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POSITIVE 'SEARCH PROJECT' RESULTS

John Bartle

The Natural Heritage Trust (NHT) Search Project conducted by CALM over the past four years has now delivered its final report. It concluded that there are many species in the flora of the south-west that have good potential to be developed as commercially viable large-scale crops.

The 1996 State Salinity Plan identified large-scale perennial crops as a necessary component of agricultural systems to bring salinity under control. It specified that long-term investment in developing new woody crops and processing industries be undertaken. This gave rise to the Search Project proposal that was submitted to NHT in 1997 but the project did not finally commence until 2000. It received an allocation of $4.5 million, to investigate crop and industry development, and also to establish substantial demonstration plantings.

Confidence in the Search concept was high because commercial development of native mallee species appeared to be making good progress. CALM commenced mallee development in 1993 and by the time of submission of the Search Project proposal it was proceeding strongly. Confidence was reinforced in 2001 when a commercial feasibility investigation indicated the viability of integrated mallee processing to produce a combination of activated carbon, eucalyptus oil and electricity. A$10 million demonstration processing plant has now been completed at Narrogin and is scheduled to commence operating early in 2005.

The Search Project adopted a method consisting of two parallel streams of progressively more intensive evaluation of species and products options. Species selection was confined to the WA native flora. The products had to have markets that would be profitable enough to attract farmers and large enough to accommodate all production if the crop was adopted on a scale able to make a significant contribution to salinity control. Hence the products chosen were large-scale commodities both domestic (bioenergy) and export (timber, wood panels, paper, chemicals). Specialty products like fruits, flowers, nuts, pharmaceuticals and bush tucker were therefore not included in this study because their markets are too small.

Analysis showed that potential economic viability of sawn timber production declines steeply with the decrease in average rainfall across the wheatbelt. Where rainfall is below 500mm/year conventional sawlog crops, with a production cycle of more than 30 years, are unlikely to compete with short cycle crops (like mallee) that can be harvested every 2 to 4 years. These new short cycle crops can produce wood chips for processed wood products. Some, like mallee, regenerate from the cut stump after harvest and do not need replanting. Others can be used as a 3 to 5 year de-watering phase in the annual crop rotation every 20 or 30 years. The Search Project focused in particular on species likely to be suitable short cycle coppice or phase crops.

It took some time to develop a method by which to combine the large hierarchy of objectives into a practical and systematic way to screen the entire 9977 species in the WA native flora. The first coarse level of screening had to rely on existing records. Fortunately the WA Herbarium has comprehensive and readily accessible records. Table 1 provides an overview of the steps taken.

The Herbarium lists 14,186 species names but nearly 3,000 of these are redundant. Of the current 11,038 species there are 9,977 natives. Rare and endangered species were excluded on the basis that they were less likely to be vigorous and diverse enough to warrant development. This reduced the field to 7,965. Excluding non-woody species further reduced the number to 6,339. To be consistent

Table 1: WA Herbarium list of species in various categories showing progressive selection.

Category	Region	No. Species
Total (including non-current names)	All WA	14 186
Current names	All WA	11 038
Native	All WA	9 977
Not "Priority" species	All WA	7 965
Woody (Dicotyledon Gymnosperm)	All WA	6 339
IBRA - AW - ESP - GS or MAL	Wheatbelt	3 664
Taller than 4 metres	Wheatbelt	484
Taller than 4 metres	"AW"	309
Taller than 4 metres	"ESP"	266
Taller than 4 metres	"GS"	219
Taller than 4 metres	"MAL"	293
Taller than 4 metres	All 4 areas	68

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with the native plant development preference the selection range was constrained to species that occur in the Interim Biogeographic Regions of Australia (IBRA) boundaries that encompass the wheatbelt. Of the 6,339 woody species, 3,664 occur in one or more of the 4 IBRA regions of the wheatbelt (i.e. Geraldton sandplain (GS), Avon-wheatbelt (AW), Mallee (MAL) and Esperance plains (ESP)). Herbarium specimen data on plant height was used as a surrogate for productivity of short cycle crops. Only species with a maximum recorded height greater than 4 metres were considered. This reduced the total to 484 species, with between 219 and 309 of these present in each IBRA region. Many of these species were found in more than one region, with 68 occurring in all 4 regions. Those present in more than one region were favoured because they are likely to display greater adaptability as crop plants.

The selection criteria were applied under the scrutiny of a range of experts who helped sift out undesirable species, for example, those that are parasitic, toxic, spindly in form, or found in narrow niches. Further selections were made between similar species (especially eucalypts), to trim the number of selected species back to a manageable 250 before commencing field and laboratory testing.

Field assessment commenced with wood coring to estimate wood density, a critically important factor in many processed wood products. As far as possible tested plants were selected to be representative of farm-grown crops. Consideration of wood density and to a lesser extent colour enabled the 250 species to be reduced to about 50 'test species', defined here as those that warrant intensive laboratory testing leading up to sample product manufacture.

The two major products tested in the project, paper and wood panels, have well-established testing procedures and performance standards, and require specific wood properties. These tests were undertaken at the CSIRO Forestry and Forest Products Clayton laboratories in Victoria. For wood panels, the results of wood property tests were used to select the 20 most promising species for sample panel manufacture. In the case of paper, all 50 test species were chemically pulped, since laboratory-scale pulp manufacture is relatively cheap. After pulping, the 30 species with the highest pulp yield were carried forward for sample paper manufacture and testing.

Table 2 gives ratings for the top 20 species for paper and two types of panels (medium density fibreboard and particle board). Other aspects of the project included testing of combustion and sawn timber properties, and extensive demonstration planting of the early selections of Search species, involving planting more than 6 million seedlings by 600 farmers.

The results from all aspects of the Search Project, along with a closer examination of the biological attributes and production potential of each test species, will be used to select a refined list of about 10 species for further, more intensive investigation. The most commercially promising of these will then become 'development species', and will enter full-scale development programs.

The Search Project generated considerable national interest. Its theme was adopted at the national scale by the Joint Venture Agroforestry Program (JVAP) in a project named FloraSearch, now jointly sponsored by the CRC for Plant-based Management of Dryland Salinity. In Western Australia, CALM is an active participant in FloraSearch and will commence intensive assessment of the best performing local species identified by the Search Project, with a view to selecting two or three 'development species' that warrant commercial development.

For further information or for the CD version of the Search Project Report telephone Cathlin Jakovcevic in the Natural Resources Branch of CALM on 9334 0209 or email cathlinj@calm.wa.gov.au

Table 2: Species ratings (1 good, 5 poor) for performance tests on sample paper and panel board results for the 20 best species.

Species	Paper	Panel board		Average ranking
		Fibre board	Particle board	
Taxandria juniperina	1	1	2	1.3
Anthocercis littorea	3	1	2	2.0
Acacia saligna	4	2	1	2.3
Callitris glaucophylla	5	1	2	2.7
Codonocarpus cotinifolius	4	2	1	2.3
Eucalyptus rudis subsp. rudis	4	1	2	2.3
Gyrostemon ramulosus	5	1	2	2.7
Viminaria juncea	4	2	1	2.3
Senna pleurocarpa	3	3	1	2.3
Grevillea leucopteris	2	2	2	2.0
Alyogyne huegelii var. huegelii	2	3	2	2.3
Hakea oleifolia	5	2	2	3.0
Acacia lasiocalyx	3	2	3	2.7
Eucalyptus loxophleba subsp. lissophloia	3	2	3	2.7
Bursaria occidentalis	5	2	3	3.3
Casuarina obesa	5	3	2	3.3
Jacksonia sternbergiana	3	2	4	3.0
Melaleuca preissiana	5	3	2	3.3
Eucalyptus occidentalis	4		2	3.0
Grevillea candelabroides	2			2.0