins for any METs in which the cultivar is included.
 - iii. The new variety tables list each cultivars’ Breeding company, industry assigned Grain classification (if applicable), and Cultivar description.
 - 1. The information for new variety tables is extracted from the NVT database after all data has been extracted for a specific Harvest Report.
 - 2. It is the responsibility of Advanced User Breeders to ensure their cultivar information is recorded correctly in the database.
 - 3. If a Released cultivar is missing a cultivar description at time of extraction, the cultivar will be included without a description in Harvest Reports.
 - (e) Cultivars included in any yield table in a Harvest Report are included also in the disease ratings tables in the same Harvest Report.
- 4) Commercial and Pre-commercial cultivars in NVT
- (f) The following terms are used to describe cultivars tested in the NVT Program based on their availability to Australia grain growers:
 - i. Pre-commercial – cultivar is being developed by a Breeder and is not available to Australian grain growers to purchase and grow commercially.
 - ii. Commercial – cultivar is available to Australian grain growers to purchase and grow commercially in the current season or the season immediately following for that crop type.
 - (b) Trialing costs for Commercial cultivars will be paid for by GRDC on behalf of Australian grain growers where either of the following is true:

- i. The cultivar has previously been included in the program as a Commercial cultivar AND the NVT Management Team has identified the cultivar as being of commercial relevance and decided it will be retained for testing in the upcoming season.
 - ii. An NVT Manager has approved a Notice of Commercialisation [APPENDIX L – NOTICE OF COMMERCIALISATION](#) for the cultivar prior to the Commercialisation Deadline ([APPENDIX B – NVT NOMINATION AND SEED DELIVERY DATES](#)) AND there is no good reason to believe that testing of the cultivar in the NVT Program will not deliver benefit to Australian grain growers.
 - (c) To ensure Commercial cultivars included in the NVT Program remain relevant to Australian grain growers, the NVT Management Team annually review all Commercial cultivars included in the NVT Program through consultation with Participating Breeders, NVT Advisory Committees, and other members of industry.
 - i. GRDC and the NVT Management Team have the final say in each season’s GRDC-funded Commercial cultivars and testing locations.
 - ii. Breeders may request to include Commercial cultivars at testing locations that GRDC has decided not to fund accepting that, if approved, the Pre-commercial Line Fee will be incurred for testing of the Commercial cultivar. The NVT Management Team will consider such requests on a case-by-case basis and reserve the right to decline requested testing.
- 5) Cultivar “commercialisation” process
- (a) A cultivar must be “released” if it is to be “commercialised”.
 - (b) For a cultivar to achieve “commercial” status in an upcoming NVT season, an Authorised Representative for the Breeder must submit a signed Notice of [Commercialisation form](#), by the Commercialisation Deadline listed in [APPENDIX B – NVT NOMINATION AND SEED DELIVERY DATES](#), declaring and/or evidencing that the cultivar:
 - i. has a fixed name for promotional usage,
 - ii. is being actively promoted to growers, and
 - iii. is available to Australian grain growers to purchase seed and grow commercially in the current season or the season immediately following for that crop type.
 - (c) Cultivars are “commercialised” upon receipt of a satisfactorily completed Notice of Commercialisation form ([APPENDIX N – NOTICE OF COMMERCIALISATION](#))
 - (d) Once a cultivar is “commercialised”:
 - i. The NVT database will be updated to record and show the commercialisation date of the cultivar.
 - ii. The cultivar will be treated as a Commercial cultivar for testing in subsequent NVT seasons.

2.4 Seed Supply (general)

- 1) Accurate germination percentage and seed size (1000 grain weight) for each cultivar will be supplied to the Trial Service Provider on the CoC documentation to calculate seed packing weights.
 - (a) The Trial Service Providers will use this information to calculate the amount of seed of each cultivar required per plot to achieve the target plant establishment rate indicated in [APPENDIX H – CROP SPECIFIC PROTOCOLS](#).

- 2) The Trial Service Provider must have operating systems in place to ensure that seed is accurately identified throughout this process.
- 3) It will be the responsibility of the Trial Service Provider to ensure the seed is placed into packets or magazines appropriate for their sowing system.
- 4) Seed of all cultivars in each trial must be treated in exactly the same manner.
- 5) A 50g sample of each cultivar's seed must be retained and securely labelled by the Trial Service Provider for germination testing if required post NVT emergence, or in case there is any dispute over the genetic identity of plots sown.
- 6) This sowing reference sample must be stored in a cool dry place for two (2) years following the sowing period.
- 7) This sowing reference sample must be stored in a cool dry place for two (2) years following the sowing period.

2.5 Breeder Supplied Seed (General)

- 1) To participate, Breeders will supply seed to NVT when the cultivar is:
 - (a) a canola or sorghum cultivar, and/or
 - (b) a hybrid, and/or
 - (c) Pre-commercial,
- 2) The breeder must supply seed of a quality that enables those Cultivars to perform to their full genetic potential.
- 3) The Breeder is also required to provide Trial Service Providers with accurate information on germination percentage and seed size (1000 grain weight) for each nominated line on the Chain of Custody (CoC) documentation. It is the Breeders responsibility to ensure accuracy of details provided.
 - (a) Seed quality audits will be conducted by GRDC to ensure the accuracy of the information provided in the Chain of Custody. Cultivars will be removed from the program, if inaccurate CoC information results in incorrect seeding rates and plant populations.
 - (b) Accurate seed quality information needs to be provided to the TSP on or before the TSP Seed Delivery Deadline listed in [APPENDIX B – NVT NOMINATION AND SEED DELIVERY DATES](#). In the event no seed quality information is received the TSP will assume a germination percentage of 100% and a seed weight based on the average of all cultivars in that trial.
 - (c) The Trial Service Provider has the right to remove a cultivar if seed arrives after the TSP Seed Delivery Deadline specified in [APPENDIX B – NVT NOMINATION AND SEED DELIVERY DATES](#). The Breeder will be made aware of any cultivar removed in this manner.
- 4) If the Breeder is aware that their cultivars have particular traits that may affect their performance in the trial (e.g. short plant structure, prone to lodging, develops brittle stems post physiological maturity) the Breeder is required to notify the NVT Manager during nomination. The Breeder should also provide additional seed to the Trial Service Providers for sowing additional buffer plots for harvester set up.

- 5) The Breeder must provide seed that is weed and disease free. Seed that is dirty or contaminated will not be included in NVT trials.
 - a. For the purposes of biosecurity, contamination risks of seed include soil, live insects/snails, seed species that have been assessed as a weed risk, unidentified seeds, fungal mycelium (sclerotia), animal faecal matter, and plant material.
- 6) Seed should be free of soil. Soil is not always readily visible, but 0.1% has been adopted as the standard maximum tolerance above this level the seed must be cleaned or disposed of.
- 7) Each Breeder will advise the NVT Manager of its preferred method of excess seed disposal. The NVT Manager will provide this information direct to the Trial Service Provider. It may be that seed either be returned to the Breeder if requested or destroyed by confounding into a common container and delivered for rubbish disposal. Excess seed is not to be sown or used as stock feed.
- 8) Trial Service Providers must comply with the preferred method of each breeder and keep records to confirm that they have employed the preferred method identified by each breeder.
- 9) Seed must be supplied in robust packaging. Paper packaging or envelopes are to be avoided as they can be damaged in transit or handling.
- 10) All seed will be treated with Concept + Cruiser + Epivio C as per label rates.
- 11) Minimum seed germination of 85% post seed treatment.
- 12) Seed samples of 50g will be retained and securely labelled by the Trial Service Provider for germination testing if required post NVT emergence, or in case there is any dispute over the genetic identity of plots sown.

2.6 Material Transfer Agreement

- 1) All cultivar genetic material must be protected under a Material Transfer Agreement (MTA) between the Breeder supplying/distributing the seed for the purpose of NVT trials, and the Trial Service Provider (receiver) for the seed allotment.
- 2) GRDC provide NVT minimum terms that must be included as clauses within each MTA. These clauses are provided in [APPENDIX D – MATERIAL TRANSFER AGREEMENT](#).
- 3) Breeders may include additional clauses within the MTA by negotiation, as long as GRDC's specified minimum terms are not contradicted.
- 4) Breeders are to execute an MTA with each Trial Service Provider receiving their seed/IP prior to the TSP Seed Delivery Deadline ([APPENDIX B – NVT NOMINATION AND SEED DELIVERY DATES](#)).
- 5) MTAs are valid for the term of the NVT Trial Service Provider contract period.
- 6) The TSP will be responsible for collating and recording all required MTA documents. Once collated, or when requested by the NVT Manager, the TSP will provide the NVT Manager with a copy of all executed MTAs in a single email confirming that all MTAs are accounted for and attached.
- 7) Should the supply of a fully executed MTA be delayed beyond Milestone 1 date ([APPENDIX A – DATA ENTRY, MILESTONES, KPI](#)), the Trial Service Provider should advise the NVT Manager in advance

2.7 Chain of Custody

- 1) The Trial Service Provider is required to maintain and retain all documentation showing the full process of acquisition, transfer, handling and disposal of all physical or electronic materials.
- 2) Chain of Custody form to be used in attached. ([Appendix D – Chain of Custody](#))

- 3) The TSP will be responsible for collating and recording all required CoC documents. Once collated the TSP will provide the NVT Manager with a copy of all executed CoCs in a single email confirming that all CoCs are accounted for and attached.

3. SITE SELECTION, PREPARATION AND PROFILING

3.1 Trial Co-operator Agreement

- 1) For each NVT site, where the trial site is on land belonging to a farmer or other third party, a written agreement must be prepared and signed by both the farmer and the Trial Service Provider to ensure clarity of arrangement for the trial site for any one year.
- 2) If NVT trials are hosted by the same co-operator for multiple years, one agreement can be signed for the length of the current NVT contract period.
- 3) Trial Service Providers may use their own template; however, this agreement must be made available to the NVT Manager when requested.
- 4) The Co-operator Agreement should include at a minimum, but not limited to, the following points
 - (a) Ensure the co-operator agrees for the Service Provider to meet obligations to provide all data required for the NVT program (including data listed in [Appendix A – Data Entry, Milestones, KPIs Table A.1 Data entry Requirements](#)).
 - (b) Ensure access to the trial site for personnel approved by the Service Provider and/or the NVT Manager.
 - (c) The co-operator grants permission to the Service Provider, GRDC staff, NVT Participating Breeders, and third party researchers approved by the NVT Manager to fly Unmanned Aerial Vehicles (UAV/drones) over the NVT site to gather relevant images and data.
 - (d) The publication of data collected from the Site, including but not limited to yield data, soil test results, Predicta B results, rainfall and weather.
 - (e) The publication of co-operator details in NVT and GRDC publications (e.g. NVT Harvest Reports).

3.2 Co-Location of trials with NVT's

- 1) Non-NVT trials can be co-located at an NVT trial site at the discretion of the NVT Trial Service Provider.
- 2) When co-locating other trials at the NVT sites the following should be considered:
 - (a) The NVT should be spatially distanced and clearly defined from other co-located trials. There should be no confusion about which trial is NVT.
 - (b) NVT signage should be prominent and separate from other trial signage to avoid confusion of the public
 - (c) Management of the NVT should not be compromised. Timing of spraying, sowing, harvest etc, should be optimised for the best outcome for NVT.
 - (d) The NVT should not be co-located with any trials that present a risk to NVT delivery.
 - (e) In trial sites with multiple co-located NVT trials, there needs to be an NVT sign with QR code on each crop type. A single QR code can be re-used for all trials at the site

3.3 Site Selection

- 1) Sites should be within 50 km radius of the allocated site name unless otherwise approved by the NVT Manager.
- 2) Sites must be accessible for trial operators, breeders, field day personnel and attendees, and others who need to look at the trials. Sites must also be accessible for third party researchers to collect and remove samples from trials for research purposes approved by the NVT Manager. Visibility for local farmers is encouraged, however, not at the expense of uniformity and relevance. Consequently, sites should be as near as practical to access roads but not be compromised by machinery turning areas, drainage lines or tree lines.
- 3) It is recommended that the paddock is in the same phase of the best local rotation practice as the crop being trialled.
- 4) A trial area must not be compromised by weed, disease or pest competition. This may require a higher level of weed, disease and pest management than the level considered acceptable to the landholder for the surrounding crop.
- 5) Avoid areas where the use of UAVs is restricted, i.e., close to airports/airstrips., power lines, buildings etc.
- 6) NVT sites co-locating with local grower groups & field day locations is encouraged provided all site selection rules are adhered to. TSP's should work with the local grower group to ensure they are aware of NVT requirements and to assist in site selection for future years. Suitable site selection and trial quality takes priority over co-location with grower groups, and it is the TSP's responsibility to ensure quality trials are delivered. To that end NVT will always support the decision of the TSP in site selection.

3.4 Site Accessibility

- 1) Sites should be as near as practical to access roads, whether that be main council roads or internal farm tracks, however not at the expense of uniformity and relevance.
- 2) All trials are to be readily accessible by 2WD vehicle.
- 3) All trials must have the potential to be a field day site.
- 4) All trials should enable visibility and access to local farmers, advisors, third party researchers (which may consist of research organisations and Government departments and agencies) and other NVT stakeholders, including Breeders representatives.
- 5) All sites should have an access/walking track with crop cut low to allow easy access and visibility.
- 6) Be aware that wet conditions may block some access roads. Try to choose sites with all-weather access.
- 7) Biosecurity and general site hygiene practices must be adhered to.
- 8) All site visitors must contact the nominated Trial Service Provider and Trial Co-operator for permission to access the trial site. Permission may not be granted automatically by the Trial Service Provider.
- 9) Any organisation or individual wishing to access an NVT site for the purpose of taking measurements or samples must do so in line with the NVT Resource Sharing Key Requirements and only after receiving all appropriate authorisations.

3.5 Site Uniformity

- 1) The soil type of the selected site must be representative of the major cropping soil type in the district.
- 2) The site must be visually and physically uniform in soil type and soil profile.
- 3) The site must not be subject to excessive drainage from surrounding areas or at risk of flooding and be large enough to allow for machines to turn within any proposed fence line.
- 4) The site must be free of any possible complications from the past practices or uses (levelling, compactions, wheel tracks, fertiliser rate, soil emolliate, livestock activity) or the proposed use during the NVT trial season.
- 5) Residual of soil active herbicides must also be assessed and managed to avoid impact on the trial.
- 6) Crop residue from previous crops must be evenly distributed across the trial site
- 7) Where heavy stubble burdens may jeopardize the establishment of a trial, crop residue must be managed or removed by raking, burning or other means necessary.

3.6 Paddock Rotation History

- 1) The paddock history over the last three (3) years is to be recorded in the NVT database. The paddock history information should be entered according to the following capture fields in the database:
 - (a) Year: The year the paddock history information pertains to.
 - (b) Crop: Crop type/s grown in the paddock in the year.
 - (c) Herbicides: Name and application rate (if known) of any herbicides applied in the year that may pose a residue risk. This includes, but is not limited to, Imidazolinone (Group 2), Sulfonyleurea (Group 2), and Triazine (Group 5) herbicides.
 - (d) Fertilisers: Name and application rate (if known) of any fertilisers applied in the year.
- 2) All data is to be entered onto the GRDC NVT database as required by [Appendix A - Data Entry, Milestones, KPI's, A.1 Data Entry Requirements](#).

3.7 Soil Testing and Soil Nutrition

- 1) The cost of soil testing is to be covered by the Trial Service Provider
- 2) Soil testing (including PreDicta B) should be completed well before seeding to allow returned results to fine-tune site selection from high levels of root disease and professional nutrient management.
- 3) Nutrition testing depths and sampling process
 - (a) As per [Appendix F - Standard Operating Procedures, F.3 Soil Testing](#)
- 4) Production targets
 - (a) The yield target is to be the highest level expected for the site, given the likely season
 - (b) Nutrient applications should be targeted at levels so that the yields of the best performing Cultivars in the trial are not limited
- 5) To meet nutritional requirements, it may require pre-sowing application of fertilizer as well as starter fertilizer at sowing as determined by soil tests and regional best practice.

- 6) Soil cores across the site can be bulked into desired depths. (Minimum of 3 cores per rep)
- 7) All test results are to be entered on the NVT database required by Appendix A - Data Entry, Milestones, KPIs, – [A.1 Data Entry Requirements](#).

3.8 Predicta B Testing

- 1) The cost of Predicta B testing at the lab is covered by GRDC/NVT. Trial Service Providers must cover the sampling and shipping costs.
- 2) Predicta B sampling and testing must occur at all NVT sites.
- 3) The Predicta B sample barcode number must be recorded and uploaded to the corresponding trial on the NVT database.
- 4) In the NVT system, the Predicta B sampling and the testing aim is to identify the risk of soil borne disease impacting trial results and Cultivar performance and provide a deeper insight into crop health and yield performance.
 - (a) It may also allow trial managers to identify potentially problematic sites that would not be suitable for NVT trials. Finally, the results may also provide some data for the genotype responses in NVT trials.
- 5) A detailed description of the sampling method required can be found in Appendix F - Standard Operating Procedures, [F.2 – Predicta B sampling](#).

3.9 Soil Moisture Profile

- 1) Site gravimetric moisture cores to be collected within 48 hours of sowing at every trial site.
 - a. If rainfall occurs within two days of sowing and sowing is delayed, the site must be re-cored.
- 2) Individual data from the Nine cores per trial will be collected at each depth interval described in the protocols. (3 cores per rep per trial)
- 3) Soil testing depths and sampling process
 - (a) As per Appendix F - Standard Operating Procedures, [F.4 Measuring gravimetric moisture](#).
 - (b) Minimum plant available water requirements are outlined in the regional specific protocol.
 - (c) Sowing outside these limits will require consultation with the NVT Manager
- 4) All test results are to be entered into the NVT database within 30 days of collection

4. BIOSECURITY

4.1 Biosecurity for Visitors and Vehicles

- 1) It is the responsibility of the Trial Manager and to work with the Trial Co-operator to minimise any potential biosecurity risks and ensure the continued delivery of successful NVT trials.
 - (a) The NVT Manager, Trial Manager, and/or Trial Co-operator reserve the right to refuse entry to the NVT site due to biosecurity concerns.
- 2) Farm biosecurity plans must be respected and adhered to at all times. It is the Trial Service Provider's responsibility to monitor adherence and report any breaches to the Trial Co-operator and the NVT Manager.

- 3) In the absence of a farm biosecurity plan, Trial Service Providers must comply with Grower/Landholder requirements. This may include:
 - (a) Notify the Land manager before entry to the farm.
 - (b) Ask land manager about weeds, plant pests, or restricted areas on the farm.
 - (c) Machinery, vehicles, and equipment are thoroughly inspected for insects, soil and plant material prior to arriving and when entering the property.
 - (d) Designated parking areas are used for all non-farm vehicles and equipment.
 - (e) Movement of vehicles is kept to farm roads and laneways whenever possible.
 - (f) Farm gates are closed after opening and passing through them.
 - (g) Unfamiliar, unusual or new plant pests reported to farmer, Agriculture Department or Exotic Plant Pest Hotline. (1800 084 881).
 - (h) Consideration could/should be given to erecting “Biosecurity Signage” alongside the GRDC NVT sign at entry to the trial site with consultation with the co-operator.

5. TRIAL DESIGN AND MANAGEMENT

5.1 Trial Design

- 1) Trial designs utilise the latest statistical methodology available and allow for site and subsequent across-site analysis by qualified NVT biometricians.
- 2) The NVT Manager will determine the list of cultivars for each trial after discussions with the breeders, the NVT Team, and the regional NVT Advisory Committees.
 - (a) Once the list of cultivars is determined and entered into the NVT database by the NVT Manager, the Trial Service Provider will use the NVT database to determine the shape and layout of the trial and enter this information into the NVT database to obtain a trial design.
- 3) There will be sufficient commercial cultivars, or trial standard Cultivars, in each trial to allow growers to benchmark upcoming Cultivars relative to a well-known Cultivar in any region.
- 4) There will be repeated cultivars from year to year to allow connectivity among trials. The NVT Manager will determine these numbers in consultation with the supporting Biometrician.
- 5) Plot length must have a minimum harvestable length of 6m and ideally a maximum of 10m (longer plots require an excessive amounts of seed). The ideal harvestable length is 10m.
- 6) Plot width must have a minimum width of 1.5m, ideally the maximum harvestable plot width should be 3.0m.
- 7) All plots at a site, including buffer plots, are to be the same width and length and have the same number of rows.
- 8) The inter-row and inter-plot distance must also be consistent across the trial site.
- 9) Trial pathways are to be straight and plots are to be uniform
- 10) Where trials are located on properties where the co-operator use Controlled Traffic management, pathway widths should be adjusted to ensure that compacted wheel tracks fall into the pathway rather than within the plots. Wider pathway widths need to be recorded and entered database (preferred), and/or recorded in detail on Mud Map to allow biometricians to analyse the trials spatially.

- 11) Where header trails and/or chaff rows are present on the site, the site should be pegged, where possible, such that the concentrated crop residue lines and pathways coincide. This is to minimise the detrimental effects on crop establishment within plot.
- 12) Additional replicates of a Cultivar may be used in the place of fillers if the same seed source, sowing rate and seed treatment is used.
- 13) The distance between trial plots is to be determined by the Trial Service Providers. It must remain consistent. Design must be either 3 or 6 ranges unless approved by the NVT Manager.

5.2 Plot One identification

- 1) An identifying marker (e.g. white peg, plot sign etc.) is to be placed at the front of “Plot 1-1” (range 1, row 1) to allow ease of locating plot 1 and orientation of the field plan for field observations. If multiple trials occur at a site, an identifier for each NVT trial is required.

5.3 Fillers

- 1) The use of “fillers” is considered not ideal and only to be used when absolutely necessary.
- 2) Trials sown on 6 ranges require an even number of Cultivars. Trial Service Providers may add a single Filler Cultivar to reach an even number.
- 3) “Operational fillers” are fillers that may be necessary as part of the trial for randomisation to fit on the TSP’s preferred layout.
 - (a) Operational Fillers will not be reimbursed by NVT and will be a Trial Service Provider cost.
 - (b) NVT will still reimburse the Trial Service Provider for the cost of other fillers that occur due to:
 - i. Removed Entries
 - ii. Missing Plot
- 4) Trials sown on 3 ranges do not require the use of Filler Cultivars when designs are first generated.
- 5) Fillers should only be added after consultation with the NVT manager under the following conditions:
 - (a) Fillers must be a commonly grown commercial Cultivar and be an existing entry to the trial.
 - (b) When there are seed supply issues through timing or quality and Cultivars need to be substituted.
 - (c) Are preferably from the same seed source and sowing density as other entries in the trial
 - i. When (c) above is true, “fillers” should be labelled on the database as the actual Cultivar sown.
 - ii. When (c) above is FALSE, a unique “Filler” ID is used.

5.4 Timing of Operations

- 1) The NVT program will be guided by best-practice in each region where trials are conducted and facilitated by engaging with regional NVT Advisory Committees to recommend sowing times and seeding rates. These recommendations will be ratified and implemented by the NVT Management Committee and participating Breeding programs for adoption.

5.5 Calibration and Checking of Weighing Devices (Scales)

- 1) All weighing devices used for the NVT Program must be checked, and calibrated if required, to ensure accuracy and reliability under field/lab conditions. Trial Service Providers must provide details of how their recording devices have been calibrated, when, and by whom, to the NVT Manager when requested.
- 2) All weighing devices used for the NVT Program must be checked on a regular basis during each operation within the NVT Program using the appropriate range of certified check weights according to an industry accepted protocol, to ensure accuracy and reliability under field/lab conditions. Trial Service Providers must provide details of how their weighing devices have been checked, when, and by whom, to the NVT Manager when requested.
- 3) Should any weigh device fail to meet the check standard during any operation, the weighing device must not be used until it has been recalibrated and certified by a suitably qualified person.

5.6 Germination Windows

- 1) Germination windows are outlined in [Appendix C](#) of this document.
- 2) Germination windows are the desired date range for the germination of seed for a specific trial series. Seed must be sown to ensure it germinates within the preferred germination window.
 - (a) The sowing date is the date that seed is sown.
 - (b) The germination date is the first date when sown seed can be expected to have adequate moisture to germinate.
 - i. When the seed is sown into adequate root zone soil moisture, sowing and germination will occur at the same date.
 - ii. When the seed is dry sown, the germination date will be the date that seed receives adequate moisture from an adequate rainfall or irrigation event.
 - (c) The germination date is not defined by when the seed ‘strikes’ or emerges.
- 3) Preferred Germination Windows have been determined via consultation with stakeholders as representative of “best local practice” to reflect the expected performance of the Goal Post varieties and nominated entries for the specific trial series. Preferred germination windows may be adjusted from time to time
- 4) Unpreferred germination windows, pre or post the preferred germination window, are sub-optimal windows in which germination is acceptable if:
 - (a) Favorable environmental conditions have resulted in the majority of growers sowing early within the region.
 - (b) Environmental constraints outside the control of the Trial Service Provider mean the trial will be sown late. Note that management issues or other constraints that could have been avoided by the Trial Service Provider are not considered a valid reason to sow in the late unpreferred germination window without the application of KPI Service Credits.
- 5) All trials should be sown within the approved germination windows unless express written permission is given by the NVT manager (this includes sowing in the “unpreferred germination” window)
 - (a) If a sowing opportunity does not occur that will result in germination within the germination windows, the TSP may request written approval from the NVT Manager for trial planting at the earliest opportunity following the germination window. This includes dry sowing prior to the end of the germination window. Approval will be granted provided germination of the trials aligns with commercial crops in the surrounding district.

- (b) This does not include early break wheat trials, given they can be supplementary watered to ensure germination.
 - (c) Breeders will be advised of any trials approved for germination outside the germination window. Breeders may choose to opt-out of trials germinated outside the germination window, by which cultivars unsuitable for later germination will be changed to fillers.
 - i. As per normal process, all trials (including those sown outside the germination windows) will be included in the MET dataset for review by the NVT Biometricians and excluded from the analysis due to statistical reasons as required.
 - ii. Grain quality testing will not be conducted on cultivars that have been opted-out.
- 6) Trials must be sown within the approved germination windows provided for each region as specified in this document. This sowing time is the optimum sowing period for the trial crop in the selected district. This requires that the trial area be ready for sowing well before the optimum sowing period.
 - 7) Soil temperature to be not less than 16 degrees for 3 days and increasing at the intended seed depth.
 - 8) Trials should be sown to emerge within +/- 5 days of the same surrounding crop type unless agreed by NVT Manager.
 - 9) The trial configuration must be sown according to the trial design obtained from the NVT database (after the number of entries and trial layout has been confirmed by the Trial Service Provider.)
 - 10) Buffers must be included at the start and end of a trial block. Buffers do not need recording in the trial design on the NVT database.
 - 11) Packing and sowing plans are used to record alterations due to non-arrival of seed or mishaps in the field at sowing. Packing and sowing plans should be retained by the Trial Managers for a minimum of 18 months after sowing.
 - 12) The germination date must be recorded and entered by the Trial Service Provider into the NVT database within 48 hours of sowing as outlined in Appendix A – Data Entry, Milestones, KPIs, [A.1 Data Entry Requirements](#).
 - 13) All trials require seed to be sown with adequate soil coverage to allow sufficient seed to soil contact thus ensuring even imbibing of moisture and subsequent germination across the trial site.
 - 14) Trial service providers ideally have Vacuum sorghum seed singulation capacity fitted with 2cm GPS tractor guidance system.
 - 15) Trials to be sown with rows perpendicular to the grower's direction of sowing and pathways/ranges parallel to the grower's sowing direction.
 - 16) Sowing equipment design must be so that it can sow into all stubble loads of all previous crops with the ability to apply starter fertiliser at sowing.
 - 17) Establishment rates vary across the NVT regions, but trial sowing rates and the resultant plant establishment must reflect local best practice. Seed establishment measured in plants/m², by Region are to be recorded. Suggested plant densities and establishment rates are provided for the guidance of Trial Service Providers. These can be found in the Appendix H: [Region-Specific Protocols](#).
 - (a) Importantly, all trials should have a consistent and uniform plant establishment across the trial area.
 - (b) Plots exceeding the suggested plant densities must have the excessive plants removed, employing a process that does not damage any remaining plants and ensures a consistent space between plants for the entire length of the rows.

- (c) Plant establishment and uniformity protocols are to ensure robust NVT trial data; they do not reflect minimum commercial thresholds

5.7 Trial Sowing & Dry Sowing

- 1) Trials should be sown to germinate within +/- five (5) days of the same surrounding crop type unless agreed by the NVT Manager.
- 2) It is recognised that the Trial Co-operator's surrounding crop may be sown in conditions suitable for commercial cropping but unsuitable for small plot cultivar trials (e.g. sown dry, or in sub-optimal conditions resulting in staggered or patchy establishment). In these situations, the KPI's pertaining to alignment of emergence with surrounding crop can be waived, provided the TSP has sufficient documentation of the issue and has flagged with the NVT Manager prior to harvest.
 - (a) The trial configuration must be sown according to the trial design obtained from the NVT database (after the number of entries and trial layout has been confirmed by the Trial Service Provider).
 - (b) Buffers must be included at the start and end of a trial block. Buffers do not need recording in the trial design on the NVT database.
 - (c) Packing and sowing plans are used to record alterations due to non-arrival of seed or mishaps in the field at sowing. Packing and sowing plans should be retained by the Trial Managers for a minimum of 18 months after sowing.
 - (d) The Trial Service Provider has the right to remove a cultivar if seed arrives after the TSP Seed Delivery Deadline specified in APPENDIX B – [NVT NOMINATION AND SEED DELIVERY DATES](#). The Breeder will be made aware of any removed cultivars.
 - (e) The sowing date must be recorded and entered by the Trial Service Provider into the NVT database within 48 hours of sowing, as outlined in APPENDIX A – [DATA ENTRY, MILESTONES, KPI](#).
 - (f) Trials require seed to be sown with adequate soil coverage to allow sufficient seed to soil contact thus ensuring even imbibing of moisture and subsequent germination across the trial site.
 - (g) Trial Service Providers should ideally use vacuum seed singulation seeding equipment fitted with a 2cm GPS guidance system. Sowing equipment design must be so that it can sow into all stubble loads of all previous crops.
 - (h) Trials are to be sown with rows perpendicular to the Trial Co-operator's direction of sowing and pathways/ranges parallel to the Trial Co-operator's direction of sowing.
 - (i) Sowing rates vary across the NVT regions, but trial sowing rates and the resultant plant establishment must reflect local best practice as outlined in APPENDIX H – [CROP SPECIFIC PROTOCOLS](#).
 - (j) Importantly, all trials should have a consistent and uniform plant establishment across the trial area.
 - (k) Plots exceeding the suggested plant densities must have the excessive plants removed, employing a process that does not damage any remaining plants and ensures a consistent space between plants for the entire length of the rows.
3. Dry Sowing
 - (a) Some trials may be sown dry if the Trial Co-operator has sown dry or is about to sow dry, but ideally this should be no earlier than three (3) days ahead of a promising germinating rain.

- (b) If a promising germinating rain does not occur within the germination windows, the TSP can opt to sow outside the germination windows in line with clause (a) of the NVT Protocols.
- (c) The NVT Manager is to be notified in writing of all cases where dry sowing is planned.
- (d) The date of subsequent rainfall, that triggers germination, must be recorded as the “germination rain date” (sowing date) in the NVT database. The actual sowing date is also to be recorded in the NVT database.
- (e) Trials that result in patchy establishment have a high chance of being compromised and declared unusable with associated abandonment risk.
- (f) In seasons with a widespread late break, a departure from the dry sowing protocols may result in improved trial outcomes (e.g. dry sowing more than three (3) days ahead of a promising germinating rain). In these instances, Trial Service Providers are asked to submit a sowing plan to the NVT Manager detailing:
 - i. the specific trials they recommend for sowing outside the protocols;
 - ii. a justification for each trial as to why a better outcome should be expected by a departure from the dry sowing protocols (e.g. suitable soil type, soil moisture and weed burdens etc.); and
 - iii. details of consultation (if any) undertaken in arriving at this decision.
 - iv. The NVT Manager will approve trials on a case-by-case basis. Should the departure from the NVT Protocols lead to a poor outcome, Trial Service Providers will still be responsible for the abandonment risk and any relevant KPI's.

5.8 Supplementary Watering of Trials and Irrigated Trials

- 1) Definitions
 - (a) Supplementary Watering -Water applied to trials to initiate germination and establishment or to ensure survival of plants in trials.
 - (b) Irrigated Trials -These trials occur where irrigation of crops are commonplace and are designed to be irrigated on a regular basis as the primary supply for their water requirements throughout their growing period.
- 2) Supplementary watering of trials may be considered to ensure trials survive where severe post emergent drought is threatening plant survival. NVT Manager approval must be granted before supplementary watering.
- 3) When supplementary water is applied to a trial: the method of application, date of application and mm rainfall equivalent must be recorded and uploaded to the database within 14 days of application.
- 4) Irrigation dates and quantities applied to trials that are planned as irrigated trials are to be recorded and uploaded to the database within seven (7) days of harvest.
- 5) The preferred method of supplementary watering is with pressure compensated drip tape, post sowing. Minimum supplementary watering amounts are 10-25mm on light soils and 20-40mm on heavy soils. Alternative supplementary watering types, where they have been used successfully in the past, may be used with the approval of the NVT Manager. Supplementary watering must be uniform across all plots in the trial.

5.9 GPS Collection

- 1) Entrance gateway GPS coordinate collection
 - (a) The GPS coordinates of the paddock entrance gateway must be recorded for all trials and entered directly into the NVT database by the Trial Service Provider within seven (7) days of sowing, as outlined in [APPENDIX A – DATA ENTRY, MILESTONES, KPI](#).
 - i. These coordinates should represent the access point off the public roadway where the NVT gate sign is located.
 - ii. The same set of coordinates should be used for all trials relevant to that entrance point.
 - (b) GPS coordinates must be provided in decimal degrees format.
 - (c) The GPS position must be recorded to an accuracy of six (6) decimal places using an instrument which provides decimal degrees.
- 2) Plot 1-1 GPS Coordinate Collection.
 - (a) The GPS coordinates of “Plot 1-1” (Range 1, Row 1) of every trial must be recorded and entered directly into the NVT database by the Trial Service Provider within 7 days of sowing as outlined in Appendix A – Data Entry, Milestones, KPI’s, [A.1 Data Entry Requirements](#).
 - (b) GPS coordinates must be provided in decimal degrees format.
 - (c) The GPS position must be recorded to an accuracy of six decimals using an instrument that provides decimal degrees.

5.10 KML File collection

- 1) KML (Keyhole Markup Language) is a coding language used to express geographic visualisation, including annotation of maps and images.
- 2) Pathway from entrance gateway to trial site:
 - (a) A KML file that maps the pathway from the entrance gateway to Plot 1-1 of the trial, or the first trial at a multi-trial site, must be recorded and uploaded to the NVT database by the Trial Service Provider within seven (7) days of sowing, as outlined in [APPENDIX A – DATA ENTRY, MILESTONES, KPI](#).
 - (b) The same KML file should be used for all co-located trials relevant to that entrance point (if applicable).
 - (c) Trial Service Providers should use an appropriate KML recording device/software to begin “recording” at the access gateway and continue recording as they drive or walk on the most appropriate route to Plot 1-1.
- 3) Trial boundary
 - (a) A KML file that maps the trial boundary GPS coordinates is to be collected on each individual trial and uploaded to the NVT database by the Trial Service Provider within seven (7) days of sowing, as outlined in Appendix A – Data Entry, Milestones, KPI’s.
 - (b) Trial Service Providers should use an appropriate KML recording device/software to begin “recording” at the LEFT corner of Plot 1-1 of the trial and continue recording as they walk the perimeter of the trial in a clockwise direction.
 - (c) Do not include the buffer plots.
 - (d) Save the file name as “TrialCode.KML” (e.g. WMaA21BREN5.KML), in KML format.

4 General Information

- (a) KML files can be generated using various available smart phone apps or alternative devices. Please contact NVT if you require further information on this.
- (b) Measurements must be captured in “metric” units.
- (c) Where applicable (device depending), device settings must be configured to “GPS measuring” to collect “Area” data.

5.11 NVT Signage

- 1) GRDC NVT and Biosecurity supplied corflute signs are to be placed on a secure, prominent position on the roadside where access to the NVT trial is gained. In addition, NVT Signs are to be placed at the paddock access point to the trial site or at the fence-line adjacent to the trial where the trial is visible from the road. The aim is to enhance the exposure of the NVT program.
- 2) They should be installed on the day of sowing and remain in place until the trial is harvested.
- 3) Visitors must be able to find the trial of interest at a multi trial location. In these situations, an overall site map identifying NVT's should be present at the site.
- 4) TSP should contact the NVT manager if more signs are required.

5.12 Site Maps (Mud-maps)

- 1) Trial Service Provider must provide a mud-map indicating the trial's location in relation to the nearest town or main access roads as per the template supplied by GRDC NVT. Contact the NVT Manager for a copy of the template if required.
- 2) The mud-map should indicate the location of the NVT trial in relation to other trials at the same site (if relevant) and indicate the distance, including any buffer rows between co-located trials.
- 3) The mud map should include a text description of access to the trial site, relevant landmarks and distances from the closest major town and roads. It should also have a marked line that indicates the best access to the trial through the paddock or farm and the location of NVT signs.
- 4) Mud-maps must include the GPS coordinates of the site (in decimal degrees format) and contact numbers for both the Trial Service Provider and the trial co-operator (grower or landowner), and any site-specific requirements e.g. biosecurity measures, contact farmer etc.
- 5) The mud-maps are to be loaded onto the NVT database as required by Data entry document, APPENDIX A – DATA ENTRY, MILESTONES, KPI'S [A.1 Data Entry Requirements](#). This is to allow easy access to trial sites by breeders and site auditors.

5.13 Onsite Documentation

- 1) It is the responsibility of the Trial Service Provider to provide access to a trial plan of the site to visitors. . Access should be provided in the form of the NVT printed QR code contained in a waterproof container close to the “plot 1-1” identification peg. (refer section titled QR codes for more information)
 - (a) In areas of no internet reception the TSP has the option to keep trial plans with the NVT QR document. However, if they chose to not include the trial plan they must be willing and able to provide this document digitally when authorisation is granted to visitors.

5.14 Site check in and QR Codes

- 1) All visitors to NVT are required to log their visit using the QR Code system in place when accessing trial sites.
- 2) NVT QR codes are to be available in a waterproof container at plot 1-1 at every NVT trial site
- 3) TSP may use the QR codes in other locations (eg site access point, fence signs, newsletters, etc), provided the QR code is also present at Plot 1-1..
- 4) All visitors will be required to use the QR code to access the trial plans for the site.
- 5) In areas of low mobile phone reception the TSP may choose to:
 - (a) Leave trial plan on site with the QR code for visitors to access upon arrival.
 - (b) Provide the trial plan directly to visitors at time of authorisation prior to visiting the site.
- 6) The following naming convention should be used by TSP when creating a QR Code Title Descriptions:

Situation	Convention	Example
If a single trial or crop type is present	Location Name and Crop	<i>Pampas Sorghum</i>

5.15 Trial Management

- 1) Trial Service Providers are required to deliver, on time, all aspects of trial management in accordance with the conditions as agreed to in the service provider contracts. Any unforeseen problems must be brought to the attention of the NVT Manager immediately and a course of action initiated as soon as possible thereafter.
- 2) A trial site must not be compromised by weed, disease, insect or pest competition.
- 3) An outbreak of a pest or disease may offer an opportunity to assess the resistance/tolerance level of the Cultivars in the trial. The Trial Service Provider should notify the NVT Manager of such opportunities so that the NVT Manager can organise for the trials to be inspected by a pathologist.
- 4) Trial Service Providers are responsible to ensure that all treatments, including but not limited to, herbicides, pesticides, fungicides, fertilisers and soil treatments, applied to NVT trials must comply with all relevant label registration requirements. For crop specific trial management information please refer to [APPENDIX H – CROP SPECIFIC PROTOCOLS](#)
- 5) NVT recognises that off-label use of fungicides sometimes occurs to adequately control disease in trials given the wide spectrum of maturities. In instances where off-label use of fungicides does occur, the use must be reported to the NVT Manager, details accurately captured in the database (as per any other chemical use), and an appropriate management plan put in place to ensure correct disposal of harvested grain.
- 6) Fertiliser management should aim to achieve the highest expected yield for the site given the seasonal forecast. Fertiliser management should include fertiliser application at sowing and top dressing with appropriate application rates and timings based on seasonal forecasts. Trace element fertilisers should also be applied. For crop specific trial management information please refer to [APPENDIX H – CROP SPECIFIC PROTOCOLS](#).
- 7) Trial Service Providers are responsible to ensure all treatments to NVT trials must be applied by a fully qualified staff member or contractor.

5.16 Trial Monitoring

- 1) The site must be regularly monitored by the Trial Service Provider for weeds, pests, diseases or other incidents, such as grazing or storm damage.
- 2) The site must be inspected by the Trial Service Provider (at a minimum)
 - (a) 4 weeks post emergence. (Establishment/Emergence check)
 - (b) Two (2) weeks after each herbicide, pesticide and fungicide application,
 - (c) At flowering, and
 - (d) prior to harvest.
- 3) A record is to be made of each inspection, including the name of the individual who conducted the inspection.
- 4) Each trial must have a Trial Rating uploaded to the NVT database as per [APPENDIX A – DATA ENTRY, MILESTONES, KPI](#).
 - (a) The Trial Rating should indicate the potential outcome of the trial, incorporating the seasonal and management quality of the trial.
 - (b) The Trial Rating should be conducted using a 5-1 scale, where;
 - 5 = Excellent trial, no issues.
 - 4 = Good trial, should produce ok results.
 - 3 = Average trial, site has issues and needs work for the results to be meaningful.
 - 2 = Poor trial, site has issues and is unlikely to produce meaningful results.
 - 1 = Trial has been abandoned.
 - (c) The Trial Rating may change for individual trials as the season progresses. Multiple ratings may be entered for each trial TSP milestone; ratings should be updated after each visit.
 - (d) The Trial Rating will be used to communicate the potential outcome of the trial throughout the growing season and assess if any actions are required to improve the outcome of a trial.
- 5) The cooperating farmer may be prepared to assist in monitoring, by reporting any incidents or problems to the Trial Service Provider. However, this does not replace the responsibility of the Trial Service Provider to monitor the site.
- 6) Establishment counts are required as per Appendix F – Standard Operating Procedures: [F.5 Trial Measurement Table](#)
- 7) Yield limiting factors such as disease, weeds, nutrient deficiency/toxicity, and drought are to be recorded and reported. Where required, plot scale observations are to be taken on the trial and entered directly into the NVT database as per Appendix F - 'Standard Operating Procedures', [F.5 Trial Measurements Table](#).
- 8) GRDC protocols and SOPs for individual agronomic or disease characteristics are to be followed when taking plot observations.
- 9) In each NVT region, all trials must have days to flowering data collected from every plot in the trial.
- 10) Any incident, accident or other factor that could impact the accuracy or reliability of the trial, especially anything that differentially affects Pre-commercial cultivars or standard cultivars, must be reported to the NVT Manager immediately. These include frost and heat shock.

- 11) The Trial Service Provider must notify the NVT Manager of any trials, and/or plots that have been jeopardized resulting in possible abandonment, or partial abandonment, within 24 hours of detection.
 - (a) For plot specific issues, the affected plots are to be designated as “missing”, and plot yield set to “N/A” within the database. An identifiable reason as to why the plot has been set to N/A must be attached to the trial in the NVT database. Plots with general patchiness are not to be N/A.
- 12) If plot lengths are required to be adjusted, all plot lengths in that range must be adjusted to remain the same.

5.17 Trial Measurements and Plot Observations

- 1) Plot observations recorded by the Trial Service Provider can be either variates or covariates.
 - (a) Variates relate to a Cultivar (height, flowering time, etc.) and provide information on the agronomy of a Cultivar to be collected to allow a validity check that a Cultivar is in the correct location. Variates are generally Cultivar specific traits.
 - (b) Covariates are location based, independent of Cultivar, and influence the accuracy in Cultivar performance. Covariates include uneven establishment within a trial, weed infestation, blocked or missing rows, etc. Covariates are very important and, when taken, are required for every plot, not just one replicate. Covariates are important in analysis and hence must be accurately measured and well described within the database.
- 2) A list of NVT acceptable covariate and variates have been included within Appendix F: Standard Operating Procedures F.5 - Trial Measurements Table. All covariate data should be entered on the NVT database within 7 days after sampling/recording as outlined in Appendix A – Data Entry, Milestones, KPIs: [A.1 Data Entry Requirements](#) and must accompany harvest yield data when a trial is flagged as “Ready for Biometrician Analysis”. All plot measurements collected, are tested by the biometrician for non-genetic dependence (true covariate) and significance of measurement.
- 3) UAV Flights and Observations
([See Appendix I - NVT Sorghum UAV Field Protocols for full details and instructions](#))
 - (a) All staff responsible for flying UAV and capturing images are required to attend and participate in UAV Operational Training.
 - (b) Installation of Enduro 4G RGB camera and Goanna 4G CatM1 lo T canopy sensors in nominated check Cultivar within Rep 2 of trial as per Appendix I: NVT SORGHUM UAV FIELD PROTOCOLS
 - (c) Record and upload details of the plot that camera and canopy sensor is recording.
 - (d) Collect NVT Field trial boundaries with GPS Field AreaMeasure App and upload KML file within 7 days of recording as per Appendix I: [NVT SORGHUM UAV FIELD PROTOCOLS](#).
 - (e) Install Ground Control Points (GCP) and accurately Geolocate GCP as per Appendix I: [NVT SORGHUM UAV FIELD PROTOCOLS](#).
- 4) Flight requirements.
 - (a) A HD video flight at a height of 20m.
 - 3 in season UAV flights
 - i. post emergence at 4 – 8 main stem leaf stage
 - ii. At approximately 50% heading of trial and prior to heading on all plots

iii. Within 2 weeks prior of harvest or at day of desiccation.

5) All data is to be uploaded to online account within 7days of each capture

5.18 Plot Pathways

- 1) Pathways between ranges should be managed to provide easy access to visitors during the season. This may necessitate desiccant spraying or slashing prior to anthesis. Bearing this in mind, the management must not cause erosion risk on light soils.
- 2) The preferred timing of pathway management is to be completed by visible flag leaf, unless approved by the NVT Manager.
- 3) Pathways must be straight (perpendicular to plot row direction) to ensure uniform plot length, and if pathways are not straight, individual plot lengths must be measured and recorded.
- 4) The pathways must be trimmed to ensure any staggering of rows and plot ends are removed.

5.19 Weather Data Recording and Use

- 1) Temperatures experienced by the growing crop are to be recorded using Tiny Tag temperature sensors, installed and managed as per Appendix F, [F.1 - Tiny Tag data Logger Directions](#).
- 2) Trial Service Providers are responsible for the supply, maintenance and accuracy of all data recording devices, including the annual replacement of Tiny tag batteries and associated costs
- 3) Trial Service Providers are required to collect minimum and maximum temperature data for each site
- 4) Tiny Tag is to be installed on the day of sowing the first trial at each location where a Tiny Tag is required. The Tiny Tag should be removed immediately prior to harvest.
- 5) Trial Service Providers are required to ensure calibration, positioning and downloading of these loggers as per SOP directions.
- 6) Minimum and Maximum temperature at 15-minute intervals are recorded as per explanation in the SOP.
- 7) Tiny Tag and/or weather station data is to be loaded onto the NVT database with 7 days of harvest as per Appendix A – Data Entry, Milestones, KPI's guidelines [A.1 Data Entry Requirements](#).

5.20 Rainfall

- 1) Monthly rainfall measurements must be captured for all NVT trials, including those that are abandoned throughout the season.
- 2) Monthly Rainfall totals must be captured for a full 12 month period as per the following:
 - (a) Summer crops: Monthly rainfall totals must be entered into the NVT database for all 12 months of the financial calendar year (July - June) for each trial
- 3) Rainfall Data Source
 - (a) Rainfall totals should be captured from localised rain gauge at the trial site, or from a gauge monitored by the grower/co-operator ("Farmer Records").
 - (b) If a. above is not possible, rainfall data from the nearest BOM station can be used.

- (c) Paddock Gauge records may be supplemented with BOM data for those months where it's not possible to capture rain gauge data in the field (i.e. outside the growing season). The appropriate "Rainfall Data Source" field must be selected on the NVT database.
- 4) If the monthly rainfall total is zero, then zero (0) must be specified in the database, rather than being left blank.
- 5) Rainfall data is to be entered on the NVT database within 30 days of harvest per Appendix A – Data Entry, Milestones, KPI's guidelines [A.1 Data Entry Requirements](#).

5.21 Field Days (Public)

- 1) It is highly desirable for a field day to be held on most sites, to promote the NVT system and to enable local growers and advisers to see the advanced breeding Cultivars firsthand.
- 2) The Trial Service Provider is responsible for ensuring that the NVT trial at a field day site is presentable and safe. The Trial Service Provider is not responsible for hosting field days unless prior arrangements have been made with the NVT Manager.
- 3) If one breeding program/company wishes to speak at the field day, the same opportunity must be given to representatives of all breeding programs/companies whose Cultivars are sown at the site.
- 4) The Trial Service Provider MUST NOT accept sponsorship, or money, or any product from a sponsor or Breeder participant.
- 5) At a field day, one replicate (usually the first range) can be signposted with the names of released Cultivars, local check Cultivars and the breeder's code number.
- 6) If a pre-commercial Cultivar has been commercially released prior to the field day, its name is to be signposted.
- 7) Signage is to be of the same type and size for all genotypes, with all companies equally displayed.
- 8) The use of larger or more colourful company-specific genotype signage is prohibited for both Trial Service Providers and Breeding company representatives
- 9) The Trial Service Provider may be asked to present at a field day summarising the agronomic management to the visiting group. This is at the Trial Service Providers discretion.
 - (a) It is not the responsibility of the Trial Service Provider to create or execute field days for NVT sites unless otherwise stipulated in a separate contract based around extension and communication.
- 10) No destructive handling of any plants in any plots may occur at a field day. The field day manager must maintain the field day guests to pathways and ensure no plot access occurs to avoid site trampling.
- 11) If a breeder or breeding company wishes to access a site, this is not viewed as a field day. Breeders have full access to all sites at any point deemed to be safe for the visitor. Breeders must contact the Trial Service Provider to allow the grower to be notified, and the Trial Service Provider to inform the breeder any reason it is unsafe to do so at that point (e.g. just been sprayed by a pesticide, and a breach of withholding periods)
- 12) Abandoned trials/trial sites must not be shown or made available for field days. In addition, plots must be obscured of the abandoned trial ([see 8.5 Management of Abandoned trials/trial site](#)) before holding a field day where the trial is co-located with other remaining viable trials.

5.22 Breeder use of Trial Sites

- 1) NVT Participating Breeders may want to utilize NVT sites for extension, promotion, or training purposes. Use of NVT sites is contingent on the following:
 - (a) Authorization for access and use has been received by the Trial Manager and Trial Co-operator.
 - (b) All instructions provided are obeyed. Including
 - i. Entry & exit from the site
 - ii. Farm biosecurity requirements
 - (c) There is no impact or damage caused to trial plots
 - (d) All traffic is kept to approved walkways
 - (e) No information is shared on unreleased lines in the trials, (traits, data, NVT results). This includes NVT results of the breeder's unreleased lines.
 - (f) Social media use while on site is allowed however any issues identified should be raised directly with the Trial Manager and NVT team (not via public forums).
 - (g) All trial and agronomic issues identified should be raised directly with the Trial Manager and NVT team
 - (h) Breeder branded signage is permitted, however it can not obstruct any NVT or TSP signage already in place. All signage must be removed following completion of the event.
 - (i) NVT, GRDC, and TSP should be acknowledged in all communications and documents relating to any events.
 - (j) Use of drones to capture images is permitted provided CASA regulations are followed and permission is granted by the Trial Manager and Trial Co-Operator.
 - (k) Any data or measurements collected from the trial site must be done so according to the NVT Data and Resource Sharing Key Requirements ([link](#))

6. UNMANNED AERIAL VEHICLES (UAV/DRONES)

- 1) Unmanned aerial vehicles (UAVs/drones) are not to be flown over NVT sites without the express permission of the Co-operator, Service Provider and NVT Management.
- 2) NVT Participants (Breeders, Service Providers, NVT management and authorised third party researchers) are permitted to fly UAVs over NVT Sites to record images and/or video of the trials, providing the pilot is suitably qualified or certified.
- 3) Upon request, an NVT Manager must have access to all images and video recorded over NVT sites when requested.
- 4) No images or data collected via the use of UAV's are to be used publicly without the express written permission of GRDC and NVT.

7. HARVEST AND GRAIN QUALITY

7.1 Harvesting

- 1) The harvesting equipment should be well maintained, and staff involved well trained to minimise grain loss, and grain damage such as cracking and splitting. At least one staff member on site at harvest should be experienced with harvesting each crop type at the site and proficient at setting the harvester for optimum efficacy of grain harvest, ensuring all heads/pods are captured by the harvester, heads/pods are completely threshed without excessive grain damage, and the minimum amount of grain lost out the back of the harvester
- 2) Harvester settings - including, but not limited to, cutter bar height, reel height and speed, drum speed and concave settings, sieves and wind - must be adjusted to suit each trial prior to harvesting trial plots by harvesting buffer plots. During harvester set up (and throughout harvesting each trial) harvester efficiency should be checked to ensure all grain is collected by the harvester. Adjustments to harvester should be made to ensure all plants and parts thereof are collected by the harvester and fully threshed before exiting the harvester. Do not assume that standard harvester settings will be sufficient for each trial and different maturities of trial through the season.
- 3) The trial must be harvested at the earliest opportunity after desiccation to minimise grain losses through wind, rain, or pest damage.
- 4) Timing of harvest and desiccation will be determined by the desiccation standard specified in the regional specific protocols. Harvest should not be compromised by waiting for the last Cultivar to ripen if that Cultivar is excessively later maturing.
- 5) Trials are to be harvested in the one direction, not serpentine or circular.
- 6) All rows within a two row and middle rows of a four-row plot must be harvested.
- 7) Harvester set up and operation must endeavour to capture all the grain from each plot – including short cultivars, lodged cultivars, early maturing cultivars, and hard-to-thresh cultivars. Sometimes this will be at the expense of grain sample cleanliness. It is an expectation that grain from plots will be cleaned to an adequate standard prior to grain quality testing which may necessitate re-threshing and cleaning of samples.
- 8) The harvester set up, operations and timings must allow for adequate cleaning of the harvester between plots to ensure no carry-over of grain between plots.
- 9) Observations of any damage to plots are to be recorded by the Trial Service Provider and reported to the NVT Manager. Observations prior to harvest include but are not limited to head loss, shattering, or lodging as described in the crop-specific protocols
- 10) Any losses of grain that may have occurred at, prior to, or during harvest must be recorded and reported. Plots should be inspected immediately post-harvest to ensure no excessive grain loss has occurred during harvest. Where differences in grain losses are observed between plots the whole trial should be scored for that factor e.g. grain/pod loss and captured as a pre-harvest assessment to be considered for use in the statistical analysis (refer to APPENDIX F – [STANDARD OPERATING PROCEDURES](#))
- 11) The Trial Service Provider is to ensure all harvesting equipment is calibrated and cleaned.
- 12) The harvested grain from each plot must be separately and accurately assessed for the weight (kg), and grain moisture (%), preferably on-site, but a robust system of bagging and labelling must be instituted if off-site.
- 13) The Trial Service Provider must retain a minimum 1500 gram sample of each plot harvested for quality assessment and auditing purposes until deemed necessary by the NVT Manager. Grain samples must be kept in a permanently labelled sample bag and stored in a cool, dry place.

- 14) The remainder of the harvested grain must be handled in accordance with the NVT Managers instructions, which mandates the mixing of grain into a bulk that obscures the genetic identity of all trial material. The Trial Service Provider must keep a record of the method and date of their destruction. Bulked grain must not be sown or distributed to breeding programs or seed suppliers.
- 15) Data pertaining to harvesting must be uploaded to the NVT database by the NVT Service Provider within 7 days of harvest date as outlined in Appendix A – data Entry, Milestones, KPI's: [A.1 Data Entry requirements](#).

7.2 Grain Quality

- 1) Cultivars included in the NVT yield program will be eligible for grain quality testing with the following conditions.
 - (a) Cultivars are accepted for grain quality assessment on a crop by measurement type basis as tabled in Appendix G – Grain Quality Assessments and SOPs.
 - (b) Commercial cultivars included in the NVT trials will be eligible for all relevant crop by measurement assessments.
 - (c) Pre-commercial cultivars included in the NVT trials will be eligible for all relevant crop by measurement assessments.
 - (d) GRDC may exclude any cultivar from the grain quality assessment.
- 2) Grain Quality assessments are conducted only on trials that are deemed suitable for MET inclusion and are included in the Long Term Yield Reporter (LTYR) dataset. Grain Quality assessments are NOT required for trials that are deemed unsuitable for inclusion in the Long Term Yield Reporter (LTRY) dataset as identified on the NVT database as MET Include “NO”.
- 3) Grain Quality assessment samples are to be cleaned (aspirated) without removal of whole grain i.e. free of chaff, awns, cracked grain and other impurities. Grain Quality testing will be conducted as per the NVT contract or its variation. These will be as individual plot samples for each Cultivar from each trial replicate.
 - (a) Remaining impurities must be measured and recorded in the NVT database (e.g. % of Tcracked grain in the screenings sample).

- 4) Testing is to be conducted according to Appendix G - the Grain Quality Assessment and Procedures
- 5) Testing is to be conducted using the approved equipment referred to in the Grain Quality Assessment and Procedures (any alternatives from the approved equipment listed requires approval by the NVT Manager)
- 6) All the test results are to be entered onto the NVT database by the Trial Service Provider within 30 days of harvest date.
- 7) Facilities undertaking NVT Grain Quality determination must have evidence that an approved third party has conducted annual calibration of ALL grain quality measuring equipment. Evidence may be in the form of certification from a calibration service technician/company.
- 8) The Trial Service Provider must retain a minimum of 1000g of cleaned grain samples from each plot for the determination of grain quality and/or for auditing purposes for one year, or as deemed necessary by the NVT Manager. The retained samples should be the same sample as used for the quality assessments.
- 9) The NVT team reserves the right to access facilities undertaking NVT Grain Quality determinations for auditing purposes.
- 10) It is a requirement of all Facilities undertaking NVT Delivery Standard Determination to provide a member of staff to participate in Grain Assessment Training when determined and provided by GRDC.
- 11) Grain quality measurements are to be conducted to the approved standards as outlined in APPENDIX G – [GRAIN QUALITY ASSESSMENTS AND SOPS](#).

Crop	Protein	Oil	Moisture	Test Weight	Screenings	Retention	Grain Weight
Sorghum	% “as is”		% “as is”	kg/hl	%<2.0mm sieve		

7.3 Site Clean up

- 1) If the site requires clean-up, including removal of fencing, it must be done as soon after harvest as practicable to ensure good relations with the co-operator and local community. Details of any arrangements regarding site clean-up should form part of the Co-operator Agreement.
- 2) Sites that have been abandoned should be maintained or cleaned up in accordance with any arrangement with the grower co-operator.

7.4 Grain Sample Requests and Access (Breeders and Third Party researchers)

- 1) The NVT Manager may request the TSP provide grain harvested from NVT plots to NVT Participating Breeders or Third Party Researchers.
 - (a) TSP can only supply grain after receiving written authorisation to do so by the NVT Manager
 - (b) The TSP has the right to negotiate and recover all reasonable costs for supply of this grain from the receiver.
- 2) All applications for post-harvest grain samples must be submitted to GRDC prior to:
 - (a) Southern QLD and NSW; December 31

(b) Central QLD: March 30

- 3) Further information on accessing NVT grain samples can be found in the *NVT Data and Resource Sharing Key Requirements* document [here](#)

8. ADMINISTRATION

8.1 NVT Database

- 1) All information from any aspect of the NVT program should be stored on the secure NVT controlled database.
- 2) Relevant dates for the entry of data and associated milestones are outlined in Appendix A – [Data Entry, Milestones, KPIs](#) and may be subject to change following consultation between the NVT Manager and Trial Service Providers.
- 3) Access to the NVT database is provided to Trial Service Providers for the purpose of managing NVT trials.
- 4) Training in the use of the database will be coordinated by the NVT Manager.
- 5) User guides for growers and advisors, breeders and trial managers are available on the web site at <https://nvt.grdc.com.au/>. www.nvtonline.com.au.

8.2 Data Entry to NVT Database

- 1) All service providers are required to enter all data as required as per Appendix A– [Data Entry, Milestones, KPI's](#) and Appendix F – Standard Operating Procedures.
- 2) All Trial Service Providers are to report any potential delay in data entry to the NVT Manager in writing prior to the specified data delivery time.
- 3) NVT database user issues, bugs, errors and help requests can be emailed to nvt.help@grdc.com.au

8.3 Auditing

- 1) An audit of all trials will be conducted periodically during the growing season to monitor achievement against required outcomes and overall progress of the trial.
- 2) The aim of such audits will serve to reinforce stakeholder confidence in the NVT system.
- 3) An example of the trial audit template is found in Appendix E – NVT Trial Auditing: [E.2 NVT Site Audit Sheet](#).

8.4 Abandoned Trials

- 1) If a Trial Service Provider finds that a trial has been compromised, and/or may generate poor results for any reason, the NVT regional manager must be notified within 24 hours. The NVT regional manager will decide a plan of action for the trial, which may include abandonment.
- 2) The NVT manager retains the option to obtain other expert opinion around options for a trial before the final decision on a trial's abandonment will be made.
- 3) The NVT manager retains the authority to abandon any NVT trial. The NVT trial manager will provide direction in writing to the Trial Service Provider in this case

8.5 Management of Abandoned Trials/Trial Sites

- 1) Where trials have been abandoned post sowing, Trial Plans, Plot markers and any other identifier must be immediately removed from the site including removing the site plan and map stored on site where the abandoned trial is co-located with other remaining viable trials.
- 2) Abandoned trials need to be destroyed as soon as practical after the abandonment decision has been made.
- 3) Trials may be destroyed by spraying out with appropriate herbicides, mechanically slashed or over sown with same crop type to ensure that no genetic material can be individually identified, and plots are obscured whichever method is preferred by the co-operator.
- 4) Trials abandoned post flowering have the option to be bulk harvested with all harvested lines mixed to obscure genetic identity of lines. Individual plot grain weights must not be recorded.
- 5) Abandoned trial sites need to be managed to ensure that weeds are controlled throughout the season to ensure that the site is returned to the co-operator in a satisfactory and clean condition.
- 6) Where all trials located at the site have been abandoned the NVT Roadside Sign must be removed as soon as practical after the abandonment decision has been made.

8.6 Trial Outcomes

- 1) Individual trials will be assessed by the NVT manager to fit into three possible outcomes:
 - (a) Released – trials that meet the NVT quality standards are harvested and results are published. Trials that meet these standards are uniform and are not affected by severe yield-limiting factors.
 - (b) Unreleased – trials that do not meet the NVT quality standards. These trials may be affected by the following:
 - i. Site mean yield is below 0.3 t/ha.
 - ii. Trials that have a P value > 0.2
 - iii. Trials with an F value < 1.
 - iv. Trials affected by seasonal agronomic issues that unduly change variety rankings. Issues may include shattering, pest damage, herbicide damage or not managed in accordance with the NVT Protocols.
 - (c) Abandoned – trials that are not harvested. These trials have been compromised by high trial variability and covariates scores cannot be applied to an effective level. These trials are not considered to be a representative comparison between lines/varieties in the trial and the data has no value for genetic comparison.
- 2) Trials are assessed for inclusion or exclusion in the MET analysis
 - (a) MET excluded – trials are excluded from the MET analysis where:
 - i. Trials affected by seasonal agronomic issues that unduly change variety rankings. Issues may include shattering, animal damage, herbicide damage or not being managed in accordance with the NVT Protocols.
 - ii. Abandoned trials.
 - iii. Trials are genetically bound (as determined in the MET analysis).

- (b) MET included – all other trials are included in the MET analysis.
 - (c) Not all trials assessed as unreleased at the single site reporting level are excluded from the MET analysis. MET analysis can overcome some of the issues with single site reporting.
- 3) Trial Outcome decisions will be made by the NVT manager, and outcomes will be communicated to participating breeding programs and relevant Trial Service Providers at the earliest, appropriate opportunity.
 - 4) Trial stakeholders are invited to provide feedback regarding single site trial outcomes, MET datasets and analysis methodology before analysis and publication. Final decisions and outcomes are at the discretion of the NVT Manager. The review periods include:
 - (a) Single site analysis review period - five (5) working days beginning from the date of analysis before single site results are published.
 - (b) MET preliminary review period - two (2) working days before the Multi Environment Trial (MET) analysis begins.
 - (c) MET review period - five (5) working days from the date MET analysis results and before report is circulated.

8.7 Trial Service Provider End of Season Report

- 1) The annual “end of season” report including any otherwise unrecorded issues must be provided to the NVT Manager in MS Excel or MS Word format before the final season payment.
- 2) This report should include a general comment summary of the environmental and management issues occurring (including severity) with trials during the season, what actions were taken to mitigate the effects of the issue in the current or future years all trials conducted.
- 3) The document should report on all compromised trials, the column headings should be:

Location	Trial Id.	Sow Date	Harvest date	General Comments
				•

- 4) General Comments should include a summary of all environmental & management issues occurring including
 - (a) Environmental factors affecting trial – Outline any environmental factors that impacted successful delivery or impacted trial quality (cause, extent of impact)
 - (b) Response to environmental factors - Actions taken to salvage trials, actions taken to avoid similar issues occurring in future,
 - (c) Management factors affecting trial – Outline any management factors that impacted successful delivery or impacted trial quality (cause, extent of impact)
 - (d) Response to management factors - Actions taken to salvage trials, actions taken to mitigate future occurrence,

8.8 Reporting to NVT Manager

- 1) Trial Service Providers are required to notify GRDC NVT managers of any issue effecting potential trial rigour or trial viability within 24 hours, and as per as outlined in Appendix A – Data Entry, Milestones, KPI's: [A.1 Data Entry requirements](#).
- 2) Trial Service Providers are to immediately report to NVT manager by phone and email of any issue that arises that could potentially impact or implicate on GRDC's reputation.

8.9 Milestone Reporting

- 1) All milestones are to be completed by their due date as specified in Appendix A – Data Entry, Milestones, KPI's: [A.2 Milestones](#).
- 2) If any milestone requirement cannot be complied with, the NVT manager must be notified in writing before the specified milestone completion timeframe.
- 3) The correspondence must clearly identify non-compliance and the reason for the non-compliance.

8.10 Quality Assurance.

- 1) All Trial Service Providers must have appropriate Standard Operating Procedures and/or Quality Assurance procedures, to ensure the outcomes established in this document.
- 2) All staff must be adequately trained to accurately achieve these outcomes before they are permitted to undertake any activity on NVT trials.

8.11 Trial Service Providers Key Performance Indicators

- 1) The assessment criteria, with minimum service standards are described in Appendix A – Data Entry, Milestones, KPI's: [A.3 Key Performance Indicators](#).

8.12 Data Terms of Use

- 1) All data is the ownership of GRDC, and only data that GRDC publishes can be used, replicated, published, supplied or communicated to anyone other than GRDC unless requested by GRDC with an express written request.

8.13 Data Use Agreement for External Researchers

- 1) It is recognized that there may be opportunities to deliver greater returns from the GRDC NVT sites/data whilst still delivering against the core GRDC NVT objectives. E.g. NVT trials could be used for the development and validation of non-destructive measurements of phenotypic reactions.
- 2) The use of any NVT trials or data will require written approval from GRDC. Researchers should contact the GRDC manager with requests in line with the [NVT Resource Sharing Key Requirements](#). Approvals will be granted on a case-by-case basis.

APPENDIX A – DATA ENTRY, MILESTONES, KPI'S

A.1 Data Entry Requirements

Activity	Timeline to be uploaded into GRDC platform
Chain of Custody documents	14 days after seed delivery date
Material Transfer Agreement	October 30
Sowing date	48 hours after sowing
Effective Germination Rain Date	7 days after sowing
GPS coordinates	7 days after sowing
Trial maps (mud-maps)	30 days after sowing
Trial Rating (1-5 scale)	@ sowing @ trial visit @ Flowering @ Harvest
Predicta B results	30 days after sowing – Predicta B barcodes uploaded to NVT database (results provided directly to GRDC by the testing laboratory)
Paddock history	30 days after sowing
Seeding rate	30 days after sowing
Soil nutrition test results	30 days after sowing
Missing plots, and sowing/layout changes	7 days after sowing.
Soil Moisture	30 days after sowing.
Trial and plot measurements	10 days after measurement taken; or within 7 days after harvest;
UAV Flight imagery	7 days after flight
Temperature data	7 days after harvest
Trial Co-operator Agreement declaration	30 days after sowing
Rainfall data	30 days after harvest
Irrigation and supplementary watering	30 days after harvest
Harvest data (kg/plot & Moisture %)	7 days after harvest
Grain quality data	30 days after harvest
Notification of compromised rigour of trial or need to abandon site	24 hours
Notification of potential compromised GRDC reputation	24 hours
End of season report	60 days after harvest

A.2 Milestones

PAYMENT	Description	2021-2024
1	<p>Trials designed and sites prepared for sowing for early sown sorghum NVT.</p> <p>NVT MTAs executed in accordance with the agreement.</p> <p>NVT seed allocation received and all seed transfer documentation finalised with copies sent to the NVT manager.</p>	<p>Southern QLD and NSW</p> <p>30th August</p> <p>Central QLD</p> <p>30th November</p> <p>Ord River</p> <p>30th May</p>

PAYMENT	Description	2021-2024
2	<p>All trials sown as per district grower practice and within the NVT sowing window for each crop within each region; or as directed by the NVT Manager.</p> <p>Sowing date and Trial GPS coordinates to be entered on the NVT database within 7 days of trial sowing date.</p> <p>Variations to trial randomisations reported to the NVT Manager and modified in the NVT database within 7 days of sowing.</p> <p>Site details, gravimetric moisture, and paddock history details entered on the NVT database for each trial site in accordance with the NVT Protocols.</p> <p>Predicta B sampling completed for each trial site in accordance with the Predicta B sampling protocols, and samples mailed to the Predicta B laboratory at SARDI.</p> <p>UAV early-season Flight images uploaded.</p>	<p>Southern QLD & NSW</p> <p>31st January</p> <p>Cent QLD</p> <p>31st April</p> <p>Ord River</p> <p>30th August</p>
3	<p>Fertiliser usage, and chemical applications to date, entered onto the NVT database.</p> <p>Confirmation of all grower co-operator acceptance of trials.</p> <p>Provision of opportunistic observations in relation to agronomic traits, i.e. lodging, flowering time, etc, to the NVT database.</p> <p>Provision of fungicide application data, and other fertiliser and chemical treatments to date to the NVT database.</p> <p>Covariate and variate measurements taken and reported into NVT database as per the NVT protocols.</p> <p>UAV mid-season Flight images uploaded.</p> <p>Contract representative to attend the NVT Management Committee meeting to present a seasonal update and contribute to the annual operational plan (held between June and July each year)</p>	<p>Southern QLD & NSW</p> <p>31st March</p> <p>Cent QLD</p> <p>31st May</p> <p>Ord River</p> <p>30th Sept</p> <p>As determined by NVT Manager</p>

PAYMENT	Description	2021-2024
4	<p>All trials harvested in their optimal window.</p> <p>All yield and moisture data entered onto the NVT database for each trial within 7 days of harvest date.</p> <p>All covariate measurements entered onto the NVT database within 7 days of harvest date (at/before the time the yield data is sent to biometricians for analysis).</p> <p>Weather logging data loaded onto the NVT database within 7 days of harvest date (targeting the same date harvest data is entered).</p> <p>UAV pre-harvest Flight Images uploaded.</p> <p>Laboratory equipment used for conducting grain quality analysis is calibrated to industry standards outlined in the NVT protocols. Evidence of calibration is provided to GRDC.</p> <p>Grain quality measurements taken in accordance with the NVT protocols and submitted to the NVT database within 30 days of harvest.</p> <p>End of season report submitted to NVT Manager outlining delivery against the required service levels.</p>	<p>Southern QLD & NSW</p> <p>31st May</p> <p>Cent QLD</p> <p>30th June</p> <p>Ord River</p> <p>30th October</p>

A.3 Key Performance Indicators

No.	Key Performance Indicator	Minimum Service Standard
1	Trials are sown at sites as allocated by the NVT manager	Trials are sown within 50 kms of the allocated site name (unless otherwise approved by the NVT manager)
2	Trials are sown at correct time as directed by the NVT manager	Trials sown in the appropriate sowing window (as per NVT Protocols)
3	Use of Farmer agreement	An agreement must be prepared and signed by both the farmer and the Trial Service Provider to ensure clarity of arrangements for the trial site for any one year.
4	The GRDC investment in NVT is acknowledged and noticeable at all NVT sites	Trials are readily visible from the closest road unless negotiated otherwise with the NVT manager prior to sowing. Visible GRDC/NVT signage is displayed
5	Site Selection	Rotation: A two-year site cropping history is to be recorded on the NVT portal. Must be compliant with all herbicide plant back timeframes. Trials must be located within a surrounding sorghum crop which is sown within +/-5 days of trial. Trial is not affected by external factors i.e. trees, compaction lines, drainage lines, or inconsistent soil type.
6	Soil Type	Soil Type: Must be uniform across the site. Must be representative of the major summer cropping soil type for the region.
7	Trials have uniform plant establishment	Plots have a uniform plant population across all trial entries throughout the trial

No.	Key Performance Indicator	Minimum Service Standard
8	Trials with uniform plot spacing's	Trials with all plots having a uniform plot spacing
9	Trials with uniform number of rows per plot NOTE: Dry sown trials affected by lack of rain are discounted.	All plots in a trial with the same number of rows
10	Trials are free of manageable diseases	Trials are to be free of diseases that can be prophylactically managed i.e.
11	Trials are free of manageable pests	Trials are to be free of pests that can be prophylactically or actively managed i.e. pigs, midge etc
12	Trials are weed free (relative to surrounding crop).	Trial sites chosen to avoid herbicide resistance sites and weeds are managed to be as clean or cleaner than the farmers surrounding crop.
13	Visitor access to sites facilitated	Access track is required is more than 200m from the access gate/road Visitors can easily find the trial of interest at a multi-trial site
14	Trial pathways are straight, and plots are of uniform length	Trial pathways are straight and plot lengths are accurately measured if uneven lengths are required
15	Required Soil test data captured and uploaded for each trial as per the Sorghum NVT Protocols	Soil test results including Predicta B results, will be loaded onto the NVT database by December 30 Absence of potential yield effecting soil constraints. This must be confirmed by soil test
16	Soil Moisture	Site gravimetric moisture cores to be collected within 48 hours prior of/or at sowing. (9 cores per trial, of 3 cores per rep) and data uploaded to the database within 30 days of sowing.
17	Temperature and rainfall data provided for all sites in accordance with the Sorghum NVT Protocols	Tiny Tag placed in a Stevenson type screen. Tiny tag and rainfall data is provided for all sites within the timeframes nominated in the Sorghum NVT Protocols
18	Flowering data is collected as per the Sorghum NVT Protocols	Days to flowering data to be recorded as per Sorghum NVT Protocols
19	Trial harvest direction is uniform	Trials are to be harvested in the one direction, not serpentine or circular
20	Data entry meets the service level timelines and accuracy specified in Sorghum NVT Protocols.	Data is entered to the NVT database as per Sorghum NVT Protocols. 1. Trial Site boundaries latitude/longitude, sow date and design update uploaded within 7 days after sowing.
		2. UAV Flight data uploaded within 7 days of collection
		3. Soil tests, paddock history, and trial 'mud maps' uploaded within 30 days after sowing.
		4. Crop management information such as fertiliser (in-crop), herbicides, foliar fungicides, insecticide treatments uploaded by harvest.
		5. Yield limiting Trial Plot quality observations and requested covariates uploaded within 10 days after measurement or within 7 days of harvest,

No.	Key Performance Indicator	Minimum Service Standard
		6. Harvest yield, Moisture %, tiny tag data uploaded within 7 days after harvest date
		7. Weather data downloaded and entered into NVT database within 30 days after harvest.
		8. Grain quality data uploaded within 30 days after harvest
21	Engagement with NVT Management Committee	Service provider will engage with NVT management committee as required by NVT manager
22	Trial abandonment process correctly indicated or implemented	Compromised trials are immediately flagged to the NVT manager within 24 hrs and confirmed within 14 days of first notification
		Trial abandonment and site clean-up follows appropriate NVT protocols
23	Trial is successfully completed in accordance with all NVT protocols and minimum service standards	All critical trial data is delivered in accordance with service standards and as per NVT protocols.

APPENDIX B – NVT NOMINATION AND SEED DELIVERY DATES

SORGHUM	Commercialisation Date	Nominations open	Nominations close	Nominations finalised (confirmation to dispatch seed)	Seed to be delivered by
Ord	12 th July	20th July	7 th Aug	15 th Aug	30 th Aug
Southern QLD	12 th July	20th July	7th Aug	15th Aug	30th Aug
Northern NSW	12 th July	20th July	7th Aug	15th Aug	30th Aug
Liverpool Plains	12 th July	20th July	7th Aug	15th Aug	15th Sept
Central QLD	12 th July	20th July	7th Aug	15th Aug	30th Nov

APPENDIX C – TRIAL GERMINATION WINDOWS

NVT Trial Sowing Windows

Legend

Accepted Germination window

Unpreferred but acceptable Germination window

Unacceptable germination Window

State	Crop.Name	Season	RegionName	Group.Name	Apr	Apr	Apr	Apr	May	May	May	May	Jun	Jun	Jun	Jun	Jul	Jul	Jul	Jul								
WA	Sorghum	Main	Ord	Kununurra																								
State	Crop.Name	Season	RegionName	Group.Name	Sept	Sept	Sept	Sept	OCT	OCT	OCT	OCT	NOV	NOV	NOV	NOV	DEC	DEC	DEC	DEC	JAN	JAN	JAN	JAN	FEB	FEB	FEB	FEB
NSW	Sorghum	Main	NE	North east																								
NSW	Sorghum	Main	NW	North West																								
NSW	Sorghum	Main	LPP	Liverpool Plains																								
QLD	Sorghum	Main	SEQ	East Darling Downs																								
QLD	Sorghum	Main	SWQ	Western Darling Downs																								
QLD	Sorghum	Main	CQ - Highland	Central - Highland																								
QLD	Sorghum	Main	CQ - Dawson	Dawson-Callide																								

APPENDIX E– NVT TRIAL AUDITING

E.1 Audit Process

Every trial will be audited at least once by the GRDC NVT regional manager or a nominated contracted expert on behalf of GRDC. All auditors undertake the audits in the strictest of independence. The findings of the audit will determine inclusion or exclusion of a trial to the data set, and additionally inform milestone achievement and KPI delivery of Trial Service Providers.

Trial Service Providers and Participating Breeders will have transparency to the audit details for their relevant sites.

E.2 NVT Site Audit Sheet

The site audit sheet is to assess trial accessibility, operational management and factors that will affect the quality of the trial. Circle a value for each criterion, where **9 = very good** and **1 = very poor**.

Assessor: _____

Date: _____

Crop/Trial ID: _____

Trial Location: _____

Site Selection

- a) Appropriate signage at site TRUE / FALSE
NVT signage displayed at roadside or entry point
- e) Plot one identified TRUE / FALSE
White peg or similar in plot one
- b) GPS coordinates supplied, accurate TRUE / FALSE
GPS coordinates accurate to reach trial site
- f) Tinytag in place TRUE / FALSE
Tinytag/Weather station in place with weather shield
- c) Site Location 9...8...7...6...5...4...3...2...1 NA
Trials are easily accessible and not too far from main/access road. Access not limited by 4WD only, or waterway crossing, etc.
Trials are sown within 25km of specified town/location.
- d) Site Selection 9...8...7...6...5...4...3...2...1 NA
Trials are not inhibited by site selection issues e.g. sown near tree line, sown on headland, uneven soil type or topography

Sowing

- a) Timing 9...8...7...6...5...4...3...2...1 NA
Trials sown within appropriate sowing window or within 10 days of farmer/district crops
- b) Driving Accuracy 9...8...7...6...5...4...3...2...1 NA
Trial has uniform plot spacing between rows, i.e. not too close together or far apart. Trial pathways are straight
- c) Missing Rows 9...8...7...6...5...4...3...2...1 NA
All plots have same number of rows sown, with no blocked hoses.
*Provide details of number of reps/plots and number of rows missing plants in General Comments.
- d) Tripping 9...8...7...6...5...4...3...2...1 NA
Evenness of tripping across trial. Issues where seed runs into next plot or where issue cannot be corrected with plot trimming
- e) Emergence 9...8...7...6...5...4...3...2...1 NA
Even emergence, uniform establishment across trial and within plots, appropriate plant density. Trials are established as per target plants/m²
- f) Sowing Errors 9...8...7...6...5...4...3...2...1 NA
Cultivars in trial match those shown in Plot Layout field plan. Laminated Plot Layout/Field Plan provided at trial site

Management

- a) Disease Control 9...8...7...6...5...4...3...2...1 NA
Trials are free of diseases that can be actively managed i.e. SCMV (aphids) etc
- b) Pest Control 9...8...7...6...5...4...3...2...1 NA
Trials are free of pests that can be actively managed i.e. midge, heliothis, mice, etc.
- c) Weed Control 9...8...7...6...5...4...3...2...1 NA
Trials are weed free, relative to the farmers surrounding crop, headlands are also managed appropriately
- d) Plot Trimming 9...8...7...6...5...4...3...2...1 NA
Either slashed or sprayed. Issues may be not straight paths (uneven plot lengths), spray drift into plots.
- e) Crop Health 9...8...7...6...5...4...3...2...1 NA
Trial is in good condition, adequate nutrients applied, healthy colour, height, vigour, etc.
- f) Site Cleanup 9...8...7...6...5...4...3...2...1 NA
Trial site has been left in clean, tidy condition. Weeds minimised in surrounding areas

General Comments:

Please return via email to a GRDC/NVT staff member.

APPENDIX F – STANDARD OPERATING PROCEDURES

F.1 Tiny Tag Data Loggers

Aim: To obtain minimum and maximum temperature data at NVT trial sites to assist in assessing heat stress.

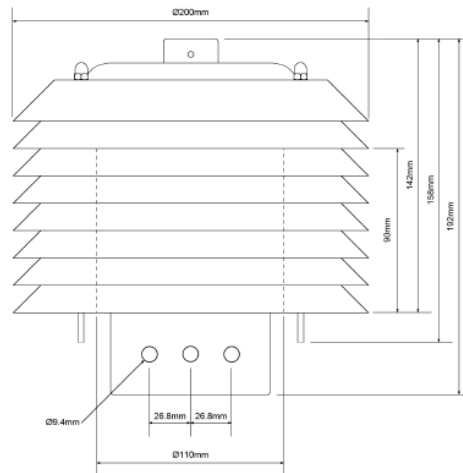


Unit: Tiny Tag Data Logger, Model # TGP-4017

A Stevenson type screen is required to protect tiny tags and must be supplied by the Trial Service Provider. The ACS-5050 Stevenson Type Screen is designed to protect Tiny tag data loggers from adverse conditions when used in outdoor monitoring applications. The screen protects units from radiant heat (direct sunlight) and precipitation, whilst allowing air to circulate freely.

Tiny Tags are to be mounted within a trial at a standard height of 1.2 meter to give conformity over all NVT sites. The stake must be of robust construction to ensure it can be supported firmly in the soil to avoid wind causing damage to tiny tags and mounts, maintaining an upright position for the duration of the season.

Tags should be set to take a temperature reading at 15-minute intervals when in the field. Temperature data must be captured from day of sowing to harvest date. Data should be retrieved, saved, and then cleared off the Tiny Tags every season. Batteries need replacing every season as well. All Tiny Tags need to be clearly labelled with the site name before being placed in the field.



F.2 Predicta B Sampling

The Predicta B sampling protocol is provided by the Predicta B laboratory at SARDI.

NVT PREDICTA soilborne disease sampling protocol

Summer rainfall cropping regions

The following guidelines have been prepared to assist researchers collecting samples from the Northern Region (north of Dubbo) prior to sowing a pulse crop in order to obtain a consistent measure of disease risk.

Materials

- Barcoded sample bags supplied by SARDI in 2020
- PREDICTA B approved soil corer **10 mm X 150 mm**; Foot stomper or AccuCore contact Russell.burns@sa.gov.au
- Clean bucket
- Esky, no ice
- Express post or courier samples to;
Attn Russell Burns, SARDI Plant Research Centre, 2B Hartley Grove, URRBRAE SA 5064

Site characterisation

- Ensure corer is clean before use. Re-clean before moving to a new site.
- Use PREDICTA Research soil bags assigned to the NVT program in 2020; the barcode is linked to this activity.
Make sure you record the barcode and site details.
- Select **15** locations on a grid to represent the site (Figure 1), and at each location collect **2** cores targeting rows of previous crop if visible (Figure 2). The total site sample will comprise **30** cores.
- Ensure each core is full before adding to the bucket; discard part-filled cores and repeat.
- At each location add **1** piece of cereal stubble **5cm** long from the base of the plant; stubble may be 1 to 4 years old
- Retain all material collected in the core; do NOT clear soil surface before coring.
- Pool the 30 cores and 15 pieces of stubble in the same bucket, then transfer to the barcoded sample bag; if sampling instructions are followed the sample dry weight should be around 500g (without sub-sampling).
- Store samples in an empty esky (no ice) to protect from direct sunlight.
- Dispatch samples to SARDI as soon as possible, if short term storage necessary, store at 5°C, do not freeze.

Plot sampling

If sampling individual plots, refer to sampling protocols on PIRSA website,

https://www.pir.sa.gov.au/research/services/molecular_diagnostics/predicta_research. Larger diameter AccuCore **12 mm X 150 mm** cores can be used to collect **20** cores per plot; can be obtained from Russell.burns@sa.gov.au.

Characterising a trial site

Select the trial site and identify **15** locations on a grid to represent the site (Figure 1). At each of the **15** locations collect **2** cores (Figure 2).

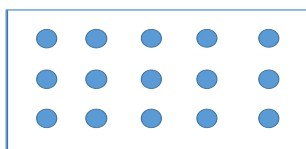


Figure 1.

Choose 15 locations on a grid that best represents designated trial site; example displayed for a rectangle site.

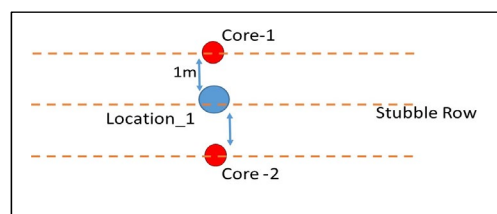


Figure 2.

Take two cores at each grid location; locate each core about 1 meter from the central location and target previous rows if visible.

F.3 Soil Testing

1. The site must have a uniform soil depth and texture and representative soil samples must be taken.

Follow Fertcare guidelines for soil testing.

A guide for fit for purpose soil sampling produced by Fertcare provides all the necessary detail on creating a representative sample for analysis.

A soil test is required at every site

Complete soil test to be carried out on the nominated four depths.

All tests to be entered on the NVT database within 30 days of sowing.

The soil testing depths required per region are:

Soil chemical tests, soil cores across the site can be bulked into 4 depths.	
1	0 – 15 cm
2	15 – 30 cm
3	30 – 60 cm
4	60 - 120 cm

Tests required

Top 15cm

- Colour and texture
- Gravel (%)
- Ammonium N, Nitrate N,
- Phosphorus (Colwell)
- Phosphorus Buffer Index (PBI)
- Phosphorous BSES
- Ammonium Acetate,(Total available Potassium)
- Chloride
- Exchangeable Cations (Ca, K, Mg, Na)
- Exchangeable Aluminium
- DTPA Trace Elements (Cu, Fe, Mn, Zn)
- Sulphur (MCP)
- pH (1:5 water) & pH (1:5 CaCl₂)
- Electrical Conductivity (1:5 water)
- Electrical Conductivity (SE) calculation
- Organic Carbon (Walkley & Black)
- Boron

Deep soil 15-30cm

- Colour and texture
- Gravel (%)
- Ammonium N, Nitrate N,
- Phosphorus (Colwell)
- Phosphorus Buffer Index (PBI)
- Phosphorous BSES

- Ammonium Acetate, (Total available Potassium)
- Chloride
- Exchangeable Cations (Ca, K, Mg, Na)
- Exchangeable Aluminium
- DTPA Trace Elements (Cu, Fe, Mn, Zn)
- Sulphur (MCP)
- pH (1:5 water) & pH (1:5 CaCl₂)
- Electrical Conductivity (1:5 water)
- Electrical Conductivity (SE) calculation
- Organic Carbon (Walkley & Black)
- Boron

Deep soil 30-60cm

- Texture and Colour
- Gravel (%)
- Ammonium N, Nitrate N
- Chloride
- Exchangeable cations (Ca, K, Mg, Na)
- Exchangeable Aluminium
- Sulphur (MCP)
- pH (1:5 water) & pH (1:5 CaCl₂)
- Electrical Conductivity (1:5 water)
- Electrical Conductivity (SE) calculation
- Boron

Deep soil 60-120cm

- Texture and Colour
- Gravel (%)
- Ammonium N, Nitrate N
- Chloride
- Exchangeable Aluminium
- Sulphur (MCP)
- pH (1:5 water) & pH (1:5 CaCl₂)
- Electrical Conductivity (1:5 water)
- Electrical Conductivity (SE) calculation

F.4 Measuring Gravimetric Soil Moisture

To assist in determining the trial site gravimetric soil moisture, collect site soil core samples and sub-sample at various depths to determine the soil water content. It is measured by weighing a soil sample (wet weight), drying the sample to remove the water, then weighing the dried soil (dry weight).

Trial Service Provider					
CORE #	depth (cm)	Core radius (cm)	Sample Thickness (cm)	wet weight (g)	dry weight (g)
1	0-15	1.9	15	126.7	92.5
	15-30	1.9	15	270.6	195.7
	30-60	1.9	30	219.0	150.9
	60-90	1.9	30	288.4	203.4
	90-120	1.9	30	273.9	195.8
2	0-15	1.9	15	171.8	124.2
	15-30	1.9	15	203.4	144.9
	30-60	1.9	30	323.9	227.0
	60-90	1.9	30	271.5	191.5
	90-120	1.9	30	345.8	244.3
3	0-15	1.9	15	135.3	100.7
	15-30	1.9	15	152.4	110.5
	30-60	1.9	30	266.6	190.4
	60-90	1.9	30	314.9	224.1
	90-120	1.9	30	316.4	225.4
4	0-15	1.9	15	175.1	132.1
	15-30	1.9	15	293.8	207.4
	30-60	1.9	30	155.0	112.2
	60-90	1.9	30	306.9	217.1
	90-120	1.9	30	405.4	289.2
5	0-15	1.9	15	109.9	80.2
	15-30	1.9	15	219.5	155.3
	30-60	1.9	30	179.1	125.3
	60-90	1.9	30	303.1	213.2
	90-120	1.9	30	406.8	290.2
6	0-15	1.9	15	168.9	124.4
	15-30	1.9	15	261.6	188.9
	30-60	1.9	30	257.9	184.7
	60-90	1.9	30	331.8	234.6
	90-120	1.9	30	302.2	212.8
7	0-15	1.9	15	152.1	114.6
	15-30	1.9	15	221.9	161.9
	30-60	1.9	30	234.8	167.5
	60-90	1.9	30	311.7	219.6
	90-120	1.9	30	261.2	189.1
8	0-15	1.9	15	131.3	102.8
	15-30	1.9	15	107.5	78.8
	30-60	1.9	30	277.0	192.8
	60-90	1.9	30	294.7	201.9
	90-120	1.9	30	290.9	205.7
9	0-15	1.9	15	175.9	133.6
	15-30	1.9	15	173.5	124.3
	30-60	1.9	30	209.4	146.4
	60-90	1.9	30	314.8	217.9
	90-120	1.9	30	350.5	248.5

Materials and Methods

Collect 9 cores per trial (3 cores per replicate) to a depth of 1.2m selecting across variations of the soil. Cores to be collected within 48 hours of sowing for every trial site. If rainfall occurs within 48 hours of sowing and sowing is delayed, the site must be recored.

Segregate cores into interval depths of:

1. 0-15 cm
2. 15-30 cm
3. 30-60 cm
4. 60-90 cm
5. 90-120 cm

The water mass must be determined by drying the soil to a constant weight and measuring the soil sample mass before and after drying. The water mass (or weight) is the difference between the weights of the wet and oven-dry samples. The criteria for a dry soil sample is that the soil sample has been dried to constant weight in oven at temperature between 100 – 110° C (105° C is typical).

Method:

1. Oven with 100 – 110°C
2. A balance of precision of +/- 0.001 g
1. Weigh samples by individual cores at each depth interval prior to placing in oven. (Wet weight)
2. Place the samples in the oven 105°C, and dry for 24 hours.
3. Weigh the samples individually and record this weight.
4. Return the samples to the oven and repeat until there is no difference between any two consecutive measurements of the individual weight of dry soil. (Dry Weight).

For each sample depth by core record and calculate:

1. Core Radius
2. Wet weight
3. Dry Weight
4. Water weight = Wet weight – dry weight.
5. % Moisture = water weight/dry weight *100

Examples of the Datasheet to collect required data for the calculation of gravimetric soil moisture. Note that it is necessary to record data for all nine cores for each depth interval

F.5 Trial Measurements Table

Activity	Description	Measurement unit	Requirement	Potential Covariate? (Y or N)
Rainfall	Report into the NVT Database as a monthly rainfall measurement. Ideally the nearby growers rain gauge should be used to collect monthly rainfall and proximity from the actual site noted in kilometres from trial in a straight line. As a last resort the local BOM records can be used.	Monthly mm	Every trial	N
Harvest Length	The longest two sides of a plot (that must be equal) and must be measured with a GPS or hand measuring tape and document into the NVT database.	Metres	Every trial	N
Harvest Width	This will be calculated by the measurement between plot centres, and the whole plot is harvested.	Metres	Every trial	N
Yield of trial	Harvest and weigh the total area of the nominated plot size. Report the weight of the plot. Harvested grain from each plot must be separately and accurately weighed, preferably on site, but if off site then a foolproof system of bagging and labelling must be instituted. Data pertaining to harvesting must be uploaded to the NVT database by the NVT Service Provider immediately following and no longer than 7 days following harvest date.	Kg per plot	Every trial	N
Moisture at harvest	Harvested grain from each plot must be separately and accurately measured for moisture content, preferably on site, but if off site then a foolproof system of bagging and labelling must be instituted. Data pertaining to harvesting must be uploaded to the NVT database by the NVT Service Provider immediately following and no longer than 7 days following harvest date.	%	Every trial	N
Number of rows in a plot	Enter into the NVT database simply the number of rows in the width of the plot (as row spacings may be different between crops).	Number	Every trial	N
Missing Row length Per Plot	Where part or all of any row in a plot > 0.5m is missing due to seeder malfunction or no emergence, measure the length of the missing row, or rows added together.	Metres	As Required	Y
Emergence	A visual assessment is to be made based on what percentage of the target total plant population has been achieved Use maximum internal % of 5	% of target population	Every trial	Y

Activity	Description	Measurement unit	Requirement	Potential Covariate? (Y or N)
	Timing of this measurement prior to tillering.			
Establishment plant count	Physically count all the plants in each individual plot. Timing of this measurement is within 5 weeks of sowing. Convert plants per plot count based on row spacing into number of plants per square metre.	Number/square metre	Every Trial	Y
Flowering time – 50% flowering	Record the day at which each plot in the trial reaches 50% flowering.	Days after Sowing (Days)	Every trial	N
Lodging score	If any lodging has occurred at the site a rating must be taken of all plots. Provide a % score of plants in the plot that have lodged (not fully erect) 100% = every plant on the ground Timing to be done at harvest.	% of plants of the total plot that have lodged.	As required	Y
Bird or animal damage (pre harvest)	A visual assessment is to be made based on of how much grain has been removed by vermin from the heads prior to harvest that has affected yield 100% = all grain has been removed. Data to be captured at harvest.	% severity	As Required	Y
Plot integrity Capturing Patchiness & uniformity	A visual assessment is to be made based on total plot area. 0 %= no factors have affected the plot other than the expression of genetics.	% area of totally affected plot	As Required	Y
Weed contamination	A visual assessment is to be made based on total impact of weed presence has had on possible yield potential of the total plot Capture and report weed type *Note all sites should be managed as per trial management in the NVT 2020 document noting that a trial should not be compromised by weed damage 100%= is total expected yield loss.	% severity	As Required	Y
Waterlogging	A visual assessment is to be made based on total plants within plot area suffering from waterlogging that may affect yield Measurement to be taken during or immediately after waterlogging event.	% severity	As Required	Y

Activity	Description	Measurement unit	Requirement	Potential Covariate? (Y or N)
	100%= is total expected yield loss.			
Chemical damage	A visual assessment is to be made based on total plot area suffering from chemical damage that will likely affect yield 100%= is total expected yield loss.	% severity	As Required	Y
Insect damage	A visual assessment is to be made based on total plot area suffering from the pest that will affect yield. Capture and report insect type. *Note all sites should be managed as per trial management in the NVT 2020 document noting that a trial should not be compromised by pest damage 100%= is total expected yield loss.	% severity Insect type	As Required	Y
Disease	A visual assessment is to be made based on total plot area suffering from the disease that will affect yield Capture and report disease incidence type. If required, send to relevant approved pathology for accurate diagnostics via plating or pathology. *Note all sites should be managed as per trial management in the NVT 2020 document noting that a trial should not be compromised by disease damage 100%= is total expected yield loss.	% severity Disease type	As Required	Y
Other Trial Measurements	Detail what is being measured in Comments 100%= is total expected yield loss.	% plot affected or severity		

APPENDIX G – GRAIN QUALITY ASSESSMENTS AND SOPS

G.1 Sampling Notes

2. Grain quality assessment within NVT will be largely based on assessment relative to trade/market specifications, as developed and published by Grain Trade Australia (GTA)
3. Prior to grain quality assessment, samples are to be cleaned (aspirated) without removal of whole grain i.e. free of chaff, awns, cracked grain and other impurities
4. Quality testing is to be conducted using equipment and procedures approved for the relevant trade specification by GTA. (Use of any alternatives equipment requires approval by the NVT manager)

G.2 Quality Analysis Testing Required for NVT

Crop	Protein	Oil	Moisture	Hectolitre Weight	Screenings	Retention	Grain Weight	Colour
Sorghum	% “as is”		% “as is”	kg/hl	%<2.0mm sieve			

G.3 Moisture Assessments

1. Definition
 - (a) This describes the NIR method for determination of moisture in cereal grains.
2. Apparatus

NIR instrument approved by the National Measurement Institute for use for trade purposes under the conditions stipulated in:

 - (i) NMI V10 (Uniform Test Procedures for the Verification, Certification and In-Service Inspection of Protein Instruments for Grain.
 - (ii) NMI M8 (Pattern Approval Specifications for Protein Measuring Instruments for Grain.
3. Procedure
 - a. Sample will be cleaned (aspirated) without removal of whole grain i.e. free of chaff, awns, cracked grain and other impurities.
 - b. Individual manufacturer instructions and procedures should be followed for operation and maintenance of NIR instruments used to determine grain moisture.
 - c. Report result to the nearest 0.1% on ‘as is’ basis.

4. References.
 - (i) NMI V10 (Uniform Test Procedures for the Verification, Certification and In-Service Inspection of Protein Instruments for Grain.
 - (ii) NMI M8 (Pattern Approval Specifications for Protein Measuring Instruments for Grain.

G.4 Protein Assessments

1. Definition

This describes the NIR method for determination of protein in cereal and canola grains.

2. Apparatus

NIR instrument approved by the National Measurement Institute for use for trade purposes under the conditions stipulated in:

- (i) NMI V10 (Uniform Test Procedures for the Verification, Certification and In-Service Inspection of Protein Instruments for Grain.
- (ii) NMI M8 (Pattern Approval Specifications for Protein Measuring Instruments for Grain.

3. Procedure

Sample will be cleaned (aspirated) without removal of whole grain i.e. free of chaff, awns, cracked grain and other impurities.

Individual manufacturer instructions and procedures should be followed for operation and maintenance of NIR instruments used to determine grain moisture.

Report result to the nearest 0.1% on 'as is' basis.

4. References.

NMI M 8 Pattern Approval Specifications for Protein Measuring Instruments for Grain.

NMI V10 Uniform Test Procedures for the Verification, Certification and In-Service Inspection of Protein Instruments for Grain.

G.5 Test Weight Assessment - Schopper Chondrometer

Schopper Chondrometer Reference Method

1. Definition

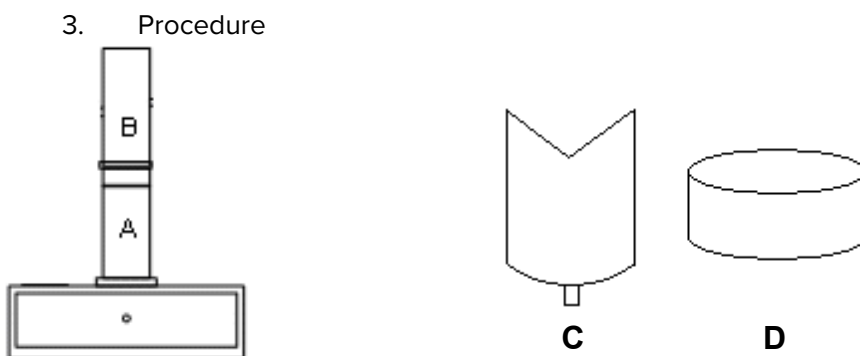
This describes the chondrometer methods for determination of test weight (bushel weight/hectolitre weight) in cereal grains.

2. Apparatus

1L Schopper Calibrated Chondrometer.

Plastic bowl

Analytical balance accurate to at least 0.01g



Secure bottom half of cylinder A to base plate on the chondrometer box.

Ensure the sliding divider C is in the slot on cylinder A.

Place weight D on top of sliding divider.

Secure top half of cylinder B to the bottom half A.

Ensure the slider is closed and pour grain in the cylinder at a constant rate until full to the top.

Pull the sliding divider out and the weight will move down, drawing the grain down with it (you will hear it moving down).

Once the weight D is at the bottom, replace the sliding divider back in the slot.

Carefully tip the cylinder upside down and tip out all the grain remaining above the divider. Make sure to catch the weight D as it drops down.

Place a plastic container on the electric balance and tare to read zero.

Remove the blade from the chondrometer and tip the measured litre of grain into the plastic container and weigh.

The weight is in grams and needs to be multiplied by 0.1 (divided by 10) to obtain a density in kg/hl.

Always undertake analysis in duplicate and average results.

Report the result to two decimal places.

4. References

Test Weight Per Bushel - AACC Method 55-10

National Measurement Institute General Certificate of Approval No 4/10/OA

G.6 Test Weight Assessment - Franklin Mark II Chondrometer

Franklin Mark II Chondrometer Reference Method

1. Definition

This is the Franklin Mark II Chondrometer reference method to determine the density of cereal grains (otherwise known as the test weight) expressed as kilograms per hectolitre.

2. Apparatus

Franklin Mark 11 Chondrometer Drop Weight Trade Certified Chondrometer.

Pre Filling Cup.

3. Procedure

assemble the instrument together and place the calibration weight onto the top of the measuring cylinder.

Place the measuring cylinder with weight on the hook at the end of the measuring beam.

- (a) Calibrate the instrument by moving the sliding weight to the position corresponding to 40kg/hl on the measuring beam. The beam should balance equidistantly between the top and bottom of the square space at the other end of the beam.

If the beam is not balanced, turn the calibration screw at the other end of the beam until the correct setting is achieved.

Remove the calibration weight. The instrument is then calibrated.

Insert the cutter bar into the bottom measuring cylinder and place the drop weight on top of the cutter bar.

Fit the top filling cylinder onto the measuring cylinder.

Fill the prefilling cup with grain.

Steadily pour the grain from the prefilling cup with one hand into the top filling cylinder until it is full whilst holding both cylinders together.

Withdraw the cutter bar in a single swift motion.

Re-insert the cutter in the slit and push it through the grain with a single firm stroke.

Remove the top filling cylinder from the measuring cylinder and discard the grain remaining above the cutter, while holding the cutter in place.

Remove the cutter and suspend the measuring container from the measuring beam of the chondrometer. Adjust the sliding weight on the beam until the instrument is balanced.

Read the test weight of the graduated balance beam at the point indicated by the sliding weight and record the result in kilograms per hectoliter.

Report the result to two decimal places.

4. References

Test Weight Per Bushel - AACC Method 55-10

ISO7971-2

National Measurement Institute General Certificate of Approval No 4/10/OA

G.7 Test Weight Assessment - Kern 222 Chondrometer

Kern 222 Chondrometer Reference Method

1. Definition

- (a) This is the Kern 222 Trade Certified Chondrometer reference method to determine the density of cereal grains (otherwise known as the test weight) expressed as kilograms per hectolitre.

2. Apparatus.

Kern 222 Trade Certified Chondrometer with valid Regulation 13 certificate.

Analytical balance accurate to at least 0.01g

3. Procedure

Assemble the measuring container with the grain cutter inserted in the slit. Place the brass piston on top of the cutter blade. Connect the filling hopper securely on the top of the measuring container.

Fill the pre-filling cup with grain.

Steadily pour the grain from the pre-filling cup into the filling hopper until the filling hopper is full.

Grasp the measuring container firmly with one hand and with the other hand withdraw the cutter in a single swift motion.

Re-insert the grain cutter in the slit and push it through the grain with a single firm stroke.

Remove the filling hopper from the measuring container and discard the grain remaining above the cutter, while holding the cutter in place.

Remove the cutter and return the base bucket to an upright position and then withdraw the cutter.

Place the Steel Bowl onto the balance and press the T (Tare) button, ensure Zeros are displayed.

Pour the grain from the bucket into the steel bowl.

The weight in grams will appear on the display of the balance. This figure is referred to as the weight in grams per litre.

All numerical results are to be written down to two decimal places.

4. References

ISO Method 7971-2

National Measurement Institute General Certificate of Approval No 4/10/OA

G.8 Screenings Assessment

1. Definition

- (a) This is the reference method used to determine the percentage by weight of Screenings (%grain <2.0mm wide).

2. Apparatus

Agtator Shaking Device

Analytical balance accurate to at least 0.01g

2.00mm Screen displaying annual certification sticker with the following specifications:

300mm diameter discs x 0.9mm stainless steel, perforated with 12.7mm x 2.00mm slots, hit and miss on ends with 4.77mm end bar and 2.0mm side bar.

3. Procedure

Obtain a certified half litre sample of grain.

Place the 2.00mm screen on top of the Agtator platform with the slots aligned toward the front of the Agtator. Ensure the screen is clean, smooth, dry and free of grain residues in the slots.

Ensure the Agtator is set to perform 40 to and fro movements over a period of approximately 68 seconds.

Pour the half litre of grain in one movement onto the screen surface. No additional movement or spreading of the sample over the screen is to occur.

Turn on the Agtator and allow it to run until the 40 movements have been completed.

Gently remove the screen and pan from the Agtator and detach the screen from the pan.

Calculate Screenings percentage - Weigh the contents of the pan on an appropriate top pan balance and calculate the percentage as follows:

$$\text{Screenings by wt (\%)} = \frac{\text{Screenings Weight} \times 100}{\text{Total Weight}}$$

- (a) Report all results to the nearest 0.1%.

APPENDIX H – REGIONAL SPECIFIC PROTOCOLS

Regional Specific Protocols tables are designed to be a template whereby the Regional NVT Committee, and other NVT stakeholders, can provide input (where required) to determine the best agronomic framework for managing trials. These are likely to be updated as needed (at least yearly).

Central Queensland	
North and South of the Emerald to Duaranga Rds.	
North CQ: 3 – 5 Sites	South CQ: 3 – 5 Sites
Criteria	Comments
Nutrition	<p>Nitrogen to be managed to achieve >10% protein at district average yields.</p> <p>Phosphorus not to be limited</p> <p>Starter Fertiliser containing at least 2% Zinc.</p> <p>Nutrition application to be informed by soil testing</p> <p>The trial must not be limited by any nutrient</p>
Site selection	<ul style="list-style-type: none"> • Wherever possible, use no-till and controlled traffic as these methods increase soil moisture storage more rapidly at depth. • Fully wet soil of at least 80% wet profile if deeper than 80cm. • <80% of wet soil at sowing increases the risk of crop failure.
Crop Rotation	<p>Avoid back-to-back sorghum.</p> <p>Ideally fallowed since previous season cereal crop</p>
Sowing dates	Refer to Appendix C -Germination Windows
Row Configuration will be regionally specific.	<p>Use Local best Practice.</p> <ul style="list-style-type: none"> • Solid plant (1.0m) • Super Single (1.5m solid) • 1m single skip • 1m double skip
Target plant establishment (use local practice within-population range)	CQ Sites: 45,000
Required herbicide/insecticide/fungicide notes (best practice)	<p>NVT service provider is to use local industry best practice to monitor and control ensuring weeds, pests and manageable diseases do not influence yield potential of any plot within the trial.</p> <p>All products must be applied as per label recommendation</p>
Harvest notes	Desiccation once 90% of the plots within the trial have developed a black abscission layer (black layer).
*if intending to work outside any of these guidelines seek input from your GRDC NVT Regional Manager	

Southern Queensland	
East and West of the Millmerran, Dalby, Chinchilla Rds.	
East: 3 – 5 Sites	West: 3 – 5 Sites
Criteria	Comments
Nutrition	<p>Nitrogen to be managed to achieve >10% protein</p> <p>Phosphorus not to be limited</p> <p>Starter Fertiliser containing at least 2% Zinc.</p> <p>Nutrition application to be informed by soil testing</p> <p>The trial must not be limited by any nutrient</p>
Site selection	<ul style="list-style-type: none"> • Wherever possible, use no-till and controlled traffic as these methods increase soil moisture storage more rapidly at depth. • Not less than 1m of wet soil at sowing unless consented to by NVT manager. • <1m of wet soil at sowing increases the risk of crop failure.
Crop Rotation	<p>Avoid back-to-back sorghum.</p> <p>Ideally fallowed since previous season cereal crop</p> <p>Avoid cotton rotation unless a minimum of 1 m wet soil</p>
Sowing dates	Refer to Appendix C -Germination Windows
Row Configuration will be regionally specific.	<ul style="list-style-type: none"> • Solid plant (1.0m or 75cm solid) • Super Single (1.5m solid) • 1m single skip • 1m double skip
Target plant establishment (use local practice within population range)	<p>Eastern Sites: 60,000</p> <p>Western Sites: 45,000</p>
Required herbicide/insecticide/fungicide notes (best practice)	<p>NVT service provider is to use local industry best practice to monitor and control ensuring weeds, pests and manageable diseases do not influence yield potential of any plot within the trial.</p> <p>All products must be applied as per label recommendation</p>
Harvest notes	Desiccation once 90% of the plots within the trial have developed a black abscission layer (black layer).
*if intending to work outside any of these guidelines seek input from your GRDC NVT Regional Manager.	

Northern NSW	
East and West of the Newell Highway north of Boggabri.	
East: 3 – 5 Sites	West: 3 – 5 Sites
Criteria	Comments
Nutrition	<p>Nitrogen to be managed to achieve >10% protein</p> <p>Phosphorus not to be limited</p> <p>Starter Fertiliser containing at least 2% Zinc.</p> <p>Nutrition application to be informed by soil testing</p> <p>The trial must not be limited by any nutrient</p>
Site selection	<ul style="list-style-type: none"> • Wherever possible, use no-till and controlled traffic as these methods increase soil moisture storage more rapidly at depth. • Not less than 1m of wet soil at sowing unless consented to by NVT manager. • <1m of wet soil at sowing increases the risk of crop failure.
Crop Rotation	<p>Avoid back-to-back sorghum.</p> <p>Ideally fallowed since previous season cereal crop</p> <p>Avoid cotton rotation unless a minimum of 1 m wet soil</p> <p>Avoid sowing immediately after canola due to allelopathic effects.</p>
Sowing dates	Refer to Appendix C -Germination Windows
Row Configuration will be regionally specific.	<ul style="list-style-type: none"> • Solid plant (1.0m or 75cm solid) • Super Single (1.5m solid) • 1m single skip • 1m double skip
Target plant establishment (use local practice within population range)	<p>Eastern Sites: 60,000</p> <p>Western Sites: 45,000</p>
Required herbicide/insecticide/fungicide notes (best practice)	<p>NVT service provider is to use local industry best practice to monitor and control ensuring weeds, pests and manageable diseases do not influence yield potential of any plot within the trial.</p> <p>All products must be applied as per label recommendation</p>
Harvest notes	Desiccation once 90% of the plots within the trial have developed a black abscission layer (black layer).
*if intending to work outside any of these guidelines seek input from your GRDC NVT Regional Manager	

Liverpool Plains	
East of the Boggabri to Coolah Rd	
3 – 5 Sites	
Criteria	Comments
Nutrition	<p>Nitrogen to be managed to achieve >10% protein</p> <p>Phosphorus not to be limited</p> <p>Starter Fertiliser containing at least 2% Zinc.</p> <p>Nutrition application to be informed by soil testing</p> <p>The trial must not be limited by any nutrient</p>
Site selection	<ul style="list-style-type: none"> • Wherever possible, use no-till and controlled traffic as these methods increase soil moisture storage more rapidly at depth. • Not less than 1m of wet soil at sowing unless consented to by NVT manager. • <1m of wet soil at sowing increases the risk of crop failure.
Crop Rotation	<p>Ideally fallowed since previous season cereal crop</p> <p>Avoid cotton rotation unless a minimum of 1 m wet soil</p> <p>Avoid sowing immediately after canola due to allelopathic effects.</p>
Sowing dates	Refer to Appendix C -Germination Windows
Row Configuration will be regionally specific.	<ul style="list-style-type: none"> • Solid plant (1.0m or 75cm solid) • Super Single (1.5m solid) • 1m single skip • 1m double skip
Target plant establishment (use local practice within population range)	Eastern Sites: 60,000
Required herbicide/insecticide/fungicide notes (best practice)	<p>NVT service provider is to use local industry best practice to monitor and control ensuring weeds, pests and manageable diseases do not influence yield potential of any plot within the trial.</p> <p>All products must be applied as per label recommendation</p>
Harvest notes	Desiccation once 90% of the plots within the trial have developed a black abscission layer (black layer).
*if intending to work outside any of these guidelines seek input from your GRDC NVT Regional Manager	

APPENDIX I - NVT SORGHUM UAV FIELD PROTOCOLS

I.1. Overview

NVT Sorghum field experimentation comprises:

- (a) UAV monitoring at each of the nominated sorghum NVT sites using DJI Phantom 4 Pro V2.0; DJI Mavic Pro V2 fitted with RGB camera types of:
 - i. Phantom 4 Pro = DJI FC6310 (EQV, 24mm)
 - ii. Mavic Pro V2 = Hasselblad (EQV, 28mm)

Canopy Sensor, and camera installation at each of the nominated sorghum NVT sites. (supplied)

Upload UAV imagery data according to protocols.

I.3. Trial Measurements

- 1. GPS of NVT boundaries
 - (a) GPS of Ground Control Points (GCP)
 - (b) Crop Canopy Sensor
 - (c) 1st UAV Flight sample date should be at the 4 to 8 visible main-stem leaf usually coinciding with scheduled establishment visit.
 - (d) 2nd UAV Flight sample date should be ~ at 50% heading of trial or before heading on all plots
 - (e) 3rd UAV Flight sample date should be ~ within 2 weeks before harvest or at desiccation

I.7. UAV Measurements.

To be conducted 3 times throughout the season at all nominated sites at specified times.

- (a) 1st UAV Flight should be at the 4 to 8 visible main-stem leaf.
 - i. Confirm Trial flight plan, check images. Upload images as directed within 7 days.
- (b) 2nd UAV Flight should be ~ at 50% heading of trial and before heading on all plots.
 - i. Repeat UAV flight with existing trial flight plan, check images. Upload images as directed within 7 days
- (c) 3rd UAV Flight should be ~ within 2 weeks of harvest or at desiccation
 - i. Repeat UAV flight with existing trial flight plan, check images. Upload images as directed within 7 days

UAV data will be uploaded to a DropBox repository. The links will be shared by email when this happens.

APPENDIX J – ACCEPTABLE PUBLIC PRESENTATION OF NVT RESULTS GUIDELINES

In order to ensure consistent and accurate reporting of NVT results, the following guidelines have been developed. GRDC requires these guidelines to be followed whenever NVT Results are published, presented or reported. GRDC's prior approval to publish, present or report NVT Results is not required,

although GRDC reserves the right to change this position and amend these guidelines at any time. GRDC also reserves the right to take any necessary action in the event that NVT Results are used other than in accordance with these guidelines.

For the purpose of this document, “NVT Results” means any output or indicator of variety performance that is analysed, predicted or demonstrated from operations conducted as part of the NVT program. This includes but is not limited to all analysed NVT yield results, NVT grain quality results, and NVT pathology results.

“NVT data” means any form of information collected at or resulting from an NVT trial.

- (1) Reference to NVT as the source of data and/or results must be made in all media resulting from use of NVT resources.
 - (a) Use of the NVT logo is encouraged and may be enforced as a condition of accessing NVT data.
- (2) Results must not be edited, manipulated, or presented in a way that could be construed as misleading, biased or otherwise detract from the value and reliability of the results.
- (3) To maintain transparency and integrity of reported NVT results it is important users can cross check any published results against the official results presented on the NVT online website. As such:
 - (a) Any results reported must clearly identify what information is included (Trial locations, years, varieties included/removed, selection rationale, etc) so results are reproducible on the Long Term Yield Reporter (LTYR).
 - (b) Results of **unreleased varieties/Cultivars** must not be published. Only results on commercially available varieties/Cultivars marked as released on the NVT Online website can be published.
 - (c) Results relating to **unreleased or quarantined trials** must not be published. Only results on trials that have been released can be published.
- (4) When presenting NVT results alongside alternatively sourced data (for example, results from other projects or trials outside of NVT):
 - (a) NVT results and alternatively sourced data should be clearly delineated.
 - (b) Recalculating and/or combining NVT results with alternative data to produce blended or mixed results should not occur.
- (5) Results from the NVT Long Term MET analysis provide the most accurate and reliable prediction of variety performance and therefore should be the only yield results used in any additional reporting.
 - (a) Participating Breeding companies have visibility of **plot level yield data (kg/plot data)** for data integrity and transparency reasons only, but it is not to be used for further analysis or reporting.
 - (b) Analysed **single site data** is available from the NVT website in the Trial Report PDF and the Statewide Tables. This information is only made available to provide growers with information in the interim between harvest of their local trials and publishing of the official MET results. It is not to be used for further analysis or reporting.
 - i. Using social media to reference a Trial Report PDF or a Statewide Table is allowed, but any post must include a direct link to the Table of PDF to ensure the latest information is presented to the reader.
 - ii. Use of screenshots is discouraged - Tables and PDFs are constantly updated/changing in the interim before MET data is finalised and available, and screenshots may not present the latest information to the reader.
- (6) Any reanalysis of NVT results should not occur.

- (a) The original NVT data set has already undergone statistical analysis to produce the NVT results. Any additional analysis will not take into account the previous analysis and will therefore produce sub-optimal results.

APPENDIX K – NVT ENGAGEMENT WITH BREEDING COMPANIES ON NVT SOCIAL MEDIA

- (1) NVT will engage with breeding companies on social media platforms if the following are met;
 - (a) If post is referencing specific variety or technology, do not make reference to competitor cultivars, programs, or technology.
 - (b) All claims made can be substantiated by publicly available NVT information, any unsubstantiated claims (e.g. Breeder produced results etc.) will not be engaged with.

APPENDIX L – NOTICE OF COMMERCIALISATION

*Please transfer the declaration below onto your company letterhead, complete the required information, and sign.
Return the declaration via email by 1 February to the NVT team ahead of the nomination period for the coming season.*

NOTICE OF COMMERCIALISATION

I _____ (**Name**),

_____ (**Position Title**),

authorised representative of _____ (**Breeder**),

declare to Grains Research & Development Corporation (**GRDC**) for the purposes of the NVT Participation Agreement entered into between the Breeder and GRDC (**Agreement**),

that the cultivar _____ (**Variety**)

on and from _____ (date of first commercial release)

is eligible for inclusion in the NVT program as a Commercial Cultivar, in accordance with the terms and conditions of the Agreement and the NVT Protocols.

The cultivar must be available to Australian grain growers to purchase seed and grow commercially in:

- the year the cultivar is first tested in NVT as a commercial cultivar funded by GRDC, and/or

I **attach** to this notice the following documents evidencing the above (e.g., documents demonstrating use of a commercial cultivar name, marketing materials, evidence of seed sales, evidence of EPR collection):

- _____
- _____
- _____

Signed for and on behalf of **Breeder**:

Signature of representative

Full name of representative (print)

Date

APPENDIX M – FENCE SIGNS

- (1) For artwork file and colour references please refer to **APPENDIX N – NVT BRAND STYLE GUIDE** available at <https://grdc.com.au/brand/#nvt>.
An example of the artwork is shown below.



- (2) The sign should be printed on:
(3) Print: Full Colour - single sided
(4) Stock: 5mm White Corflute
(5) Finished size: 594 x 841mm (A1)
(6) Finishing: Trim to finished size. Supplied with 6 eyelets in each.
(7)
(8) The blank Site Manager Field should be completed by including Site Manager Name & phone number details which can be:

Printed in a black arial font of 75 pt minimum font size, or

Handwritten using thick BLACK permanent marker with instant drying, waterproof ink that won't bleed or blur when damp

At their discretion, TSPs are able to add a NVT check-in QR code stickers to the sign between the NVT and GRDC logos.

No other design changes should be made to the fence sign without prior approval from GRDC.

APPENDIX N – NVT BRAND STYLE GUIDE

NVT encourages the use of the NVT logo wherever NVT Results are published.

if you require digital files of the various NVT logos they can be found at <https://grdc.com.au/brand#nvt>.

Some examples are shown below:

National Variety Trials

Brand Style Guide

Logo Rules

Clear Space - all NVT logos must always have a clear area surrounding it. Allow a minimum 5mm clearance, illustrated below:



The following rules also apply for all NVT logos. Don't - change the logo font or logo colours, distort the logo, reposition the lockup elements, add a drop shadow / inner glow / outer glow or any other effect.

Fonts

Two primary font families have been selected to be used in all GRDC and NVT branded collateral. In instances where there is no scope to fund or provide the primary font, the alternate secondary font is available. These fonts are:

Primary font. Proxima Nova & Proxima Nova Condensed









Secondary font. Arial

The NVT logos use the font - Proxima Nova Condensed, Semibold.

Colours

GRDC Green (PMS 348C) is to be used whenever possible. This is the primary colour for GRDC and NVT. Table 2. NVT Colours, adjacent displays all colour specifications:

Table 2. NVT Colours

	GRDC Green	Light Green	Lime	Black	White
CMYK	 100/0/85/24	 25/5/20/0	 50/5/100/0	 0/0/0/100	 0/0/0/0
RGB	 0/12/69	 191/216/204	 156/188/75	 0/0/0	 255/255/255
PANTONE	 PMS 348C	 PMS -	 PMS -	 PMS -	 PMS -

Contact

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National Variety Trials

Brand Style Guide

This style guide has been prepared in order to protect the consistency and integrity of the GRDC National Variety Trials (NVT) brand.

Please refer to this style guide before applying an NVT logo to any printed material or electronic artwork. The logos must not be re-created. A full set of logo artwork files are available from the GRDC Communications team.

Logo Forms

There are two forms of NVT logos - the NVT Default Logo (Primary) and the NVT Logomark. The primary logo should be used in all instances, except where NVT results are being displayed. The logomark should be used in all locations where NVT results are displayed. The logomark badges the results as official data of the GRDC National Variety Trials. For example, in a graph the logomark can be placed; bottom right corner in the caption/footnote, or to the right of the graph title, or in the top left or bottom right corner of the graph background etc.







Table 1. Logo Forms, adjacent displays the variations of these logos - colour, black, white. Colour is the preferred variation, then black. White is to be used when the logos appears on a dark background.

Opacity can be applied, however the approved percentages must be followed to allow enough contrast. Refer to adjacent table for allowable opacity percentage.

To maintain good legibility, do not use the colour logos on dark background, and do not use the white logos on light backgrounds.

The minimum size of each logo must be followed.

Table 1. Logo Forms

	Colour	Black	White
NVT DEFAULT LOGO (PRIMARY) Usage: in all instances (besides NVT data results), for both print and online. Minimum size: W 22mm H 12mm			
	Do not apply opacity.	Opacity is allowed. No less than 30%.	Opacity is allowed. No less than 70%.
NVT LOGOMARK Usage: in all instances where NVT data results are being displayed, for both print and online. Minimum size: W 14mm H 4mm			
	Do not apply opacity.	Opacity is allowed. No less than 30%.	Opacity is allowed. No less than 70%.

APPENDIX O – NVT QR CODES

NVT encourages the use of the NVT QR codes wherever NVT data is published. if you require digital files of the various codes, they can be found at <https://grdc.com.au/brand/nvt-qr-codes>. Some examples are shown below:

For more information, [contact the NVT team](#).



QR code goes to the [NVT website](#)

[Download](#)



QR code goes to [Harvest Reports](#)

[Download](#)

NVT Tools



QR code goes to [Trial Results](#)

[Download](#)



QR code goes to the [Long Term Yield Reporter](#)

[Download](#)

**APPENDIX P – NVT PARTICIPATION AGREEMENT - AFFILIATED PERSONNEL
NOMINATION FORM**

Participating Breeding Company Name (“*BREEDER*”) : _____

Preferred Username* (UserID)	First Name	Last Name	State	Email	Mobile Number	Crop/s Required	Company / Business Name *	Advanced User Access Required? **	Reason for requiring access

The Participating Breeder will be required to ensure that all Affiliated Personnel are abiding by all NVT data terms of use covered by the NVT Breeder Participation Agreement and the NVT Protocols.

SIGNED as authorised representative for the *BREEDER*, by a person duly authorised in that regard

Signature of authorised representative

Name of authorised representative (block letters)

Date

* New Users Only. This field cannot be changed once created in the NVT database, and it is used as the person’s login ID. This field can be any text name that the user desires. New users will receive a temporary password in an automatically generated email once added to the system. The NVT database URL is <https://www.grdc-nvt.com.au/login>

** Advanced Users have the ability and authority to nominate pre-commercial cultivars for entry into NVT via the online portal, and commit the Breeding company to all costs associated with submitting cultivars into the NVT program. They can also create new cultivars, “release” varieties, and make edits to existing cultivar owned by the company that the user is assigned to.