

Mining to Plant Enterprises Project: A case-study for potential economic diversification

Project scope

- 5.1 Established in 2012, the Mining to Plant Enterprises Project (MINTOPE) is a research partnership between Murdoch University and Christmas Island Phosphates.
- 5.2 MINTOPE evaluates the scientific merit of establishing agriculture on exhausted mining leases on Christmas Island, and has undertaken parallel research to determine if the soils and climate of the Cocos (Keeling) Islands are capable of producing agricultural crops.¹
- 5.3 The project is funded mostly through the Indian Ocean Territories Community Development Grants Programme, with the balance supported by Christmas Island Phosphates and Murdoch University. There is in-kind support from the Christmas Island Shire and the Water Corporation.² A grant from the Australian Research Council (to look at microbial biodiversity on island) supplements the project.³
- 5.4 The project has ambitious objectives, including:
 - facilitate the introduction of agriculture as a new economic driver for Christmas Island and establish a legacy beyond

1 Mr Neil Ballard, Cropping and Procurement Manager, MINTOPE, *Committee Hansard*, Perth, 8 May 2015, p. 1.

2 MINTOPE, *Submission 34*, p. 2.

3 Mr Neil Ballard, Cropping and Procurement Manager, MINTOPE, *Committee Hansard*, Perth, 8 May 2015, p. 1.

- mining that aims to reduce the reliance on imported food and produce economically viable export products;
- provide knowledge and recommendations on how to transition mining sites to arable lands;
 - develop the technical basis to establish a sustainable food chain using pulse legumes and cereals as the primary source to support small agro-businesses such as crop farming, poultry, aquaculture and horticulture;
 - trial plant species for the purpose of hard wood and plantations suitable for the cosmetic, pharmaceutical and perfume industries;
 - evaluate possibilities for integrated recovery and management of bio-wastes;
 - facilitate transmission of knowledge and experience between the MINTOPE team and the community in all forms of farming practice including broadacre mechanical cropping; and
 - provide local opportunities in tertiary level education and training in relevant sciences.⁴

Importance of reducing dependency on imported food

5.5 Limited fresh produce is grown on Christmas Island and the Cocos (Keeling) Islands. Successive JSCNCET inquiries have documented residents' dissatisfaction about the high cost of food in the IOT, which is nearly all imported (see Chapter four of this report). The poor quality of fresh produce by the time it reaches customers is another aspect. Ms Valerie Coleman observed:

Lettuces [cost] \$15...if [the produce] is not bought and eaten fairly quickly it doesn't often survive the week. Islanders on fixed incomes struggle to eat well.⁵

Planning framework integral

5.6 Redressing the island's dependency on imported food through encouraging rural development, including agriculture, horticulture and aquaculture, was one of the recommendations in the Crown Land Management Plan for the Indian Ocean Territories commissioned by the Attorney General's Department and completed in 2009.⁶

4 MINTOPE, *Submission 34*, p. 2.

5 Ms Valerie Coleman, *Submission 5*, p. 1.

6 Attorney-General's Department, *Report for Crown Land Management Plan for the Indian Ocean Territories*, Christmas Island, September 2009.

5.7 Mr Neil Ballard, Cropping and Procurement Manager, MINTOPE summarised other relevant recommendations of the Plan:

...the establishment of a research centre focusing on the sustainable production of equatorial land and marine food to assist in the introduction of agro-businesses into the island's economy; ...and that this strategy be implemented in the local planning strategy.⁷

5.8 MINTOPE explained how the recommendations of the Crown Land Management Plan were subsequently reflected in the 2011 Shire of Christmas Island Planning Strategy. In effect:

...all mining leases were included in the 'rural zone' of the Shire of Christmas Island Town Planning Scheme 2 in order to align with the standards of the Western Australian Planning Commission.⁸

5.9 MINTOPE said that planning framework provides a legitimate and robust statutory framework for MINTOPE's project.⁹

Overcoming the obstacles to agriculture

5.10 There has been a long-standing view that broadacre crop production in the IOT is not feasible.¹⁰ Problems include mineral deficiencies in the soil (including a serious deficiency of Nitrogen), mined areas devoid of organic matter - which makes growth of anything challenging - and high pH levels in most of the land. Additional challenges include seasonal conditions, variable rainfall, soil compaction (caused by machinery operation in mining activities) and pinnacle fields (sites where phosphate has been mined and self-standing limestone rocks or pinnacles are left and the phosphate mined around them: generally there is little soil left there and soil needs to be brought in to rehabilitate the sites.¹¹

5.11 Mr Ballard provided the Committee with examples of how MINTOPE had refined techniques to successfully establish agriculture on exhausted mining leases:

7 Mr Neil Ballard, Cropping and Procurement Manager, MINTOPE, *Committee Hansard*, Perth, 8 May 2015, p. 1.

8 MINTOPE, *Submission 34*, p. 2.

9 MINTOPE, *Submission 34*, p. 2.

10 MINTOPE, *Submission 34*, p. 3.

11 Mr Neil Ballard, Cropping and Procurement Manager, MINTOPE, *Committee Hansard*, Perth, 8 May 2015, p. 1 and MINTOPE, *Supplementary submission 34.1*, p. 1.

It has taken some time...due to serious compaction on the stockpile areas and working out how to manage the pinnacle fields. Only a couple of weeks ago we finished sowing a pinnacle field for the first time without any additional soil, which is the common practice for parks when they do the rehabilitation program for the government. They bring in four metres of topsoil to cover all that. Certainly in some areas that would still have to be done, but we were able to with the use of the agricultural equipment, mainly a chisel plough... get enough of the soil up and physically pick out the rocks, and sow a crop into land that we can harvest with a conventional self-propelled header that we have up there.¹²

- 5.12 Whilst the lack of Nitrogen (N) is the most limiting factor to crop production, the MINTOPE research team has found that this can be overcome through:

“N fixation” by legume crops such as soybean, mung bean, cowpea and lablab (all nutritious food). This removes the need to import expensive N-fertiliser to the IOT whilst providing high protein dietary food and feed materials.¹³

Success so far and community involvement

- 5.13 In addition to cowpea, lablab and mung bean crops, MINTOPE has cultivated peanuts, cereals (sorghum, millet, and dryland rice), and pumpkins on Christmas Island.

- 5.14 Sorghum and cowpea crops have been particularly successful:

We had some measurements done about a month or six weeks ago. The sorghum crop grew 70 tonnes per hectare of biomass in seven weeks and cowpea grew 24 tonnes of biomass. Both gave about 14 tonnes per hectare of dry matter in seven weeks, which is a significant amount of productivity...¹⁴

- 5.15 On Cocos (Keeling) Islands crops have been grown successfully on the old Quarantine Station and the Farm:

12 Mr Neil Ballard, Cropping and Procurement Manager, MINTOPE, *Committee Hansard*, Perth, 8 May 2015, p. 1.

13 MINTOPE, *Submission 34*, p. 3.

14 Mr Neil Ballard, Cropping and Procurement Manager, MINTOPE, *Committee Hansard*, Perth, 8 May 2015, p. 2.

Lablab and sorghum have been the most successful so far and although higher fertiliser rates are required [than on Christmas Island], insects have been less of a challenge.¹⁵

- 5.16 Mr Ballard said that community support and involvement is a driving force behind the project. MINTOPE consults with residents about what plant crops they want. For example, Christmas Island residents had asked if anything could be done to improve the pumpkins that grow in the wild there, but tended to be tasteless. MINTOPE found this was due to cross-pollination and had produced better tasting pumpkins:

We took new seed and planted that around our main site at Airport 4, and the taste is phenomenal.¹⁶

- 5.17 MINTOPE's community engagement strategy includes a recently held field day on Christmas Island where pumpkins were handed out (in their hundreds) and residents were shown around the project. While there had been scepticism about the viability of their project initially, Mr Ballard said that there was now community support across the board:¹⁷

One of our greatest achievements has been to overcome the negativity existing on the island about being able to successfully grow and harvest crops. Our field day in May was so successful that we have been able to convert our strongest on island critics to valuable supporters of our aims and objectives.¹⁸

- 5.18 The Christmas Island Women's Association (CIWA) indicated its approval for the project and appreciation for assistance with a community garden as well:

CIWA fully supports the development of the agricultural Mining to Plant Enterprise and the organic, sustainable vegetable production enterprise, 'Hidden Gardens' on CI.¹⁹

- 5.19 MINTOPE has designed a fertiliser mix to overcome productivity restraints, which it handed out to community members at the field day, for residents to use in their own home gardens.²⁰

15 MINTOPE, *Supplementary submission 34.1*, p. 2.

16 Mr Neil Ballard, Cropping and Procurement Manager, MINTOPE, *Committee Hansard*, Perth, 8 May 2015, p. 2.

17 Mr Neil Ballard, Cropping and Procurement Manager, MINTOPE, *Committee Hansard*, Perth, 8 May 2015, p. 2 and personal communication to secretariat by phone on 3 June 2015.

18 MINTOPE, *Supplementary submission 34.1*, p. 2.

19 Christmas Island Women's Association, *Submission 8*, p. 7.

5.20 The Chinese Literary Association voiced its support:

...[the project] looks very positive and we hope the government would support this project which will see agriculture on CI.²¹

5.21 Mr Ballard alluded to the collaborative nature of the project and emphasised that Phosphate Resources – as a major employer on island with a strong community focus - was very committed to the project, and willing to help out where it could.²²

Where to next - and scaling up

5.22 MINTOPE commented that it had taken several seasons to get to this point in its research, and that more research will be required to take crop production to the next level:

...the MINTOPE research will take several years, taking into account variations in climate from year to year and the adaptive reaction of plant species, before it can provide reliable data on yields and land preparation/management and before individuals and/or groups can formulate for themselves reliable business cases for agricultural investment...

Nevertheless...several hundred hectares could be leased to individuals or groups within a few years for the purpose of cropping, plantation or animal farming.²³

5.23 Opportunities present once agricultural production is proved to be economically viable. For instance, feed for cattle, chicken and fish could be produced, insects farmed and timber produced. Mr Ballard expanded on various possibilities:

...we can produce feed for a feedlot where animals can be fed and fresh meat can be provided to people on the island instead of having to pay \$40 a kilogram for frozen meat...

There are some potential opportunities for export into South-East Asia. The yields are good. The quantities would not be enormous, with perhaps the exception of things like pumpkins, because the

20 Mr Neil Ballard, Cropping and Procurement Manager, MINTOPE, *Committee Hansard*, Perth, 8 May 2015, p. 5.

21 Chinese Literary Association, *Submission 3*, p. 3.

22 Mr Neil Ballard, Cropping and Procurement Manager, MINTOPE, *Committee Hansard*, Perth, 8 May 2015, p. 5.

23 MINTOPE, *Submission 34*, p. 3.

acreage is not going to be enormous. There are only 2,500 hectares potentially available.

There are opportunities for other things down the track. We are looking at insect farming and we are looking at timber production. Some of the sites have already been planted; some of the native timbers on the island have already been identified as suitable for timber production, and they grow very quickly.²⁴

You could have cattle, goats and possibly sheep...It is a matter of finding the right variety or breed of sheep that would tolerate those conditions. It happens in other parts of the world, so we know how that can be done.

We have trials going on at the moment in silage production...

Challenger TAFE at Fremantle are happy to work with what we produce to develop a pellet for fish. That would make the aquaculture both on Christmas Island and the Cocos (Keeling) Islands more viable.²⁵

A further business opportunity would be a small abattoir for slaughtering animals for local consumption.

We are also trying to establish trials to use waste products, including Water Corporation waste products from sewerage treatment.²⁶

- 5.24 MINTOPE advised that it was preparing a proposal, MINTOPE 3, to secure a further \$200,000 in funding from the Commonwealth Government under the IOT Community Development Program. This would be complemented by additional cash and in-kind contributions from Christmas Island Phosphates, Murdoch University, the Shire of Christmas Island and the Water Corporation, and allow MINTOPE to continue its work for another twelve months.²⁷
- 5.25 MINTOPE said that longer term funding arrangements would be better for their project:

24 Mr Neil Ballard, Cropping and Procurement Manager, MINTOPE, *Committee Hansard*, Perth, 8 May 2015, p. 3.

25 Mr Neil Ballard, Cropping and Procurement Manager, MINTOPE, *Committee Hansard*, Perth, 8 May 2015, p. 4.

26 MINTOPE, *Supplementary submission 34.1*, p. 1.

27 Mr Neil Ballard, Cropping and Procurement Manager, MINTOPE, *Committee Hansard*, Perth, 8 May 2015, p. 3.

Subject to ongoing research we believe we can further refine the production packages. We need to have an understanding of what is required to convert old mines that haven't been left in a condition for immediate transition to agriculture...Crop species and varieties still needs a lot of work, to match them best to the climactic conditions and local threats such as insect populations.²⁸

- 5.26 Former IOT Administrator Mr Brian Lacy observed that trialling different crops over the past four years had been very successful. He said:

...[they] show promise of a viable economic enterprise.²⁹

- 5.27 On Murdoch University's involvement in the MINTOPE partnership, he added:

...tertiary education and research could be part of [boosting] the Christmas Island economy.³⁰

Committee comment

- 5.28 While on Christmas Island, the Committee had the opportunity to view the MINTOPE project site itself. The Committee saw a number of crops, including peanuts, pumpkins and lablab, all of which appeared to be growing well.

- 5.29 The project is impressive on a number of counts. Firstly, it is a collaborative effort underpinned by effective relationships with local government and industry, and embedded in the community. Secondly, the team have persevered over the years, including picking up from where they left off after missing a funding cycle in 2013. Thirdly, the project embraces possibility, experiments, refines techniques, and shares learnings. MINTOPE sees itself, rightly, as a catalyst for potential economic diversification in the IOT.

- 5.30 The Committee acknowledges that MINTOPE will need to obtain further long-term funding to continue to test commercial viability of agricultural production, and MINTOPE's position that additional land (outside the National Park on Christmas Island) should be released when research proves that agricultural production is a viable option.

28 MINTOPE, *Supplementary submission 34.1*, p. 1.

29 Mr Brian Lacy, *Submission 39*, p. 20.

30 Mr Brian Lacy, *Submission 39*, p. 19.

- 5.31 The Committee recognises the project's achievements to-date and wants to see it supported, and flourish.

Mr Luke Simpkins MP

Chair

23 June 2015

