



Australian Government

**Rural Industries Research and
Development Corporation**

Travel Destination: 3rd Taro Symposium, Fiji

**Research Officer for the Northern Rivers Agricultural Development
Association (NORADA)**

**A travel report for the Rural Industries Research
and Development Corporation**

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*Organisers: Secretariat of the Pacific Community (SPC); International Plant Genetic Resources Institute (IPGRI);
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Summary

Recently, an Australian delegation of research and industry representatives attended the 3rd Taro symposium held during the 21st-23rd of May at Nadi, Fiji. The primary purpose of the trip was largely a fact finding and networking mission in order to further facilitate research and commercial activity by Australian producers. The symposium was organised into 5 different themes, from which an international array of speakers presented aspects of their research work on taro. Workshops on these themes were also conducted allowing interaction in a small group format so that the most important issues could be identified. Future research would hopefully be conducted to address these concerns. The future of taro research itself was also an underlying current. Tarogen and Tansao, the project bodies set up to fund taro research, had or will soon realise their expiry date, without further funding on the horizon.

This report outlines the key features of each symposium theme, the objectives and outcomes of the travel as well as the benefits from this excursion. Recommendations for future Australian industry enhancement are also provided.

Themes of Symposium

1. Taro Diversity, Ethnobotany and Conservation

Over 200 varieties of taro are held in germplasm collections, with an approximate 7000 different accessions spread around the world. It was inevitable this theme dominated the symposium. The greatest concern was the loss of varieties, and how to overcome this problem in a world which values items with commercial application over those which are regarded as artefactual and/or of academic interest. The high costs of maintaining germplasm collections necessitate research into techniques to adequately store genetic material and safely transport this material from one region to another. Representatives from many countries reported significantly sized accessions and activity into storage of this material. Current methods of conservation include in field and in vivo techniques. Proposed future protocols for storage under investigation, but not yet completely fallible, are cryopreservation and seed storage. Concerns are held over the reliability for cryopreservation. For seed, the issues of the 'virus free' status of material plus saving genes at the expense of genotypes were raised.

It soon became quite clear that this theme had taken the largest slice of research quantum from the project bodies Tarogen and Tansao, and that much work was being repeated. It was also speculated that many collections probably had repetition of varieties within accessions but also that many collections probably were very similar in their content. The importance of identification of varieties and reduction of repeated varieties in storage was recognised. Centralisation of an international collection was suggested, though thought to be impractical at this stage. Limits were determined by quarantine restrictions and subsequent transport logistical problems associated with the differing requirements from so many nations involved. Most participants agreed upon a germplasm sharing arrangement for the improvement of existing varieties subject to transport approval. It was curious that no leading varieties were identified by any party, and researchers when pressed for this information remained quite reticent. This indicated a serious gap between the research and commercial sectors.

2. Pests & Diseases

Without doubt the most important pest of taro is Taro Leaf Blight (TLB). Caused by the fungal organism *Phytophthora colocasiae*, this disease was responsible for the decimation of the Samoan taro industry in 1993. Control and management of TLB depends upon local environmental conditions, stage of crop and pathogen development. Implementing varieties with 'horizontal' resistance will assist in prevention of disease. This is a phenomenon where the plant is not completely resistant and symptoms are evident though minor, and plants are resistant enough to prevent a full blown disease.

Four viral organisms and their symptoms have been recognised and diagnostic tests have been developed for the known viral pathogens. Transport of germplasm between countries is dependent upon satisfactory tissue evaluation and indexing. The general agreement amongst all parties was that any material to be shipped should go through a diagnostic screening before allowed in transit. Other pests of significance but less so to Australia, due to their absence, are the taro beetle (*Papuana woodlarkiana*) and *Rhizoglyphus* mites. Strategies for control of these pests require development of 'novel' IPM methods, for example the use of *Metarhizium anisopliae* fungus as biological control agents.

3. Production & Production Constraints

Maintaining 'food security' for developing Pacific Island nations with a traditional reliance on taro was a strong theme. Ranked 14th amongst staple crops around the world, approximately 9 million tonnes is produced on 2 million hectares. The importance of taro is often understated. For many of the nations represented at the symposium, their reality is a top 5 ranking and in some instances taro is an essential ingredient to any meal. Surprisingly, West African nations produced and consumed the largest amount of taro. They were reported to be self sufficient and did not export. Most reports addressed production volume, area under production and the particular limits to their production. Limits were varied and included the influence of pests on yields, problems with propagation material, poor postharvest practices, restricted land availability, water stresses, and the implementation of other more valuable or favoured crops.

Of the many nations producing taro, export growers were those with adequate land and environmental capacity, eg Fiji and Samoa. Export markets tended to be niche oriented towards populations of expatriate Pacific Islanders living in developed nations, such as Australia, New Zealand and USA.

Production techniques and methods were largely ignored. The status of taro for most countries as a staple crop of subsistence agriculture precluded research efforts into production techniques. Apparently, practices developed in particular local areas have been maintained and change has not been readily accepted. Most taro grown in the world is consumed where it is grown. Therefore the need for consistency in the product has not been a driver. Further, each locality seems to have developed their own varieties to suit their tastes through selection. The influence of environmental conditions or 'terroir' was also made apparent, not only on yield but on organoleptic properties (taste in relation to physical quality). This has enormous significance to producers who wish to target export markets. Exporters must aspire to reproduce similar quality parameters within the taro they hope to capture market share with.

4. Breeding & Distribution of Improved Materials

By necessity, the breeding efforts were closely linked to the conservation and diversity research. Identification of desirable characteristics in available varieties could be useful in breeding to overcome disease like TLB, or simply to provide a consistent product. Diversity recognition through genetic markers could reduce the number of accessions in germplasm collections as well as provide convenient gene locators for breeders. Other breeding efforts concentrated on specific organoleptic and quality properties such as overcoming acidity, appearance flaws, and general taste. Increasing yield and dry matter content (starch) were also in the breeder's consideration.

Distribution of improved materials and existing varieties was addressed through reports on *in vitro* or tissue culture techniques and through the use of stolons as material for mass propagation. These issues are significant for varieties which form few corms or setts. For the small corm varieties which are prolific in their corm production, the topic was not so important.

5. Product Development & Marketing

Taro as a product has mostly been consumed in local markets, supplied by local growers. This situation has been changing due to increasing populations and the need for greater volumes to satisfy demand. Further, in many traditional areas of production, land is becoming either scarce or cost prohibitive and many growers are opting for other crops with elevated priority or higher returns per unit area of land. Japan was one such market identified with those particular qualities and was also shown to be the largest importer of taro, sourced from China. Out of season opportunities in the Japanese market for Southern Hemisphere producers were reported to be highly lucrative. Evidence of such market penetration was unavailable, leaving speculation about the actual demand during such a period. Potential export marketers would be advised to observe local cultural influences in conjunction with the market volume throughput statistics before committing to any export focus venture.

The composition of taro is mostly starch, consequently it lends itself to a number of potential value added products. It can be used as a component in pre-cooked meals, as a bulking agent in sauces and vegetarian burgers, a source of starch, the material for ethanol, and the flavouring for ice creams. These spin-off industries are largely undeveloped and the potential market size for such products was not presented.

Objectives & Outcomes of Travel

Australian production of taro is in relative infancy, hence there was a need for researchers and growers to gather information and develop contacts with appropriate international corresponding people. Attendance at the symposium determined the availability of germplasm and ascertained the mode of delivery with time frames for acquisition. These steps were absolutely necessary; presently the Australian domestic market is too small to sustain a large number of growers. Therefore, Australian interests in taro production, must be focused on export markets and utilising the information gathered on those market requirements, which could only be delivered in breadth at an event such as the symposium. These objectives were more than satisfactorily achieved

Benefits of Travel

The knowledge base now available to Australian research and industry was greatly increased and strengthened through attendance and interaction by the RIRDC delegation. The clearer picture of the world taro situation has provided a better context and perspective of the R&D requirements for the Australian scene. The connections arranged with the major stakeholders in the world taro network, has made it possible to acquire the correct varieties for the target markets, though arrival of such material will take time. The pathway through different countries and quarantine requirements is extremely convoluted and unavoidable at present. Material is in culture but must be indexed for the known viral organisms and then assessed through the Australian quarantine requirements before release into research observation. The release date is estimated to be around late 2004.

Concise Symposium Outcome Focus

The future direction of the world research effort, outlined by the outcomes from the thematic workshops held post-presentations determined:

- The need to identify the world taro resources and accumulation so that collections could be maintained efficiently and without costly repetition.
- Protocols for safe germplasm transport, storage & availability required development and approval from authorities.
- Identification of organoleptic properties in major varieties & any relationship with genotype, production area or environment.
- Breeding and development of production strategies to overcome pests & diseases to maintain a grower's economic threshold of tolerance to such problems. Improvement through breeding to increase dry matter yield and reduce acidity in corms.
- Developing commercial links to the research effort which to date were unreported, except for the Australian RIRDC sponsored programs. These programs were not formally presented but spoken of as examples during workshop opportunities.

Symposium Limitations

The heavy focus on conservation and biodiversity by research teams, whilst of great importance, produced a failure to adequately balance or recognise the importance of developing parallel commercial interests. This approach inevitably restricts further funding to the discretion of government bodies, which increasingly require financial milestones as the measure of success of a project. Involvement of the commercial sector would help to identify immediate research requirements for industry success and provide logical arguments for funding for all interested parties in the current market driven climate. Funding for research activities such as conservation, which do not provide direct or immediate financial benefit, is in jeopardy if a coordinated approach is not taken. The commercial sector must be educated to the longer term benefits of the

non-commercial research. A carefully coordinated, cooperative approach would provide balance between the broad academic interests of science and the narrow focus of the commercial sector.

The absence of Chinese and Japanese representatives, the largest exporters of taro and the largest importers of taro respectively, presented an incomplete picture of the world taro situation. This was especially pertinent since many representatives identified the Japanese taro market as one of significant opportunity. Confirmation of this position was impossible without their interpretation.

There was no opportunity for researchers to view local production via farm visits and there were no local product examples for consumption and evaluation.

Recommendations to RIRDC and Industry

- Correct determination of the size and value of potential markets is required in order to capture market share and tailor industry development to suit.
- Maintain and develop an international profile for taro in Australia. The physical location on the pacific rim and vicinity to Asian markets, coupled with the scope and infrastructure for quality research, places Australia in a unique position to lead in not only taro but all specialised root crop research. Now is the time to seize the initiative.
- Addressing the communication structure between taro R&D workers and industry representatives will help coordinate research efforts into areas where attention is required. At present, this would require a greater onus of responsibility and organisation to be placed on industry representatives, who, currently fragmented, only serve to defeat industry development through over zealous supply and ignorance of recommendations from R&D.
- Funding a further 1-2 years of research on the current project will provide a greater scope for: analysis of the performance of the newly acquired materials which will not become available until after the current round of funding; nutrition trials with tissue compositional analysis, not currently funded for; developing a field maturity index for corms; identify the correct organoleptic properties required for the target market(s); and promotion of the product on the domestic market.

Advocate and lobby for the further funding of the Tarogen project by the relevant Australian government departments. This is especially important to Australia's image in the Pacific region in the wake of its recent imposing demands on political issues at the Pacific leader's forum. Food security is a great priority to most Pacific communities and should be recognised as the basis for political and social security.