

Provisional proposal for a tiered registration system for Nadudana Cattle in Australia

Background:

Nadudana cattle were first introduced to Australia in 1995. A Breed Association has existed for most of the period since this introduction to attempt to monitor and support the development of the breed in the country. This Association has undergone several iterations which has created some inconsistencies in the herd book and the registration system. It is understood that significant interbreeding has occurred since this introduction and it is not clear if there are any truly pure Nadudana remaining whose lineage can be traced back to these original introductions without any crossbreeding. The membership of the current association (Nadudana Association Australia) is limited to just a handful of breeders. The current committee considers that there are a significant number of Nadudana cattle in Australia that could potentially qualify as Nadudana that are currently not registerable because they do not have full pedigree data and possibly some cattle that are just as good as registered cattle but with no documented breeding history. This includes cattle owned by existing members which can be quantified but it is also likely that there are potentially an unknown number of Nadudana owned and bred by studs that are not registered or by breeders that are not currently members of the Association. These Nadudana may have full or partial pedigree but many are likely to have no documented breeding history. It should be noted that, without any documented breeding history, there is no knowledge whether an animal with adherence to breed standard, is likely to breed true.

Objective:

The objective of this paper is to present a potential framework for a more flexible registration system with different categories of registered cattle in the herd book which can enable many of these currently unregisterable cattle to be brought back into the herd book to expand the national herd to help ensure its survival as a rare breed. It is also important, given the past history of the breed and the crossbreeding that has occurred, and given that Nadudana are rarely exhibited and thus evaluated in cattle breed shows, that the registration system ensures that breed standards are maintained and ultimately, that the national herd has the highest proportion of cattle that meet the breed standard.

This is presented here as a discussion document with the intent that the proposed system can be modified and adapted in response to feedback, prior to approval by the membership. When reviewing this document it is important to bear in mind the complexities of breeding systems and suggestions for modification need to bear in mind the need to have clear strategies for future breeding and upgrading of cattle to build the numbers of Foundation pure Nadudana.

Proposed registration criteria:

The basic principle is that we can have a tiered partially open system where we have a **Main Registry**, with two categories of registration, for what will be known a 'Foundation Pure' cattle with known Nadudana pedigree and then we could have an **Appendix Registry** allowing registration for cattle with incomplete pedigrees, upgraded cattle with crossbred pedigree and appearance certified cattle which have the appearance of Nadudana but with no documented breeding history. It may be that the Appendix Registry would eventually become obsolete when the majority of Nadudana in Australia are fully registered as Foundation Pure and we have reduced the level of threat to the future of the breed as classified by the Rare Breeds Trust of Australia.

These registration categories could be based on criteria as proposed in Table 1. There are some complexities in this system and this may be unavoidable if we are to achieve the objectives outlined above.

Main Registry of Foundation Pure Nadudana

This is an adaptation of the existing system where cattle require full pedigrees (with up to four generations of ancestry) to be registered as Foundation Pure (FP) and they must meet the criteria as minimum 87.5% purebred. This can only be established by provision of certified pedigree breeding history validated by DNA testing. Registration can be made early in the life of the calf as soon as DNA data is available to confirm the pedigree. It is understood that not all FP cattle conform strongly to the breed standard so it is intended that a further grading system should be applied to FP cattle based on a scored grading system of adherence to standard. A three tiered scoring threshold should be applied to enable cattle to be classed A, B or disqualified. Class A FP cattle will be the only ones that can be used for upgrading. Class B FP Nadudana can be used in breeding but will not contribute to upgrading. Disqualified cattle cannot be registered and cannot be used in breeding for registration purposes.

Appendix Registry for upgrading Nadudana

The Appendix Registry is for cattle that are not fully pedigreed and cannot be registered in the Main Registry but may still have useful contributions to make to the national herd. The intention is that breeders should register their cattle in the Appendix Registry with a view to using them in an upgrading programme by crossing them to Class A Foundation Pure animals. Cattle that can be considered for appendix registration include: i) F1 and backcross crossbred Nadudana; ii) Nadudana with partial pedigree documentation; and iii) animals that are considered to be Nadudana based on their appearance and their adherence to the breed standard but with no documented breeding history.

Table 1 Table of proposed criteria that could be used for a tiered registration system for Nadudana cattle in Australia

| Category | Suggested Criteria | Designation | Notes |
|--|--|-------------|--|
| Full Registry | | | |
| Full Registration Foundation pure Unclassed pre-registration | Full 5 generation pedigree verified by DNA testing and meeting minimum level of purity (87.5%). Not yet graded | FPxxxxU | This is a preliminary registration based on pedigree only prior to being classified at 2½ or 3 years old following grading. Animals bred before grading will be assumed to be equivalent to FP-B |
| Full Registration Foundation pure Class A | Full 4 generation pedigree verified by DNA testing and meeting minimum level of purity (87.5%). Grade score (at age 3+) above threshold for acceptance as Class A | FPxxxxA | These are the premium Nadudana with full pedigrees and strong conformity to standards. Only FP-A animals can be used for upgrading. |
| Full Registration Foundation pure Class B | Full 4 generation pedigree verified by DNA testing and meeting minimum level of purity (87.5%). Grade score (at age 3+) below threshold for acceptance as Class A | FPxxxxB | These are second class Nadudana with full pedigrees but weaker adherence to standards. FP-B maybe bred with other FP animals to produce FP progeny but may not be used for upgrading appendix animals. FP animals that are not graded at 3yrs+ will be assumed to be FP-B until they are graded. |
| Partial pedigree | 75% pedigree Class A | FPxxxxA | An animal for which registered pedigree is available for three out of four grandparents and which are assessed to have strong conformity to standard (i.e meet Grade |

| | | | |
|------------------|-------------------------|---------|---|
| | | | A standards). These animals are likely pure Nadudana but with some missing information. May be used for upgrading. |
| Partial pedigree | 50% pedigree Class B | FPxxxxB | An animal for which registered pedigree is available for two out of four grandparents and which are assessed to have strong conformity to standard (i.e. meet Grade A standard). These animals are likely pure Nadudana but with half of pedigree information missing. These may not be used for upgrading. |

Appendix Registry

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|--|---|-------------|---|
| Appendix Registration Appearance Certified Class A | Graded on appearance (at age 3+). Grade score above threshold for acceptance as Class A | AP2-ACxxxxA | These are animals that have good adherence to the Nadudana standard but have no breeding history. Many of these may be pure Nadudana (just lacking evidence) and this category will enable more rapid integration of their genetics into the national herd. |
|--|---|-------------|---|

| | | | |
|--|--|-------------|---|
| Appendix Registration Appearance Certified Class B | Graded on appearance (at age 3+). Grade score below threshold for acceptance as Class A but above threshold for consideration as Nadudana type | AP1-ACxxxxB | This can be used for registering animals that don't have pedigree data or have minimal documented breeding history. Should be animals that meet a minimum conformity to the standard but cannot be classified as Class A. |
| Appendix Registration Crossbred F1 | F1 crossbred between FP-A and another breed 50% Nadudana | AP1-CBxxxx | This category is to support upgrading of cattle to increase genetic variability in the breed. |
| Appendix Registration Backcross | Backcross between F1 crossbred and FP-A 75% Nadudana | AP2-CBxxxx | This category is to support upgrading of cattle to increase genetic variability in the breed but represents $\frac{3}{4}$ Nadudana genetics. |
| Partial pedigree | 50% or greater pedigree Class B | AP2-PPxxxx | Reflecting that the animal might be pure bred but does not adequately meet standard |

Only FP animals will be used in the census of the status of the breed.

Table 2 Summary of the different categories of registration

| Category | Description | Types |
|----------|---|---|
| FP-U | Foundation Pure but too young to grade | Full pedigree of pure Nadudana but less than grading age (<3years) |
| FP-A | Foundation Pure, Class A, strong conformity to standard | Full pedigree of pure Nadudana and graded as Class A $\frac{3}{4}$ pedigree of pure Nadudana and graded as Class A |
| FP-B | Foundation Pure, Class B, weaker conformity to standard | Full pedigree of pure Nadudana graded as Class B |

| | | |
|------|---|---|
| | | Full pedigree of pure Nadudana ungraded. ½ pedigree of pure Nadudana and a graded as Class A |
| AP-1 | Appendix registered needs two generations of upgrading to attain FP | Appearance certified, meets minimum standard but not Class A F1 (50% pure) crossbred animal using FP-A parent |
| AP-2 | Appendix registered needs one generation of upgrading to attain FP | Appearance certified, graded as Class A, strong conformity to standard 75% crossbred/backcrossed animal using FP-A parent Partial pedigree (50% or 75%), meets minimum standard but not Class A |

The system would also need to allow for upgrading of progeny from Appendix Registry parents to the Full Registry and this needs to be considered and debated as it introduces further complexities. A proposed system for upgrading based on the possible types of crosses is presented in Table 3.

Table 3 Foundation Pure and upgrading options for crosses of different categories of registered cattle.

| Parent A | Parent B | Designation | Notes |
|---------------------------------|----------|-------------|---|
| <u>Foundation Pure breeding</u> | | | |
| FP-A | FP-A | FP | Class would be determined at grading (3+) |
| FP-A | FP-B | FP | Class would be determined at grading (3+) |
| FP-B | FP-B | FP | Class would be determined at grading (3+) |
| FP-U | FP-A | FP | Class would be determined at grading (3+) |
| FP-U | FP-B | FP | Class would be determined at grading (3+) |
| FP-U | FP-U | FP | Class would be determined at grading (3+) |
| <u>Grading up breeding</u> | | | |
| FP-A | AP-1 | AP-2 | Considered 75% pure |
| FP-B | AP-1 | AP-1 | |

| | | | |
|------|------|------|--|
| FP-A | AP-2 | FP | Considered 87.5% pure, Class would be determined at grading (3+) |
| FP-B | AP-2 | AP-2 | |
| AP-1 | AP-1 | AP-1 | |
| AP-1 | AP-2 | AP-1 | |
| AP-2 | AP-2 | AP-2 | |

Grade scoring classes of animals

If we are to include conformity to standard as part of the criteria for registration to be applied to manage quality in Foundation pure stock and for appearance certification it will be necessary to develop a grading system for assessing conformity to standard. Physical on-site inspection of cows is not really an option due to the cost of organising assessment by qualified individuals and the fact that Nadudana are rarely shown in front of judges.

It is thus proposed that an assessment system is developed based on photographs and accompanying declarations. These submissions can be evaluated and categorised by one or more qualified assessors who are appointed by the NAA but independent of the Association (i.e. not breeders). However, one of the challenges here is that the breed standard (see Table 1) applies to adult animals, particularly for size criteria but also for characteristics such as horns. Thus conformity to standard can only really be assessed in mature animals, say those over 3 years old (or 2 ½ to be agreed?).

It is thus proposed above that Foundation Pure animals are provided with an initial registration based on their documented pedigree (with DNA evidence) with a secondary registration made when the animal attains the required age and is graded. The grading assessment will have threshold scores dividing cattle into Class A, Class B and unregistered. With the thresholds to be established when NAA has developed and evaluated a grading scheme. For breeding purposes, ungraded cattle shall be considered as Class B (FP-B) and thus should not be used for up-grading. If an animal is used for breeding before being graded and is then subsequently graded as Class A, it will be possible to upgrade the registration of the progeny it produced prior to its grading.

Owners with cattle with only partial pedigree or no pedigree could apply to register their animals under an appendix standard if they meet conformity criteria as adults based on the assessment of conformity to standard.

The grading system will need to be standardised and based on weighted importance all the elements of the standard. Once the Registry system is agreed members can be consulted on developing the grade scoring systems based on such weightings. A fee structure for primary and secondary registration would be required on the assumption that NAA will need to pay a fee for the assessors. We would also need to develop a standardised procedure for preparing submissions for grading including details of the data and photographs to be provided.