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The role of good genetics in sustainability and food security

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In the current global context of climate change and an expanding human population, food security needs to be ensured by implementing sustainable and resilient agricultural practices and calling on resources to make the execution of it possible. This is to ensure healthy and flavoursome food, while still being economically viable for the producer. Macadamia, the "Queen of nuts", has seen soaring increases in market demands, and has proven itself to be at the forefront of health-related food security. Consumers are becoming increasingly aware of health benefits and receiving education on it. The versatility of macadamias makes it just all the more appealing for vegans and health-conscious consumers – even cheese can be produced from this nut..

Natural resources are becoming increasingly scarce. Agricultural production costs are increasing, and in certain contexts the financial break-even point for macadamias is only after eight years. Investment into breeding programs that deliver precocious crops producing high yields of optimal quality, and that are adapted to climatic and biotic threats, is required. Breeding and cultivating new and revolutionised plant varieties, no doubt put agricultural production systems on the right path to ensure food security. Economic development and viability are only possible if innovation is made priority. This can also provide momentum to developing countries to not only alleviate poverty and enhance food security, but also to give these countries the opportunity to obtain access to global markets. The fact that macadamia requires relatively low input costs but has a high value of produce, makes it an attractive crop to reach such outcomes.

Desirable traits in crops that have been domesticated for centuries, such as apples or tomatoes, have improved over a very large timespan by means of selection of plant material. Since the macadamia has only been commercialised for 150 years, it has not gone through as many cycles of selection as these crops, so there is still a lot of opportunity to improve traits by means of selection breeding. Knowledge gained through research on breeding and genetics creates immense potential for future breeding programs.

Domesticated, cultivated macadamia varieties in their uniformity contain a limited gene pool and low genetic diversity in comparison to their wild ancestors. Original traits may have been lost from the wild over the years due to land clearing, wild fires and climate change. In these domesticated trees, genetic diversity can be enhanced by selecting wild germplasm from parent plants, to produce a cultivated crop by means of crossing and selection breeding. It is especially the rich genetic diversity in the germplasm of wild macadamias that shows potential in future breeding. Controlled cross-pollination pertaining to produce offspring with traits from both parents can be used to select trees with desirable traits, for example smaller or dwarfed trees that reach adolescence faster, bear nuts earlier, show a resistance to diseases, and are adapted to climate change.

In the last decade, several breeding programs for macadamias have come to see the light, where only two breeding programs were in existence about a decade ago. The breeding process is not simple, and in order to breed new varieties successfully, an intrinsic knowledge of plant genetics and genetic diversity is an advantage when it comes to accomplishing the best possible outcome. Careful and skilled selection of plant material and the development of new varieties is time consuming, and may take up to 15 years. Breeding also does not come cheap – it requires extensive financial input to guarantee success. Greenhouses, laboratories and other specialized tools and equipment are needed. The hard work and financial input of any breeder should be recognized and protected, and that is where the importance of plant variety protection comes in. A breeder has the right to seek protection for his/her plant patent, thus reaping the benefits of the investment. These rights do not only benefit the breeder, but also the broader society. Without giving a breeder the deserved credits and remuneration for the innovation, time and money that they have invested in the process, the future of reputable breeding programs hangs in the balance. Where resources are invested, the likelihood to obtain an improved product greatly increases, and incentives are needed for breeders to be encouraged to be apply their minds and demonstrate innovation and pioneering work.

Intellectual property protection in the tree nut industry has been limited up to relatively recently. TopNut (UK) a global nut variety management company, based in the United Kingdom with operations in South Africa, offers the service of protecting Plant Breeder's Rights (PBR) and Intellectual property and commercializing this through a secured and scalable network. TopNut is the Master Licence holder in Africa for the new macadamia nut variety MCT-1 which shows a lot of potential for growers to increase profitability back on the farm.

For more information, or if you need advice on any promising mutations in your orchard, please visit TopNut's website at http://topnutgroup.com, or contact Anneli Bosman, general business developer on (+27) 83 736 5553 or annelib@topnutgroup.com

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