

# We need to stop Australia's genetic heritage from being taken overseas

October 26 2015, by Steve Wylie

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*Nicotiana benthamiana* growing in the wild in coastal northern Western Australia. Credit: Steve Wylie, Author provided

In August this year Professor Mark Chase from the Royal Botanical Gardens at Kew, west of London, flew into Perth in Western Australia, hired a 4WD vehicle and drove north.

After clocking up 9,000km he told me he had collected seed from thousands of plants of nine species and subspecies belonging to one

genus. This genetic resource is now catalogued and stored in England. He had done the same in South Australia in 2014 and plans to repeat the exercise in WA in 2016.

Let's be clear upfront. Chase is no bio-pirate, he's a respected professor and everything he did was perfectly legal and above board.

So what's the problem?

## **A brief history of rubber**

Consider rubber. In the 1800s there was a rubber boom. Rubber trees are indigenous to the Amazon basin and Brazil was making a fortune.

In 1876 Kew Gardens commissioned Henry Wickham to steal rubber tree seeds. They were planted in the British colonies of Ceylon and Malaya forming the basis of a successful industry for the then British Empire. Brazil's rubber boom ended.

Back to present-day Australia. The plants collected by our visiting professor all belong to Western Australian native members of the genus *Nicotiana*, a cousin of tobacco, potato, tomato, eggplant and capsicum. The name looks familiar because of nicotine, a psychoactive alkaloid of tobacco, *Nicotiana tabacum*, which is native to the Americas. The Spanish took it to Europe in the 1500s. Shipping *Nicotiana* seeds between continents has a long history.

For thousands of years Australian Aboriginal peoples have used *Nicotiana* in religious practice, for medicinal purposes and recreationally. Near the end of August in 1770, Joseph Banks was aboard James Cook's ship Endeavour observing the local people who lived on the northern coast of Australia. He wrote:

*We observd that some tho but few held constantly in their mouths the leaves of an herb which they chewd as a European does tobacco [...]*

They were almost certainly chewing Pituri, made from dried *Nicotiana* leaves rolled in ash. The alkalinity of the ash releases nicotine. Native tobacco is still of cultural significance to groups of indigenous Australians.

## **Interest from overseas**

The Kew professor is not the first foreign scientist to come to Australia collecting *Nicotiana*. Illustrations of Australian *Nicotiana* plants in a series of Fact Sheets by the South Australian herbarium borrow heavily from *The Genus Nicotiana Illustrated*, a book published by Japan Tobacco in 1994.

Why the international interest in Australian *Nicotiana* species? Our English professor said his interest lay in clarifying the taxonomic status of the Australian members of the genus. But detailed taxonomic studies have already been done at the University of Melbourne: so collections of thousands of plants are not required for this purpose.

*Nicotiana benthamiana* is Australia's most scientifically famous native plant, grown in labs around the world. It grows naturally across northern WA.

Its immense value to science lies in two inter-related properties. It's extraordinarily susceptible to plant pathogens and so has been invaluable in helping understand how to control diseases in crops.

It also has the unusual ability to express proteins of many foreign genes – this made it the species of choice for GlaxoSmithKline when developing an experimental Ebola virus vaccine in response to the 2014 outbreak in

Africa. The world has already benefited from *Nicotiana benthamiana* in many ways.

## Crops of the future

A worldwide race is underway to develop tough new crops able to withstand the drought, heat and disease coming with climate change. Kew Gardens publishes a guide for bio-prospectors to collect seed from wild plants for their Adapting Agriculture to Climate Change project.

Australian *Nicotiana* species from arid zones have evolved a suite of genetic tricks to cope with the notoriously unpredictable rainfall and severe heat. They live in small, scattered populations of favourable habitat, isolated from other populations by inhospitable dry rocks and sands.

Over time, nature has experimented with these isolated populations, tested new ways to survive. Our research at Murdoch University has already shown that each distinct population exhibits markedly different responses to drought and virus attack.

Our Kew professor is attempting to sample all the genetic variety present within each Australian *Nicotiana* population so that the best genes from them may one day be selected for agriculture, or perhaps other uses. Stress tolerance genes that evolved in the deserts of Australia could one day protect fields of wheat, maize, potatoes and other crops so fundamental to our survival.

So where is the problem? We might applaud the noble quest of agricultural scientists to save the world from famine, irrespective of their geographical location.

## **Australia's rich resource**

The problem is the means by which this outcome will be achieved. Australia's scientists should be mining Australia's gene bank, and all Australians should benefit from the rewards of this intellectual property (IP).

International collaboration is the lifeblood of scientific advancement, but so is competition and protecting IP. When Australia's genetic heritage is lodged in other countries, we have lost control of our IP.

Most of Australia's mineral heritage has been sold cheaply as unprocessed ore. Our international customers increase its value many-fold through innovative manufacturing. Then we buy it back.

Should we follow the same path with our genetic heritage so that one day Australian farmers will be forced to buy from overseas agricultural companies new drought-tolerant crop varieties sporting Australian genes? Or should we build genetic IP in Australia for the sustainable benefit of Australians?

But the collection and export of Australian native genetic resources remains completely legal. The Kew professor obtained a state government Flora license permitting seed collection on WA crown lands, and a Regulation 4 Authority for collection in WA National Parks and reserves.

Exporting seed from Australia was also legal under the federal government's Environment Protection and Biodiversity Conservation Act 1999. Who can blame him then for helping himself to Australia's genetic resources? The door was wide open and a welcome sign was swinging above.

Australia is a lucky country. It has all the features needed to lead the world in the next great agricultural revolution. It has extensive farmlands, educated and technologically aware farmers, and world-class scientists.

What is under-appreciated by Australian governments is the vast wealth potential lodged in the genomes of its precious native flora and fauna. It can be assigned a quantifiable dollar value that could one day be far greater than that of our mineral wealth.

For this and many other reasons it's critical that state and federal governments protect Australia's wildlife, and legislate to prevent foreign interests raiding our [genetic heritage](#) before more is lost.

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