Cultivar development in the southern African citrus industry

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Cultivar Development (CD) entails creating new cultivars, improving existing cultivars, obtaining access to existing cultivars, evaluation of cultivars and managing the commercial utilisation of the cultivars. This must not be confused with the Citrus Improvement Scheme (CIS), which entails the processes and procedures for handling of citrus propagation material to ensure that the material is of sound phytosanitary and horticultural status. This document looks at CD within the southern African citrus industry.

PAST

In the distant past, most cultivars were “open access”. Cultivars moved fairly readily between industries across the world. The southern African citrus industry principally gained access to new cultivars through involvement of Outspan’s CD department in international sourcing, the local breeding programme operated by the ARC and identification of naturally occurring mutations.

The “open access” nature of cultivars has changed dramatically over the past 15 years. The majority of recently developed cultivars have Plant Breeders Rights (PBR) attached to them. This is similar to a patent and protects the owners’ rights. A PBR on citrus cultivars lasts for 25 years from date of granting, the owner is entitled to charge royalties and for the first 8 years can restrict access (that is decide who may and may not plant the cultivar). It is important to distinguish between the owner and a licensed agent. Decisions about the conditions of access to the cultivar are ultimately in the hands of the owner. The extent to which an owner may choose to delegate this to a licensed management agent remains the right of the owner. This is particularly telling when considering that many cultivar owners are, and in future can increasingly be citrus growers.
Prior to 1999, Outspan and then Capespan held management rights to most of the protected cultivars in the industry at the time. In 1999 Citrospan, a private cultivar management company was formed, and in the process, these cultivar rights moved to Citrospan, now Citrogold. Subsequently, a number of other private cultivar management companies have also become operational in the industry.

CRI was formed in 2001, but strong initial limitation of funding meant that the focus had to be restricted to continuing with the most critical Research and Development functions. The following CD functions were originally included: cultivar evaluation and limited funding of the ARC breeding programme (up until 2003); but cultivar management (including the international procurement of cultivar rights) was not included. The situation provided a vacuum that was filled by various private cultivar management companies.

In 2005, additional funding became available to CRI that enabled it to again become more active in a broader range of CD activities and appoint an industry CD manager. The following functions were added to the CD portfolio: procurement of cultivar rights, and operation of a local mutation screening programme.

CRI’s aggressive entrance into international procurement elicited a backlash from private cultivar management companies. In 2007, CRI updated its CD Policy (ratified by the CGA Board), by including the following amendments: CRI will not compete internationally for cultivar rights in a way that increases cost of access for growers, and CRI will preferably not handle cultivars that require active management beyond the sale of trees (for example cultivars where the owner requires royalties on the fruit sold). In 2009, CGA advised CRI that growers wanted CRI to increase its level of involvement in cultivars. Consequently these restrictive provisos were removed.

**PRESENT**

The current CRI CD Policy is attached as Appendix 1. The following functions are currently included in CRI’s CD portfolio:
1. **Cultivar Evaluation.** CRI operates an industry-wide cultivar evaluation project to provide growers with impartial, objective advice on planting options, regardless of the cultivar’s ownership status. CRI strives to include all available cultivars in such evaluations, but this is constrained by the willingness of private cultivar management companies to permit inclusion of such cultivars. To date, private cultivar management companies have mostly been willing to make the cultivars that they manage available for inclusion.

2. **A Natural Mutation Screening Project.** This is the most cost effective mechanism of generating new cultivars for the future. This project has now been operational for 5 years. There are already approximately 25 selections in various stages of development, but the process is lengthy and the first potential new cultivar can only be expected to be available on a commercial basis in another 15 years. The ownership of such cultivars vests with the grower who owns the tree on which the mutation was identified. There is no better opportunity for the development of new cultivars and growers being in a position to determine how they are accessible in the future. In some cases the owners of such new potential cultivars have been prepared to enter into shared-ownership agreements with CRI, but in other cases they have committed the cultivar management to private cultivar management companies. This is in apparent conflict with growers’ expression of frustration with both the dominance of private cultivar management companies, and lack of progress in providing alternative mechanisms of accessing new cultivars.

3. **International Procurement of Cultivar Rights.** CRI makes itself internationally available to acquire the rights to commercialisation of new cultivars in South Africa, but there is a need to have realistic expectations about what an industry organisation can achieve in this regard. Private cultivar management companies became well positioned to procure the rights to most of the available cultivars around the world, when they gained control of the industry’s suite of cultivar rights in 1999 and could subsequently operate in the absence of involvement of an
industry body until 2005. There is now limited opportunity for a late-entry industry body to acquire numerous or superior cultivars through international procurement. Furthermore, for many breeders, appointing a private cultivar management company to promote their cultivar may be more commercially attractive than assigning such rights to an industry body that is committed to planting advice based on objective evaluation of all available cultivar options. Nonetheless, CRI continues to be available for collaboration with cultivar owners who may prefer to work with an industry organisation. CRI has 10 new international cultivars in the first phase of introduction and evaluation and is currently negotiating for a further 8 cultivars.

4. **Accelerated Mutation Development.** Accelerated mutation development entails the use of irradiation to increase the rate of mutation in irradiated budwood, with the associated prospect of such irradiated material undergoing a mutation that codes for an advantageous horticultural characteristic. This technique has been particularly successful in producing seedless cultivars. CRI has recently initiated a small scale programme of this nature. A very small percentage of irradiated material will have advantageous effects and the development period from first successful irradiation induced mutation to a cultivar will be no less than 15 years.

5. **Breeding.** Considering the origins of the range of currently available cultivars across the world, breeding is not a particularly productive method of generating new citrus cultivars. It is expensive, with a low success rate and has a very long development term (at least 20 years). South Africa’s breeding programme has been operated by the ARC and has produced a number of new cultivars that are now becoming available for commercialisation. Growers made funding contributions to this breeding programme over the years, terminating in 2003 when agreement could not be reached about shared Intellectual Property rights. The CGA maintains that growers have a right to an input into decisions about the commercialisation of these cultivars, and the matter is the subject of ongoing discussions. CRI is engaging with the ARC about renewed future research cooperation, given that new National
legislation and ARC Policy has clarified the Intellectual Property rights issues that gave rise to the previous breakdown in collaboration.

6. Protecting growers’ cultivar rights. CRI does engage in cultivar matters where defence of the collective rights of growers is necessary. There are cases where cultivars that should have open access have been restricted and unjust cultivar ownership rights made by private parties. In such cases, CRI does act in the interest of CGA members by engaging in legal process to protect growers’ rights.

7. Managing commercialisation of cultivars. The management of cultivars is an activity that is prone to a great deal of misunderstanding and sensitivity. The process of managing protected cultivars can range from simple non-propagation agreements and collection of royalties with the sale of trees, to more complex limitation of plantings, administering fruit royalties and coordinated marketing. Within the southern African citrus industry there is a great deal of sensitivity especially to the more complex forms of management. Grower objections to these actions are mostly directed at the cultivar management companies, whereas they are often just executing directives handed down to them by the cultivar owners (in some cases growers themselves) and grower clubs. Regardless of whether these frustrations are justified or appropriately directed, the group of cultivar management companies operating in southern Africa have facilitated industry access to most leading cultivars currently available around the world.

CRI also does manage cultivars, both open-access and protected. However, CRI has to date refrained from pursuing licenses to manage cultivars where the owners require the more intensive and intrusive forms of management involvement (for example collection of fruit royalties and involvement in marketing).

It is noteworthy that the majority of protected cultivars owned by local growers have been licensed to private cultivar management companies and not CRI. This is in apparent conflict with the call from growers for CRI to become more directly
involved in the management of cultivars as an alternative to private cultivar management companies.

FUTURE

Both the Boards of CRI and CGA have taken cognisance of growers’ expression of dissatisfaction with various aspects of CD. A great deal of careful consideration has been given to this complex issue. Every reasonable effort is being made to ensure that grower expectations will be met in the future, to the fullest extent that is reasonably achievable. There is also a need within the industry to gain a balanced understanding of what can reasonably be achieved and very importantly grower support for the efforts of industry bodies in this endeavour.

The first priority must be to ensure that the industry has mechanisms in place to ensure that propagation material meets appropriate phytosanitary and quality standards. This function is provided through the CIS that CRI administers for the industry. Participation in the CIS is still voluntary. Although there is a very high level of voluntary compliance with the CIS, the CGA and CRI have been pursuing the instatement of a statutory CIS for several years. This remains a top strategic priority required to ensure biosecurity and quality of the industry’s supply of propagation material. It establishes an environment within which responsible CD can be operated by all parties. The complete unwaivering support of growers is needed to ensure that the statutory nature of the CIS is achieved in the near future.

The following CD functions will be undertaken by CRI and other CGA industry bodies:

1. **Cultivar Evaluation.** CRI will continue operating the cultivar evaluation project, striving to include all available cultivars in objective and impartial evaluations and provision of readily accessible and relevant information to assist growers in making informed planting decisions. Grower support is required to encourage private cultivar owners and agents to make their cultivars available for inclusion in these evaluations.
2. **A Natural Mutation Screening project.** CRI will continue to operate and escalate the intensity of the natural mutation screening project. This is the most promising source of potential new cultivars, but strong grower support is essential for success. Firstly there is the need to look for signs of promising mutations and to engage CRI CD to evaluate the potential of the discovery. The ownership right of growers in such discoveries is fundamental to any industry effort to re-shape the future of cultivar access. The selection of a development partner (CRI or a private cultivar management company) and subsequent commercialisation model is solely that of the grower. In other words, **whereas the current status of cultivar control and ownership in the industry is a source of dissatisfaction among growers, the future profile of the industry's cultivar basket is squarely in the hands of growers themselves.** This is a long term endeavour and it is essential to have realistic expectations about how quickly changes can be effected. CRI will remain available to support growers in re-shaping the future of the industry’s cultivar landscape, but growers must be prepared to provide CRI with the opportunity to do so.

3. **International Procurement of Cultivar Rights.** CRI will continue to be available for appointment as licensee for cultivars where the owner elects to work with an industry organisation. However, given CRI’s commitment to dealing with all cultivars in the industry in an impartial and objective manner, many overseas cultivar owners seeking maximisation of commercial returns can be expected to continue licensing their cultivars to private cultivar management companies. The CGA Board has indicated that consideration may be given to the potential utilisation of a commercial industry body to pursue a more aggressive procurement of such cultivar rights. CRI will continue to support the industry gaining access to the best cultivars, by facilitating the quickest, but safe, movement of all new cultivars through quarantine and into the CIS pipeline, regardless of their ownership or management status.
4. **Accelerated Mutation Development project.** CRI will continue to develop a small, directed, accelerated mutation development project. CRI is well positioned in terms of expertise and facilities to operate such a project at low cost, with reasonable prospects of future success. It must be remembered that the application of irradiation is principally directed at the improvement of existing cultivars and that it is also a long term exercise, with a typical least development time to commercial availability of 15 years. In most cases, improvement of the cultivar will not change its ownership status, with the exception of open-access (unrestricted) cultivars, where CRI can obtain ownership of the new improved cultivar. Consequently, the focus will primarily be on improvement of open-access cultivars. However, CRI will also offer the service to private cultivar owners, because all improvements will be in the interest of the industry as a whole. However, growers must realise that due the nature of ownership rights, new cultivars arising from improvement of any such protected cultivars will in most cases remain under the control of the current owners.

5. **Breeding.** CRI and CGA will continue to engage with the ARC on the handling of cultivars both from the past and in the future. CRI could begin operating its own conventional breeding programme. However, this is not considered a prudent option for the industry, given the low rate of success with such an approach, the very long term for expected output and the high cost (a minimum of R3m pa). There is good potential for CRI to become more directly involved in the ARC’s breeding programme in the future (being a more affordable approach) and this will be investigated.

Triploid breeding is a specific approach to breeding that has better prospects for success than conventional breeding. CRI has initiated the development of a small scale, focussed triploid breeding project and will pursue this strategy into the future, either on its own or in collaboration with the ARC. However, growers need to have realistic expectations of what is achievable with such a project, both in terms of
likelihood of successes and the very long term nature of the exercise (at least 20 years).

6. **Management of Cultivar Commercialisation.** CRI will continue to handle open-access cultivars. CRI will also continue to remain available for being licensed by owners of protected cultivars to manage the commercialisation of cultivars in South Africa. CRI will preferentially pursue less restrictive and intrusive commercialisation models and avoid involvement in management of cultivars where owners demand fruit royalties and interference in the market. CRI will conduct such services on a non-profit basis. It must be recognised that the pool of cultivars that internationally remain available is limited and that many owners may prefer to license their cultivars to commercially driven management agents. Where cultivar owners prefer to work with an industry body, CRI will be the obvious preferred partner.

CGA may also investigate the prospect of deploying an industry-owned commercial entity to potentially engage in more commercially oriented international procurement of cultivar rights in addition to the CRI’s role. However, here again it must be remembered that conditions of access to cultivars are largely dictated by the owner of the cultivar and therefore cultivars procured through such a channel will in most cases have similar conditions of access to those accessible through current commercial cultivar management companies.

7. **Protection of growers’ cultivar rights.** CRI and CGA will continue to protect the collective cultivar rights of growers where appropriate. Unjustified restriction of access to open-access cultivars will be challenged. The rights of access to cultivars arising from publicly funded research (such as the ARC breeding programme) are subject to various legal obligations. These rights will be defended wherever necessary.
CONCLUSION

The circumstances under which CD operates in the southern African citrus industry has changed dramatically over the past 2 decades. CRI and CGA have remained involved in CD from their inception. This was initially only partial in terms of types of activities engaged in, but has subsequently become comprehensive, as both more resources have become available and growers have demanded greater involvement. A good foundation for future change to the industry's cultivar environment has already been established and success is achievable with strong ongoing support, but there is a need for an industry understanding of what is realistically achievable to avoid the build up of frustration over the long-term nature of these CD projects.

CGA and CRI have taken cognisance of growers' frustration with the status of industry cultivar matters and have subjected the matter to exhaustive evaluation of options. A path has been carefully crafted and set for the future and whereas this requires commitment from industry bodies, the success of this strategy is fundamentally dependent on future grower actions. CGA's industry structures will provide the requisite mechanisms, but re-shaping the future of the industry's cultivar portfolio is in the hands of individual grower decisions. If they support the type of projects that are offered, the industry can re-shape the industry's cultivar environment.
Appendix 1

CULTIVAR DEVELOPMENT POLICY

A. BACKGROUND

CRI’s mission includes the maximisation of “the long-term global competitiveness of the southern African citrus growers through the development, support, co-ordination and provision of Research and Technical services....”. Access to new cultivars impacts on the future global competitiveness of citrus growers, and the availability of objective and accurate information on available cultivars is valuable in assisting growers to make appropriate cultivar planting decisions. The citrus growers of southern Africa have therefore instructed CRI to be involved in all aspects of cultivar development. Given the historic background to cultivar development in the industry, it is acknowledged that it is not feasible for CRI to occupy a position where it controls all cultivars. It is therefore important that CRI cooperates with other cultivar development organisations and has in place a policy that directs the operation of CRI’s Cultivar Development Division.

B. OBJECTIVES

B1. CRI will strive to ensure that southern African citrus growers are provided with timely access to cultivars and that such access be on reasonable terms and conditions.

B2. CRI will strive to provide the southern African citrus growers with appropriate and impartial information on cultivars and rootstocks in order to assist growers in making decisions with respect to plantings and product quality standards.

C. MODE OF OPERATION

C1. In pursuit of Objective (B1) above:

1.1 CRI will operate a mutation screening project to identify and develop new cultivars arising from natural mutations.

1.2 CRI may choose to operate or support one or more of the following as additional, and potentially cost effective, sources for new cultivars: an accelerated mutation (irradiation) screening project; an in-house breeding programme; and other citrus breeding programmes, both local and international.

1.3 CRI (on behalf of all southern African citrus growers) will be available to acquire citrus cultivar rights, both locally and internationally.

1.4 CRI will strive to expedite the movement of all cultivars through the post-entry quarantine, STG, pre-immunisation, virus indexing and CIS pipeline.

C2. In pursuit of Objective (B2) above:
2.1 CRI will operate a cultivar and rootstock evaluation project, including as wide a range of relevant cultivars as it can access.

2.2 CRI will make available to growers, objective and reliable information on cultivars and rootstocks.

2.3 On the request of growers or the relevant regulators, CRI will provide available technical information to facilitate the establishment of relevant product quality standards.

D. GUIDING PRINCIPLES

D1. With regard to Objective (B1) and its associated Mode of Operation (C1) above:

1.1 CRI will pursue provision of grower access to cultivars, on a non-profit basis.

1.2 CRI will respect the rights and protection afforded to other parties by Plant Breeders’ Rights and other relevant legislation.

1.3 CRI will comply with all relevant phytosanitary regulations.

1.4 The funding of breeding programmes will be conducted via standard CRI structures, policies and procedures, that include the condition that the allocation of industry funds to such actions requires, as a pre-requisite, agreements that secure collective grower ownership (or shared ownership) of resultant IP.

1.5 The CRI Cultivar Development Division will be subject to CRI line management supervision and a CRI sub-committee may be appointed by the Board to operate as an advisory body, as required.

1.6 CRI will strive to cooperate, where appropriate, with cultivar owners and their appointed agents (cultivar management bodies), for the benefit of growers.

D2. With regard to Objective (B2) and its associated Mode of Operation (C2) above:

2.1 CRI will use a Cultivar and Rootstock Evaluation Committee (composition will be endorsed by the CRI Board of Directors) to advise on the nature and funding of the project.

2.2 The Cultivar and Rootstock Evaluation project will operate in accordance with standard CRI research policies and procedures.

2.3 CRI will deal with all cultivars on an impartial basis, regardless of the cultivar’s ownership or the management status of its rights.

2.4 CRI will strive to maximise the range of available cultivars that are included in the evaluation project, but in the case of all protected cultivars, the authorisation of the owner or agent will be obtained prior to inclusion in evaluation trials or the dissemination of any proprietary information on the cultivar.

2.5 Once a cultivar (or rootstock) has been included in the evaluation project, information on the outcome of the evaluations will be made available to growers regardless of the cultivar’s (or rootstock’s)
ownership and regardless of whether the information is favourable to the
cultivar (or rootstock) or not.

2.6 CRI will maintain objective impartiality with regard to the technical inputs
that it may be requested to make on the regulation of product quality
standards.