



**Cooperative Research Centre for the
Sustainable Development
of Tropical Savannas**

Fifth Year Review: Stage 1 Report

10-12 July, 2000 Darwin, NT.

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Panel

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OVERVIEW

Research Activities

The tropical savannas of Australia are the woodlands and grasslands, occurring in the northern part of the continent, where the climate is hot and wet in summer, and warm and dry in winter. The main economic activities are mining, tourism and pastoralism. Savannas are an environment of considerable biological diversity. In an international context the north Australian savannas have low population pressures, both human and herbivore, and appear to be in generally good condition.

Some of these savannas have been the subject of intensive pastoral use in recent history. The more productive areas, the riparian and run-on areas, have been subject to degradation. The tenure over most of the savanna extent is Crown leases. More than 20% of the area is Aboriginal tenure land, and much of the land is subject to Native Title claims.

The Cooperative Research Centre for the Sustainable Development of Tropical Savannas (Tropical Savannas CRC) commenced in July 1995 as a fifth Round Centre. The Mission of the Centre is “To achieve sustainable use and conservation of Australia's tropical savannas through excellence in collaborative research, communication and education”.

The Centre undertook a major reassessment of its strategy and structure in the third year of operation, and as a consequence, moved to a thematic approach, coupled with a refocusing of its targets. While this must have caused some digestion problems at the time, the panel is convinced that it was a progressive, and probably essential, step for the Centre to take. It has resulted in a much more cohesive team approach and a better focusing of the research effort, more relevant to the stakeholders and with a significantly enhanced prospect of producing outcomes and tools to achieve sustainable, healthy savannas

As a consequence of the recommendations of the Third Year Review, Schedules 1, 5 and 6 were varied to reflect changes to the Theme structure and the changes in the project portfolio. Following consideration and development of proposals by the Centre's Board of Management, the changes were approved by the Commonwealth in a letter to the Centre dated 19 November, 1998. These changes fulfil the recommendation requirements of the Third Year Review. They remain current and relevant to date and are represented in the Centre's Business Plan 1998–2002.

The research program of the Centre consists of four Themes.

- North Australia Landscapes—descriptions and definitions of the resources and health status of the tropical savannas
- Landscape Processes—the natural interaction of resources in the landscape
- Ecosystem Management—interventions in landscape processes which create ecological, economic and social impacts
- Human Capability Development—enhancing the knowledge and skills of people who are current and potential stakeholders in the tropical savannas.

The research program also consists of the three Management Studies: Victoria River District (Northern Territory), Desert Uplands (Queensland) and Burdekin (Queensland).

These are regionally-based activities designed to collaboratively develop management strategies and options in collaboration with other agencies and land owners.

The four Themes are the mechanism for coordination across 28 projects to meet performance output targets within the four Key Result Areas, which are the basis for achieving the Centre's Mission. The Key Result Areas are:

- Healthy Landscapes. Definitions of healthy landscapes at space and time scales useful to landholders, managers and users.
- Assessing Landscape Health. Methods for assessing landscape health, which incorporate landscape processes and resource status at a range of space and time scales.
- Management Options for Sustainable Use and Conservation. Management options for ensuring sustainable use and conservation of tropical savannas at scales relevant to decision-makers.
- Information and Learning Products. Information and learning products and access processes for tropical savanna stakeholders.

The Centre supports 22 PhD, 3 Masters, and 13 Honours students. The student fields of study are congruent with the Centre's Themes and research projects and directly contribute to the Key Result Area output targets.

Research Relevance and Significance

The panel notes that the tropical savannas cover about one third of Australia, with the diversity landform, soils, climate, vegetation, cultures and development intensity to be expected from an area this size. It also spans two states and a territory, many different Aboriginal communities, and encompasses rugged and remote country. This mosaic presents a real challenge in designing and commissioning a viable and relevant research program. In particular, the stakeholder community is diverse, sometimes at odds with one another, and not uniformly organised into representative groups.

The panel is of the view that the Centre has done an excellent job in this regard, establishing a coherent set of research projects with a clear focus on achieving its mission, and with targets that match the needs of the quite diverse set of stakeholders. The integration across disciplines and jurisdictions is impressive. The natural beauty and biodiversity of the tropical savannas means that a major stakeholder is the Australian and world community per se, and this needs to be borne in mind when considering the resources to be provided to the Centre for its research. The Centre also needs to keep this in mind when targeting its outputs.

It must also be recognised that, by its nature, the savanna requires a commitment to research over long time spans. Individual research projects can be, and are, completed on an on-going basis, but they fit into a research envelope that will require many years to complete. The ecological and sociological change processes are intrinsically slow, which means that long periods of observation are required to determine cause and effect relationships.

The panel is impressed by the quality of the research students and by their integration into the Centre as contributing team members. The panel also considers the Centre is outstanding in its approach to a performance on communication and education; it is a model of best practices.

Research performance

The panel considers that the Centre is well focused on the achievement of its objectives and that its program of research activity is advancing effectively. The objectives are ambitious, and it will be a challenge to meet them fully by the end of its current seven-year term. Progress to date has substantially contributed to the knowledge base and the panel is of the view that the Centre has been effective and efficient in its research. The output measures meet expectations and there are good indications of successful outcomes.

Conclusions and Recommendations

The panel conclude that the CRC for Tropical Savannas is substantially on track for the achievement of its objectives. No major changes in research direction are recommended. The quality of the research, researchers and research training is high. Several aspects of the CRC's activities are exemplary, notably the integration which they have achieved in a formerly very fragmented field and geographical region, the educational program which they have developed, and the communication strategy they have implemented. The following recommendations are made:

1. The sociological aspects of the research program, especially but not exclusively in relation to Aboriginal land owners and users, need to be expanded. Important research contributions by the CRC in this arena are noted, but the existing research capacity is too small in relation to the current and future needs.
2. The CRC needs to find further ways to serve, and to be seen to serve, all the savanna interest groups. While pastoralism is the most extensive savanna use, and one where the research needs are clear, it is not the only (or even economically dominant) activity. The CRC has recognised this in its board and consultative group composition, and has delivered products and services to tourism, mining, Aboriginal communities and defense. It will need to be more proactive in delivery to these stakeholder groups if they are to have an increased sense of ownership of the Centre.
3. The CRC should establish and strengthen links with other CRCs and targeted research groups within Australia and abroad. The CRC is partly dependent on research carried on outside of its immediate control to deliver on its objectives. Furthermore, it can be more effective by drawing on related work elsewhere in Australia and the world, and can raise its scientific profile at the same time.
4. The panel recommends that the Cooperative Research Centres Committee considers the issue of continuity of research student streams in the CRC system. This CRC has not supported new PhD candidates since its fourth year of existence, on the basis that it cannot commit to supporting them beyond the period of its contract with the Commonwealth. This will lead to delay in the training of high-level skills, and a loss of critical mass and momentum, should a second round be approved. Mechanisms of disconnecting the flow of students from the short-term systemic fluctuations in research funding need to be explored.

Recommendation: The panel congratulates the staff, collaborating partners and Board of the CRC on their progress towards their research targets and on the quality and quantity of their achievements to date.

QUALITY AND RELEVANCE OF THE RESEARCH PROGRAM

The quality of the research is high in all themes. The projects to which the review team was exposed in detail are well conceived and rigorously implemented. The quantity of peer-reviewed publications, and the stature of the journals in which they appear, is an index of the quality of the work being performed, as assessed by the broader scientific community. In the case of the CRC Tropical Savannas, the scientific output for the year ending June 1999 was 59 peer-reviewed papers, 13 chapter in books, 15 conference papers and 11 reports, from a scientific effort equivalent to 87 full-time researcher-years. In the previous two years a similar output was recorded, while in the first two years of the CRC existence they were much lower. Taking into consideration the other products generated by the group (extension notes, teaching materials, videos, CD-ROMs) this is a respectable level of scientific productivity by international standards. The journals in which the publications appeared show a desirable mix of local and international, specialist and generalist vehicles.

All of the themes have a clear relationship to the achievement of the CRC Mission. A scan of the projects and the published outputs reveal none that are significantly at variance with this goal. Since we are convinced that the mission of the CRC and the objectives of the individual themes are of great relevance to the management and use of the Northern Australian savannas, it follows that the research taking place within individual projects and themes is also highly aligned with the needs of stakeholders within the region. There are several mechanisms, and many opportunities, for stakeholders to influence the direction of the research program. These mechanisms are apparently effective. There are several instances of adoption of research findings resulting from the CRC, and of consultancies with stakeholder groups, which confirm the relevance of the work.

Theme 1 to do with the definition of savanna landscapes in Northern Australia, has achieved an interim biogeographical classification of the region which forms a robust basis for area-specific recommendations. In doing so it has demonstrated an ability to integrate across different disciplines and administrative jurisdictions. It is unlikely that this would have occurred without a structure such as the CRC. This theme has been closely associated with the development of the concept of 'savanna health', which forms a focus-point for much of the current CRC activity, and is deliberately posed in such a way as to be readily understood and supported by diverse stakeholders. While not a completely novel concept globally, it has moved forward the debate on the appropriate use of Northern Australian savannas. It blends scientific rigour with an acknowledgement of the role of human value systems in determining appropriate use. It provides a common ground for the integration of biophysical and socio-cultural work, and identifies a need for significantly greater effort in the latter area.

Recommendation: The sociological aspects of the research program, especially but not exclusively in relation to Aboriginal land owners and users, need to be expanded.

The task of identifying indicators and quantifying their thresholds of tolerable change is still largely in progress, and remains a substantial challenge. The savanna health assessment system is unlikely to be fully elaborated, tested, and adopted by the end of the first round of CRC funding, but it has a good chance of demonstrating sufficient advantages that it will be supported by participating agencies. The third objective of the theme, a statement about the current status of savanna health, has made progress on several fronts to the extent that it has formed an important contribution to national environmental audits.

Theme 2 is concerned with the processes that shape the savanna landscapes and determine how they respond to use. The distinction between themes 1 and 2 is acknowledged to be largely arbitrary. This is recognised by the contributing projects, and has not been allowed to constrain their development. The work within the theme has created a platform of understanding and quantification that will contribute to the identification of suitable indicators and criteria for savanna health. The principal challenges will be generalising the findings from the site-specific studies, and simplifying the methods to the degree that they become widely applicable and cost effective. The projects on water use, biodiversity in relation to grazing pressure, fire, and integration using numerical models are all of high standard and international interest. The enhanced linkages between the work on the North Australia Tropical Transect and similar work in Africa is noted. The projects in this theme have generated solutions and applications of direct utility for the stakeholders, and have in some cases already been adopted. There is a small, and desirable, component of speculative work in relation to indicators of nutrient cycling. There is scope for greater interdisciplinarity: for example, how do the water, carbon and nutrient cycles interact to determine landscape 'leakiness'? How might remote sensing be applied to the extrapolation of water use? Can the SAVANNA model predict the suitability of faunal habitats at landscape scale?

Theme 3 relates to the management of savannas. All the themes have made effective use of the 'management study' regions to focus and integrate their work, but theme 3 in particular has made an

important on-the-ground impact in these areas. It has, correctly, not waited for the development of mature research products out of themes 1 and 2 before engaging with the issues raised by stakeholders, but has mined the considerable store of pre-existing research to deliver options for immediate needs. The adaptation of a suite of existing numerical models, and their application at land-manager level is an important component. The main engagement has been with the pastoral industry, partly because their needs are relatively well understood, as are their impacts on the environment. There is a need to increase the delivery of useful information to the mining, tourism and aboriginal stakeholder sectors as well, or risk the perception that the CRC view of savanna use is unidirectional. This will require innovative approaches to needs assessment and information delivery. The panel notes some innovative and exciting work relating Aboriginal beliefs to Western scientific approaches and encourages further studies in this area.

Recommendation: the CRC needs to find ways to serve, and to be seen to serve, all the savanna interest groups.

The time delay inherent in ecosystem-level research means that the CRC is to a large degree reliant on pre-CRC research for current delivery. Since the knowledge flow is not entirely internal to the CRC, this implies that special care must be given to ensuring that (1) the linkages and channels for delivery of knowledge to the CRC are well established and functioning, and (2) that the 'new' research within the CRC has a reliable path to implementation, possibly beyond the life of the CRC itself.

A similar consideration applies to the use of remote sensing technology in the CRC. It has been decided, appropriately, to use well-established technology, such as NOAA and Landsat imagery for the main CRC tasks. The CRC relies on specialised remote sensing groups elsewhere to experiment with the emerging technology. Given the current revolution in this technology, which is likely to make both Landsat and NOAA obsolete within the next decade, it is important that the connections to sources of the new technologies be strong and explicit. The on-the-ground work conducted by the CRC provides a valuable test of the new platforms, which can be leveraged into early and cheap access to the products. Specifically, a watching brief must be kept on the MODIS fire, LAI and NPP products, the IKONOS high-resolution products, upcoming and existing (airborne) hyperspectral instruments and Lidar. There is a very active global community in fire detection and mapping, and other communities in land cover and condition mapping and the integration of remote sensing with ecosystem models. These groups certainly have something to offer towards the objectives of the Tropical Savannas CRC. Expansion of the international and national linkages is noted, but there is still room for further strategic links.

Recommendation: The CRC should establish and strengthen links with other CRCs and targeted research groups within Australia and abroad.

Theme 4 has to do with communication and education. In both spheres it is a model of best practice. The education aspects are dealt with later in this report. It is noted here that some of their success may be attributed to the fact that both the communication process, and the development of educational packages, was research-driven. Secondly, it is noted that the research output by postgraduate students operating under the umbrella of the CRC is exceptional in both quality and quantity. The quality of the postgraduate work is partly recognised by the awards they have received. The close integration between student projects and the CRC themes and activities, coupled with the involvement by CRC participants in student supervision appears to have created an excellent environment for research capacity development.

The work on cultural information preservation among Aboriginal communities is valuable in its own right, as an aspect of savanna land conservation. The next steps will require expanding it beyond data collection, into practical ways of involving Aboriginal communities in deciding the future use and

management of savanna land. This process cannot be rushed, both because the supply of social scientists skilled in this field is limited, and because the development of trusting relationships is essential, but slow. The relating of Aboriginal cultural practices and beliefs to western scientific approaches is a key area that needs to be developed.

The information clearing-house concept, and the very effective use of web-based communication in parallel with other media, are commended. The issue of the survival of the electronic media beyond the life of the CRC needs to be addressed.

The CRC for Tropical Savannas is clearly the largest, and leading, body of savanna researchers in Australia and the world. The majority of leading Australian savanna researchers and research groups are connected to the CRC. The global pre-eminence of the CRC is perhaps not as well-recognised as it should be because the international savanna research community has not been explicitly targeted as a stakeholder group.

The commitments of the leading researchers to the CRC, in terms of the reported fraction of their time spent on CRC activities, is sufficient to achieve CRC objectives. Measured in terms of their enthusiasm for, and intellectual contribution to, the CRC, the commitment is very high.

Overall, no alteration in research direction is called for. Progress has been made with respect to all Key Result Areas. Progress on certain research tracks, notably the integration of social research, the implementation of the savanna health concept, and the delivery of useful information to the full spectrum of stakeholders, will need to be accelerated in the final two years of this round of CRC funding in order to meet key objectives of the CRC.

QUALITY OF THE RESEARCH TRAINING

The Centre provides research training through its post-graduate research program (PhD, Research Masters and Honours research) as well as through an innovative Master & Graduate Diploma of Tropical Environmental Management. This course-work program incorporates 4 modules generated by the CRC and the Masters program includes a major (1 semester) research project.

Overall the panel concluded that the research training program is of a very high quality.

Numbers and progress

There has been a strong cohort of PhD (22) Research Masters (3) and Honours (13) students directly associated with CRC activities, considering the time period and size of the CRC. They are enrolled across the three university partners of the CRC (eg PhD enrolments: NTU 12; JCU 7; ANU 3)

It is evident that some high quality students have been attracted to undertake post-graduate research programs through the CRC. This is highlighted by publishing histories, award nominations and receipts and jobs offered.

Support for honours research has proven to be a successful strategy. Four students supported at Honours level entered further postgraduate research training with the CRC.

The progress of student research projects has been good. The first two PhD students have submitted their dissertations. Almost all others are in the process of data analysis or writing up. Only one Honours and one PhD student have dropped out.

The pattern highlights the discontinuity occurring in the research training program: the centre considers that it cannot appoint new PhD students at this late stage of its seven year term. The panel is strongly of the view that arrangements need to be made to permit a continuous stream of research

students. One approach could be to negotiate with institutions to guarantee student funding to the end of the CRC term and for the institutions to take over funding should the CRC not continue into a second term. This may be a systemic issue in other CRCs and may need to be addressed by the CRCs Committee.

Recommendation: The panel recommends that the Cooperative Research Centres Committee consider the issue of continuity of research student streams in the CRC system.

The Master & Graduate Diploma program has steadily increased its student numbers. The 36 students in 1999 provides a critical mass and indicates a very significant achievement. Students are sourced from collaborating agencies and other stakeholders. Feedback from the agencies and the students themselves confirms that the curriculum is appropriate and the training delivery is of a high standard.

Range and selection of topics and proportion of student research

Student research projects are well embedded into the broader research projects being undertaken through the CRC across a broad range of topics relevant to CRC themes. The student projects appear to be a good mix within the CRC portfolio, and are well positioned in the more speculative end of the research arena. It was pleasing to see a number of PhD studies addressing socio-cultural topics. The panel is concerned that the lack of supervisory staff in the social science disciplines limits PhD research in this area.

Creditably, selection of research topics has been increasingly dependent on their contribution to the themes and targets of the CRC. Partner agencies have identified priority PhD research areas and research is undertaken through these partner agencies. A number of examples were provided where users (for example National Parks and Wildlife Commission, NT Power and Water Authority and Savanna Guides Ltd) have been directly instrumental in initiating or supporting specific post-graduate research work.

There have been a commendable number of papers arising out of student research – with some individual students publishing up to 4-5 papers in refereed journals of high quality. Most are now only in the stage of writing up their research.

Student support

It is evident that students are receiving high quality supervision and general support in their work. Cooperation between universities and partner agencies, catalysed by the CRC, has been strong. The positioning of PhD research in ongoing CRC programs has provided a high level of resourcing and networking for students.

The CRC also provides training in broader personal development areas – presentation and media skills; leadership and writing skills. The inclusion of leadership training is to be commended.

The panel had the opportunity to talk with a number of research students and also explored with the research team as to how well students were integrated into the overall program and themes structure of the Centre. It is clear that this is being handled extremely well. The students see themselves—and are seen by the Centre—as part of the team with opportunities to broaden their role and interests beyond the confines of the thesis topic and to contribute to the forward thinking of the Centre.

Involvement of researchers from outside the formal education system

A large number of collaborating agency staff has been involved in student supervision at all levels, as well as providing input into the Masters coursework program via module development and unit and course steering committees.

International recognition of educational training programs

It is unrealistic to expect that the CRC would achieve a high international reputation for its educational program given that it started from nothing in a geographically isolated area. Some progress towards this end has been achieved.

The PhD program has attracted a number of students from other parts of Australia and overseas, including China and the UK. The Masters coursework program has attracted 7 overseas students to date.

One panel member with extensive knowledge of this area expressed the view that the Masters coursework program is at the leading edge of similar courses offered internationally. The program has made direct links with other Universities in the USA and Botswana. Student exchange programs are being discussed.

QUALITY OF THE RESEARCHERS

As discussed in Section 2, the quality and relevance of the research program is given high marks by this review panel which, in itself, speaks well for the key researchers in terms of both the identification and undertaking of relevant research projects. Additionally, there are a number of other factors which reinforce the panel's conclusion that this CRC is supported by an excellent research team which compares favourably with researchers in this field in the international arena.

First, the number of refereed papers and the level of acceptance in journals of high repute are acceptable. When one adds the papers given at conferences and workshops, contributions to books, and other reports, the record is good. Secondly, the number and value of research grants, from a range of funding sources, is gratifying. Thirdly, the standard and performance of the post-graduate research students, discussed above, could not be achieved without dedicated and highly professional research leadership. Finally, and perhaps most importantly, the panel is entirely convinced of the Commitment of the research team to the Centre, and to its mission and objectives. We note in particular that the Theme Leaders average over 60% of time in the Centre, supported by full-time coordinators in communication and Vocational Education and Extension. In examining the table of Professional Staff, over half of the research staff are committed to the Centre at the 100% level, or very close to it. The panel was impressed by the spirit of cooperation, collaboration and enthusiasm displayed by the staff and students throughout the review process.

There is, of course, potential for improvement. While the reputation of the Centre and its researchers is recognised in Australia, and there has been recognition internationally through some invited papers and exchanges, the panel feels that the Centre could, and should, enhance its international standing through an increased level of exchanges and visits and, in particular, collaborative projects visits with kindred agencies. The benefits accruing from information exchange at the cutting edge of research should more than compensate for any costs involved. The fundamental concept underpinning the CRC system—that integration stimulates innovation and improves efficiency—applies at the international as well as the national level.

A particular concern, which is recognised by the Centre pertains to socio-economic and cultural research, there is insufficient capacity in relation to present and future needs in this area. The panel is of the view that this area of research will increase in importance in the years ahead, and believes that in developing its proposal for a second term, the Centre would need to focus on attracting at least one key research leader in this area.

REVIEW PROCEDURES

The Stage 1 review was held on 10, 11, 12 July, 2000. It was held in Darwin, Northern Territory.

The following panel was approved by the Chair, CRC Committee on 31 January, 2000:

- Dr Roy Green, Chair
- Professor Beth Woods
- Dr Bob Scholes.

Professor Beth Woods had to withdraw at short notice. She was replaced by Associate Professor Jeff Coutts, and this was approved by the Chair, CRC Committee on 6 July, 2000.

The review consisted of:

- an Overview presentation by the Director
- presentations from each of the four Themes consisting of contributions by Theme Leaders and relevant Project Leaders. They reported on research activities, outputs, relevance and collaboration, in relation to the relevant Key Result Areas and targets.
- a Summary presentation by the Director.

Each presentation was followed by a questions from the panel. The final session was a plenary discussion.

The panel met students and discussed their activities. The panel also viewed the collection of the Centre's publications and viewed a demonstration of the web-based Information Clearinghouse and other multi-media products

The review was attended by the Centre's Management Group and relevant project leaders and staff.

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