THE CRAWFORD FUND

REVIEW OF MASTER CLASSES AND TRAINING ACTIVITIES

MAY 2015

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THE CRAWFORD FUND

For a Food Secure World

Executive Summary

The Crawford Fund is an independent not for profit company with charitable status, that works for a food-secure world by raising awareness of the benefits to Australia and developing countries from international agricultural research, and arranging specialist training activities for early to mid-career scientists. The training activities are intended to build capability to support greater food security and prosperity in developing countries and Australia, particularly in emerging areas of importance, which may not be well serviced by existing training programs. Training activities are divided into focused, centrally-managed Master Classes and more diverse training activities managed by the Fund's State and Territory Committees.

This review was commissioned because of significant changes to the financial and overseas aid environment in which the Crawford Fund is operating. The Crawford Fund relies on government funds from the Australian Centre for International Agricultural Research (ACIAR) to deliver the majority of its programs. Whilst it is hoped that this funding will continue, it is timely for the Fund to consider ways in which it can both diversify its income and better leverage its funding to increase the number of its key training and public awareness programs and their impact. Consequently, it is appropriate that the Crawford Fund review its flagship centrally-managed Master Class program and State and Territory-managed training activities, particularly because these programs/activities have had limited cost recovery, although they have attracted much in-kind co-investment. Furthermore, the Master Class Programs and training activities have to date been somewhat *ad hoc* and supplier driven, rather than strategically focused on demand. This has enabled flexibility, but probably limited opportunities to garner wider stakeholder support and sponsorship.

The review methodology included examinations of the history of Master Classes and training activities since inception of the Fund and the associated financial records (for the last 5 years). Additionally, approximately 50 stakeholders were interviewed, including federal agencies, the Research and Development Corporations, state agencies, universities, several CGIAR centres and a limited number of commercial organisations and other groups working in the agriculture sector. The questions asked focused around alignment of the Crawford Fund's Programs and activities with government policy, strategic focus with respect to emerging issues of concern to agriculture in Australia and overseas and specific products and market opportunities.

Master Classes and training activities have been very successful in cost-effectively building capacity to improve food security in developing countries and Australia. Since the early 1990s approximately 1000, predominantly overseas nationals have attended the 49 Master Classes held in 14 overseas countries and Australia. In addition, almost 10,000 individuals from 98 countries have attended the wide variety of state-based and organised training activities that have included workshops, scholarships, and fellowships in Australia and overseas. Over the last six years:

- The Crawford Fund has provided on average $114,000 per annum for Master Classes from its central funds;
- State Committees have further supported the same classes with an additional approximately $9,000 per annum;
- ACIAR has contributed an additional $11,000 per annum; and
- External support from other donors and participants has averaged $9,000 per annum.

Individual Master Class total costs (excluding a large extra amount of in-kind support which has not been quantified) have ranged from $30,000 to $70,000.

With respect to training the income of the State and Territory Programs has approximated $2.5m over the last 5 years, (including almost $1m from state governments) of which over $2.1m has been committed to training. These activities have:-

- Enhanced many individuals' knowledge and career opportunities;
- Developed a network of overseas scientists closely linked to their Australian peers;
- Created a greater ability of scientists in Australia and overseas to increase crop and animal productivity and to deal with emerging agricultural threats such as plant and animal disease outbreaks; and consequentially
- Benefitted both farmers' livelihoods and national economies.

Two specific studies, on overall investment in agricultural R&D and on a Crawford Fund training activity, indicated high benefit cost ratios of 67:1 and 13:1 respectively.

Existing priorities for the Crawford Fund include improving collaboration with the private sector and greater focus on gender equity, nutrition and aspects of food security. Geographic alignment with DFAT's priorities in the Indo-Pacific region (including East Africa) seems appropriate. Stakeholders' interviews point to four overarching themes as a basis for future Crawford Fund Master Classes and training activities:

- Market Access, Biosecurity and Food Policy;
- Sustaining Agriculture's Natural Resource Base;
- Risk and Adaptation to Global Change; and a set of
- Cross Cutting Issues such as gender and youth, science communication and management, and information and communications technology opportunities.

These themes provide a strong linkage and alignment with Australia's foreign policy goals around economic diplomacy, whilst at the same time being critical to feeding more people via sustainable and profitable intensification of agriculture at home and abroad. Furthermore, the areas identified are those in which Australia has a competitive advantage in existing knowledge and expertise, where Master Classes and specialist training can fill key knowledge gaps or skill niches.

The review has identified three types of future funding pathways:

- payment for training services by international organisations, overseas and Australian institutions or individuals seeking to enhance their individual or corporate skill base;
- grants or sponsorships by Government or other agencies seeking to fund further research training for development, including successful tender applications submitted by the Crawford Fund and partners; and
- co-funding in-cash or in- kind by organisations that wish to join with Crawford Fund to deliver an agreed training module or platform (this can include training providers such as universities and government departments).

These models are underpinned by some suggestions for more diversified mechanisms of engagement with potential Master Class and training activity sponsors. It is recognised that future success in terms of seeking new stakeholders and funders will be dependent upon the Fund's Master Classes, in particular, being recognised as of high quality and value and thus in demand from individuals, governments and the private sector alike.
The report also sets out to differentiate Master Classes from other training activities. The former can be identified by:

- A **focused topic and program run over a period of one to two weeks (not necessarily contiguous)** to bring participants (generally early to mid-career graduates) to a higher skill level within the field in which they actively work and are already trained;
- **Participants dedicated to improving their skills/ knowledge**, with good English or the appropriate language for the Master Class;
- **A champion with an established reputation** who will take responsibility for organising the course mechanics and content and for post training mentoring;
- **A host institution** with the facilities and administrative back-up to run the Master Class; and
- **Additional donor support** in funds and/or in-kind to co-invest with Crawford Fund.

Under the proposed thematic structure, Master Classes will ideally be repeatable in different localities. Where possible, Classes will build on each other. For example, in the water area, complementary classes on water policy and governance, catchment management and irrigation management could be envisaged.

The current separation of Master Classes organised by the Fund's central office and other training activities by the State Committees is considered artificial. In future, any training which fulfils the criteria set out in this review, irrespective of who or where it is proposed and designed by, should be designated a Master Class.

It is suggested that initially the Fund's focus should be on developing new Master Classes in:

- Market Access and Biosecurity issues including disease risk and management;
- Water and soil management with respect to sustainable intensification of agriculture;
- Research Management training; and
- Innovation systems and platforms including information technology and communication.

Detailed business plans will be developed for these areas that focus on partnership, risk sharing and sponsorship.

In summary, Master Classes and, where possible, other training activities, should:

- be demand driven rather than supply driven, with clear outcomes and impact pathways
- focus on the priorities identified in this report
- support Australia's foreign policy and economic diplomacy objectives
- fill identified niches and knowledge gaps generally not covered by other providers
- build on key areas of Australian scientific, policy and agribusiness expertise
- be delivered by experienced, high quality instructors, and
- ideally, have delivery partners and co-sponsorship and/or some degree of cost-recovery.

RECOMMENDATIONS

1. Crawford Fund Master Classes and training activities should be strategically organised under the themes identified in the review; namely
    - Market Access and Biosecurity,
    - Sustaining Agriculture's Resource Base,
    - Risk and Adaptation to Global Change and
    - a set of Cross-Cutting Issues.
2. Gender and youth issues, economic diplomacy[1] and impact pathways should be considered and where possible incorporated in design and application of all Crawford Fund Master Class and training activities.
3. To be recognised as a Crawford Fund Master Class, activities must have a focused topic and program, participants dedicated to improving their skills and knowledge, a champion with an established reputation, a host institution and additional donor, client, corporate, sponsor or partner support.
4. State and Territory Committees should ensure that all future training activities are aligned with the strategic directions of the Crawford Fund adjusted at the discretion of the relevant State and Territory Committee to meet the capabilities and interests of each jurisdiction and the availability of partnering organisations and sponsors.
5. Consistent with its decisions under Agenda Item 5, the Crawford Fund should give added focus to seeking additional funding from the private sector based on demand from that sector, and linkages to Australia's economic diplomacy objectives. Similarly, training activities should also seek to include co-sponsorship wherever appropriate, including for selected scholarships and fellowships awarded by the Fund, *and wherever practicable give priority to training investments that generate a return for the Fund*.
6. Crawford Fund Master Classes and Training activities should have clearly defined mechanisms for risk and cost sharing between the Crawford Fund and partner organisations.
7. Subject to annual budget considerations, Crawford Fund contributions to Master Classes, subject to annual budget considerations, be restored to at least $100,000 per year with the clearly defined objective of the developing new high profile classes capable of attracting external sponsorship. The level of this core support should progressively taper down as the Fund attracts new partners and sponsors. *No single Master Class topic should receive core support for a period of more than two or three years*.
8. Over the next two to three years, focus should be given to brokering and running Master Classes and training activities in:
    - market access and biosecurity;
    - water and soil management with respect to sustainable intensification of agriculture;
    - research management training and innovation systems; and
    - platforms including information technology and communication.
9. Master Classes must be evaluated and the impact measured through post-Master Class monitoring and evaluation.
10. The term Crawford Fund Master Class can only be affixed to a training activity by the Crawford Fund CEO, or delegate.

[1] Which in Crawford Fund terms means Doing Well by Doing Good

Chapter 1. Background to the Review and Terms of Reference

This review was commissioned because of three key factors:

- Firstly, Australia's role in providing agricultural research and development aid is changing and the Crawford Fund needs to stay aligned with the changing strategies of its key stakeholders and funders.
- Secondly, the fiscal environment within which the Crawford Fund operates also continues to change. Whilst government support of the Fund increased significantly up to 2007-08, subsequently it has remained approximately the same, which equates to a cut in real terms.
- Thirdly, there is a perception that many training and Master Class activities tend to be supply rather than demand driven.

The Australian aid environment

Whilst growth projections in Australian aid have been reduced considerably in the last two or three years, agriculture and related natural resource management areas have been prioritised. Agriculture, fisheries and forestry account for 7% of Australia's $5b aid budget in 2014 (DFAT, 2014)[2]. Key points from the Australian Government's policy document include:

- The agriculture and fisheries sectors provide livelihoods for millions of workers, particularly in rural areas, and underpin food security and nutrition. Productivity will need to increase significantly to meet expanding global food demand, especially in the Indo-Pacific region. At the same time, water resources are coming under competing pressures from agriculture, industry, electricity generation, growing urban populations and the impacts of climate variability. Overfishing practices threaten the long term sustainability and profitability of global and regional fisheries.
- Optimising the potential of agriculture, fisheries and water for economic development, while ensuring sustainable use of resources for long term prosperity, is one of the biggest challenges facing our region. Australia is supporting agricultural productivity, sustainable fisheries management and water resource management, and is addressing impediments that prevent producers linking effectively into domestic and international markets.

Furthermore, the Government has identified 10 key targets to enhance aid outcomes, namely:-

1. **Promoting prosperity:** *Promote economic development by increasing Australia's aid-for-trade investments to 20 per cent of the aid budget by 2020.*
2. **Engaging the private sector:** *All new investments will explore innovative ways to promote private sector growth or engage the private sector in achieving development outcomes.*
3. **Reducing poverty:** *By July 2015, all country and regional programs have Aid Investment Plans that describe how Australia's aid will promote economic growth in ways that provide pathways out of poverty.*
4. **Empowering women and girls:** *More than 80 per cent of investments, regardless of their objectives, will effectively address gender issues in their implementation.*

[2] Department of Foreign Affairs and Trade. 2014. *Australian aid: promoting prosperity, reducing poverty, enhancing stability.* http://www.dfat.gov.au/aid/Pages/australias-aid-program.aspx

5. **Focusing on the Indo-Pacific region:** *Increase the proportion of country program aid that is spent in the Indo–Pacific region to at least 90 per cent from 2014–15.*

6. **Delivering on commitments:** *From July 2015, progress against mutual obligations agreed between Australia and its key partner governments and organisations will form part of program performance assessments.*

7. **Working with the most effective partners:** *By July 2015, design and apply new systems to assess the performance of the aid program's key delivery partners and ensure stronger links between performance and funding.*

8. **Ensuring value-for-money:** *Deliver high standards of value-for-money in at least 85 per cent of aid investments. Where standards are not met and improvements are not achieved within a year, investments will be cancelled.*

9. **Increasing consolidation:** *Reduce the number of individual investments by 20 per cent by 2016–17 to focus efforts and reduce transaction costs.*

10. **Combatting corruption:** *Develop and implement new fraud control and anti–corruption strategies for all major country and regional programs by July 2015.*

Given that approximately two-thirds of its funding is provided by the Commonwealth Government via the Australian Centre for International Agricultural Research (ACIAR), the Fund needs to be highly cognisant of these targets and in particular of ACIAR's strategic directions.

Core purpose of the Crawford Fund

The Crawford Fund is an independent not for profit company with charitable status that works for a food-secure world by raising awareness of the benefits to Australia and developing countries from international agricultural research. Crawford Fund training activities include focused, centrally-managed Master Classes and more diverse, state-managed activities managed by its State and Territory Committees. Master Classes are intended to build capability of developing country early to mid-career scientists to support greater food security and prosperity in developing countries and Australia, particularly in emerging areas of importance which may not be well serviced by existing training programs. State and Territory based training programs have covered a wide range of topics and have been made available to overseas and Australian scientists. The Fund also awards a range of fellowships for individuals at different stages of their careers.

The financial status of the Crawford Fund

The Fund's core funding from the Australian Government via ACIAR increased from 2007-08 until 2011-12 and subsequently, has been held at the nominal level of around $1.0 million, with a decline of $50,000 in 2014/15 (Figure 1). Income from all other sources, including the State Governments grew from 2007-08 until 2011-12 and has remained steady at about $400,000 since 2012-13. Since 2011-12 the State Governments' component has stabilised at about $200,000 of the above total. The Fund has been positioned to deal with the effective fall in core funding because of steps it has taken to generate new funding streams and to keep its costs down. It has, for example, attracted new sponsorship and registration income for its Parliamentary Conference; gained financial support from co-sponsors for its Master Classes (especially for its series of Master Classes on communication with stakeholders); and it has been successful in a tender for an ACIAR project on plant biosecurity and negotiated an alliance with the Syngenta Foundation for Sustainable Development and ACIAR both of which result in a net cash inflow for the Fund. It has signed an agreement with Cooperative Bulk Handling (CBH) for funding for the WA Program and had modest success with one or two other fundraising efforts. The Fund, in partnership with the Australia National University, ACIAR and the

Department of Foreign Affairs and Trade has received a grant of $180,000 from the Australian Research Council to research and write a comprehensive biography of Sir John Crawford. Taken together, and accounting for in kind contributions from research and training providers the Fund's total turnover is estimated to exceed $2.5 million per annum

The prospects for any increase in government funding, however, are poor. The Fund is uncertain about whether the prospects for a successful public fundraising program are sufficiently strong to warrant the outlay that would be necessary to mount such a program – although this is still under study. However, strong alignment with ACIAR's research projects that include capacity building and communications targets would be mutually beneficial to both Crawford Fund and ACIAR.

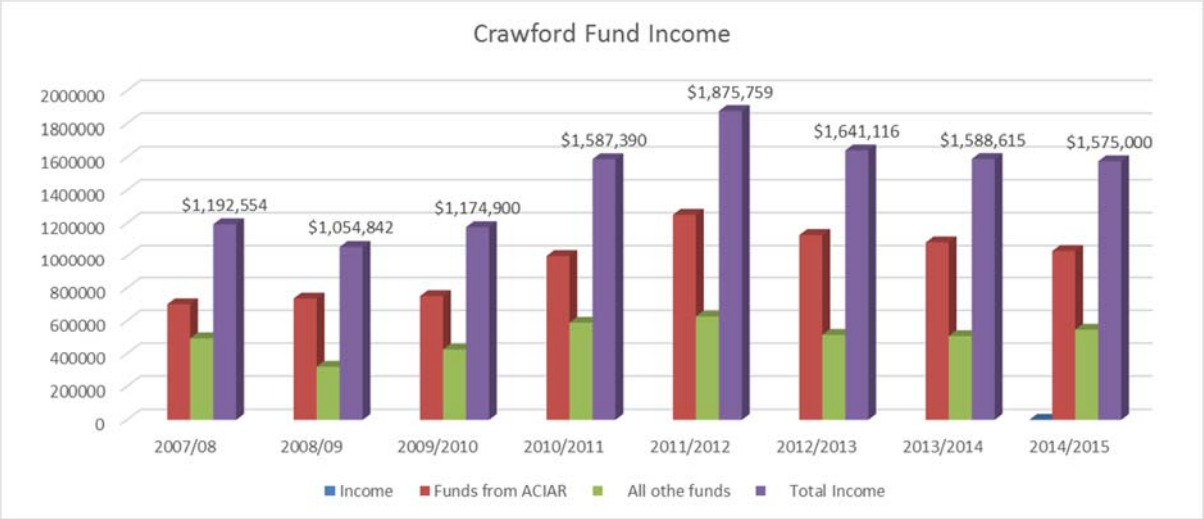

Figure 1. Crawford Fund sources of income over the period 2007/08 to 2014/15.

In order to pursue its mission with increasing impact, and to maintain its position as a key contributor in international agricultural research and training, the Crawford Fund must increase the resources available to it, whilst ensuring its operations are cost effective. Against this background, the Fund must examine its existing Master Class and training activities to determine the prospects for increased funding from existing revenue streams and from new markets; and it must review the focus and nature of these existing activities to enhance the prospect of increased funding from existing sources and to tap new revenue streams.

State and Territory training programs have attracted limited external funding but the Fund is convinced that opportunities for such funding do exist. For example, a recent training course on regulation of gene technology conducted in the ACT, was co-sponsored by the Australian Office of the Gene Regulator, IFPRI and the ACT Crawford Fund Program Committee. Part of the problem is the limited resources available to the Fund to pursue the opportunities.

The six State Governments have provided support for our State training programs with grants that range from $15,000 to $50,000 per annum. Grants from State and Territory Governments are of particular importance to the Fund because they place it in a position of being able to give somewhat greater emphasis to benefits to specific Australian States than can ACIAR.

Very substantial but poorly quantified in-kind support has been leveraged from our research and government partners. There are many opportunities to improve and better target this in the future. In particular, Crawford-funded support for mentoring of junior overseas and Australian scientists

(often volunteers) by senior scientists (often retired) can be a most cost-effective capacity building method.

Stakeholder demand for training and Master Classes

The Crawford Fund has several stakeholders whose interests it has to serve: the developing countries by providing training in international agricultural research; ACIAR, to supplement its commissioned research projects, and to sustain community and government support for its programs; and the broader Australian and international agricultural research community, to build key capabilities; and through its public awareness program to sustain support for investment in international agricultural research.

The Fund has been successful in attracting co-funding for Master Classes from ACIAR and selected international agricultural research centres, most notably in recent years International Food Policy Research Institute (IFPRI) and CABI. The Master Classes on Communication with Stakeholders have attracted sponsorship from a range of donors sufficient in most cases to meet their direct costs. The International rice Research Institute (IRRI) met the full costs of a Master Class on Communication with Stakeholders held in India in May 2015. In general, however, the Fund has had to underwrite the cost of its other Master Classes by some 30 to 50 per cent of their direct costs. Furthermore, the existing process for the development of Master Classes and training activities is generally supply side driven. Typical applications for Master Class and training funding come from specific university academics, or scientific conference organisers and are funded depending on the state of the budget, assuming that they pass some basic scientific and capability criteria. It doesn't mean that the classes and training activities have not been successful, because many have delivered excellent outcomes. However this approach has meant that is has been difficult to develop a Master Class and training strategy that maintains continuity and focuses on Australia and the Fund's strategic directions in international agricultural R&D.

The Fund also needs to be clearer on the objectives of State Government Departments (and the commercial sector) in engaging with it and in international agricultural research in order to better help serve those objectives. This in turn should consolidate and possibly increase their support for the Fund. State Government Departments can benefit from The Fund's work in at least three ways: the training may facilitate a better business to business or business to government environment which creates trade opportunities; training the Fund sponsors in a field of their expertise and interest may be of direct benefit to them by building linkages in relevant areas and by exposing departmental scientists to new agro-ecological environments which aid their understanding of and test the application of their expertise in broader contexts; and thirdly, it might build their track record to enable them to engage in ACIAR projects or to supplement something they are already doing with ACIAR or other funding agencies.

This key issue underpins a set of consultations embarked upon last year with the Queensland, NSW and Victorian Governments and indirectly with the other States and Territories. Sustaining support from State and Territory Governments and others also underpins the terms of reference for this review

The Fund has other interested parties, such as the private (e.g. agricultural exporters, banks, agribusinesses etc.) and not-for-profit sectors with whom it wants to work more closely, as well as Crawford Fund State Committee members and their scientific colleagues, who dedicate many hours of their life to the Fund's work with no or minimal remuneration. The review will explore the scope for tapping into the private and not for profit sectors and catalysing innovative work that brings together the Fund's existing skill base with the market. A separate related paper on partnerships and sponsorship has been prepared for Board consideration.

Terms of Reference

To assess whether the Fund's Master Class and State and Territory training programs are:

- *Appropriately aligned to help deliver Australia's foreign policy aid objectives*[3]
- *Strategically focused, in terms of promoting international agricultural research of benefit to both Australia, its States and Territories, and aid beneficiaries; and, the review should*
- *Define specific products and market opportunities that may attract private sector sponsorship and paying customers and that, where possible, can be delivered to significant numbers of individuals via strategic partnerships with relevant regional organisations.*

The review should also provide a business plan, focused on a number of 'best bet' Master Class and training opportunities for which the review judges a market exists. The aim is to demonstrate through these exemplars ways in which the Fund's Master Class and training programs can be self-supporting and contribute income to offset the Fund's overhead and future development costs.

The key aim of this review is to examine future directions for all Crawford Fund training programs and Master Classes as opposed to reviewing past activities in any detail. As part of this forward thinking, the review should compile a list of past Master Classes and training programs that either have already attracted substantial external support or in its best judgement have the prospect of doing so.

[3] This might point to the need, for example, to give priority to economic diplomacy and to aid for trade initiatives.

Chapter 2. Master Classes and Training Activities conducted by the Crawford Fund

Topic coverage and financial analysis of Master Class and Training Activities

The Crawford Fund has records of its Master Classes going back to their inception in the early 1990s. Since 1992 there have been 49 classes held that have attracted approximately 1000 participants. Of these classes 21 have been run in Australia and the remainder in 15 countries (Appendix 1). State run training courses, workshops and seminars over the same period have attracted almost 10,000 participants.

Initially Master Classes had an emphasis on plant breeding topics, but subsequently there has been a broadening of areas to cover animal disease, natural resource management topics including drought and climate variability/change issues, communications, risk and impact assessments and agribusiness research methods.

An analysis of funding support for Master Classes over the last 6 years (Appendix 2) demonstrates that on average the Crawford Fund Central office has provided $114,000 per annum for Master Classes. State Committees have further supported the same classes with an additional approximately $9,000 per annum. ACIAR has averaged a little over $11,000 per annum and external support from other donors and participants about $9,000 per annum. Given previous availability of Crawford Fund funding to Master Classes, and the degree of external support, approximately 2-3 Master Classes can be delivered per annum. However, current central office support has been reduced to $50,000, which means that unless this can be doubled from other sources the number of classes may have to be reduced.

The same data suggest that the total cost of running a Master Class range from $30,000 to $70,000 depending on a number of factors including location, number of speakers and the degree to which participants are subsidised. The average cost per Master Class attendee over the 2009-2015 period is $2651 taking all funding sources into account, or $2051 counting just Crawford Fund contributions.

State run training and associated activities have covered a broader range of topics. Training topics by broad categories are shown in Figure 2 for the period 1987-2015. Remarkably, the topic areas and the proportions of awards in each area have changed very little over the years. Training across a range of topics was provided in the 2012-2015 period to nationals from 98 countries. Training activities have been fundamental to the Crawford Fund and range from mentoring, through scholarships and fellowships, to workshops and study tours. Training funds have been devoted to overseas and Australian individuals. Helping Australians understand agricultural systems and issues in our neighbouring countries is vital to both domestic and international agricultural production and cooperation and is in line with the Australian Government's new Colombo education program. Over recent years the states have supported work *inter alia* on breeding, plant pathology (including work on nematode identification and identification of sweet potato viruses), anthrax testing, rice production systems flower production, organic insecticide development, sustainable forestry and wood veneers. Annually State and Territory committee income is approximately $500,000, of which $200,000 was donated by State Governments and the majority of the remainder from central Crawford Funds. State expenditure is almost all devoted to training activities including fellowships and workshops, with some funds also used to support specific Master Classes. State funded training grants range from a few hundred dollars to assist travel to conferences to several thousand dollars when support is given to major training activities and Master Classes. Over the last 4 years (2012-

2015) State and Territory commissioned training costs have approximated $1,365 per person, making the Fund a highly cost effective training delivery mechanism. It is, however, worth pointing out that the majority of our trainers provide their services free of charge to the Fund. If in-kind support of this nature is accounted for training and Master Class costs would be significantly higher.

A further important aspect of the Fund's training activities includes a Young Scholars Program. This program encourages and supports young Australians on a career pathway in international agricultural research. A key step in this pathway is participation in a Crawford Fund Parliamentary Conference where they are exposed to mature debate on key issues in international agricultural research, and at which they are afforded a unique opportunity to begin the building of the personal networks that are crucial to career success.

Expected beneficial outcomes from Crawford Fund Master Class and Training Activities

The ToR for this review state *inter alia* that the Crawford Fund's activities should be:

- *To assess whether the Fund's Master Class and State and Territory training Programs are strategically focused, in terms of promoting international agricultural research of benefit to both Australia, its States and Territories, and aid beneficiaries*

Whilst the objective of this review is not to examine impact of Master Class and training activities, some brief discussion of the types of benefits and impacts expected helps to set the scene for the development of future strategy.

The review team's premise is that any training that helps Australian farmers and companies involved in the agricultural export supply chain improve market access, profitability and that reduces risk is relevant. Also important is work that enhances the prospects of the Australian agricultural services sector in overseas markets. To an extent, work of this nature has not figured highly in past Fund activities, although it is highly pertinent to the export success of Australian farmers and to economic diplomacy efforts. Furthermore, as free trade agreements (FTAs) are ratified, greater understanding of potential non-tariff barriers to trade and how they can be managed will be highly relevant to Australian agriculture and the successful implementation of the agreements to meet government expectations.

Similarly, work that minimises risks to Australian agriculture via the prevention and mitigation of risks from exotic pests and diseases is also of high value and beneficial to Australian agriculture. The development of such research projects and of networks of overseas and Australian scientists aware of these risks are considered highly relevant to the Crawford Fund.

Also highly relevant is work that enhances the ability of agricultural researchers, managers and policy makers in neighbouring countries to increase productivity, thereby contributing to poverty reduction and helping to feed the 2 billion additional mouths expected globally by 2050.

Previous studies that have highlighted the benefit of supporting international agricultural research include an analysis compiled for ACIAR[4] and a CIE study for ACIAR on impact assessment of training[5]. The former assessed a benefit to cost ratio of 67:1 for 38 projects analysed. The latter examined as a case study a Crawford Fund GIS training in irrigation program in Vietnam. Whilst taking care to

[4] Lindner R., McLeod P. and Mullen J. 2013. Returns to ACIAR's investment in bilateral agricultural research. ACIAR Impact Assessment Series No. 86. Australian Centre for International Agricultural Research: Canberra. 54 pp.

[5] Gordon, J and Chadwick K. 2007. Impact assessment of capacity building and training: assessment framework and two case studies. Impact Assessment Series 44. ACIAR Canberra.

determine the proportion of benefit attributable to the Crawford training component of a larger project, the benefit cost ratio was still 13:1.

More detailed analyses of the benefits to Australia from investment in international agricultural research are summarised in the Crawford Fund's report "Doing well by doing good."[6]

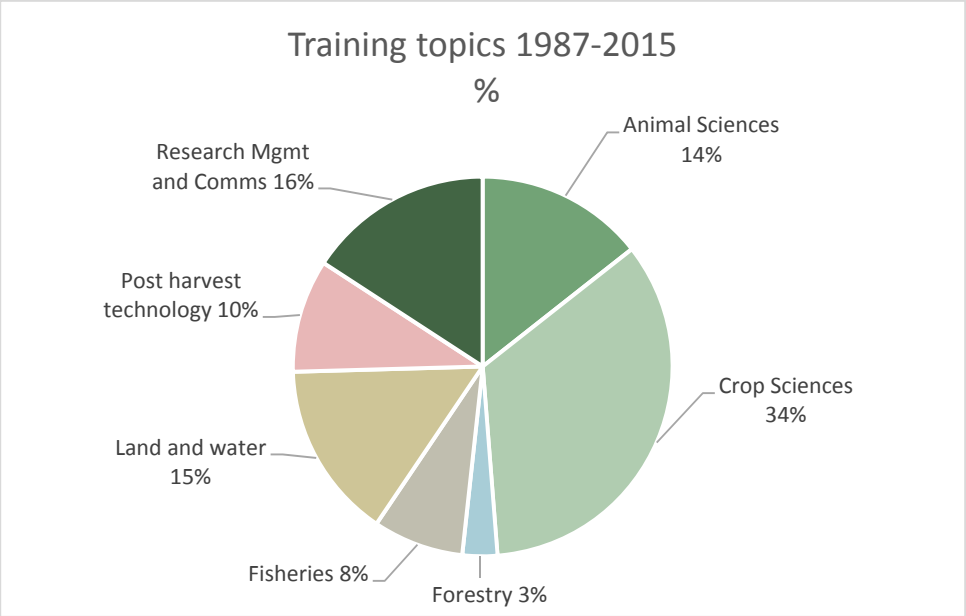

Figure 2. Training topics 1987-2015.

[6] Doing well by doing Good: International research and how it benefits developing countries. December 2013. Report of the Crawford Fund Doing Well by Doing Good Task Force. http://www.crawfordfund.org/wp-content/uploads/2014/03/cf_task_force_report.pdf

Chapter 3. Methodology and key findings

Review Methodology

This review was undertaken by questioning key stakeholders on their views about agricultural research and development as they relate to overseas markets and development issues. Approximately 50 agencies and individuals were interviewed in person or by phone (Appendix 4). A major effort was made to ensure that the review team interviewed Federal and State Government agencies, universities and the Australian R&D Corporations. Overseas, the review team contacted 7 CGIAR (previously known as the Consultative Group on International Agricultural Research) centres including, IRRI, IWMI, ICRISAT, ICARDA, ILRI, IFPRI and WorldFish. Several private sector companies were also interviewed. However, the review team considered that a more targeted approach to the company sector, building on areas of Australian expertise and identified issues would be appropriate, and based on feedback from interviewees, it has compiled a list of key companies that may be interested in sponsoring or funding Master Classes and/or training activities in the future. A further issue identified is that many multinationals interested in agriculture in Australia's neighbouring countries do not have relevant staff based in Australia. Whilst the majority of the interviews were conducted by the core review team, each Crawford Fund State Coordinator was asked to assist by interviewing key state agency and private sector contacts.

The review team acknowledge that many of the organisations and individuals interviewed represent, to a certain extent, training suppliers. To counter this the review team has attempted to ask policy makers and commercial players what they feel is needed to support Australia's broader strategic economic diplomacy and aid goals to determine relative demand in these areas. However, it has not had the resources to conduct overseas surveys of demand. Consequently, it is suggested that wherever possible this type of demand is assessed on an individual potential Master Class basis.

The questions asked of interviewees focused around appropriate alignment of Crawford Fund Master Classes and training activities with respect to emerging issues in the international food security arena and the relevance of the Fund's work with respect to Australia's foreign policy and aid objectives as defined by the Department of Foreign Affairs and Trade. Similarly, the review team asked for input in terms of what should be the key issues that should be incorporated in Fund strategy and what should be specific areas of focus for future Master Classes. As part of the process the review team tried to ensure that the individuals interviewed were aware of the limited size and resources of the Crawford Fund, fact that the review team should be looking at areas where the Fund draws on Australia's comparative strength and advantages in specific areas of RD&E, whether Fund interventions could facilitate overcoming impediments to the export of Australian agricultural goods and services, how its interventions might improve the livelihoods of poor farmers overseas, how networks might be developed that are beneficial to Australia and its neighbouring countries, that it is keen to seek partnerships for Master Class and training delivery and that it is seeking innovative ways of funding these activities. A list of specific questions is given in Appendix 6. The focus of each interview was designed to elucidate responses that were based on the specific expertise of the interviewees rather than asking all the questions to all interviewees.

Outcomes of the interview process

During the interview process, it became apparent that different agencies often had similar views about the key emerging issues where Crawford Fund Master Classes and training activities might make major interventions. We have grouped these under four key thematic headings:

- Market Access, Biosecurity and Food Policy

- Sustaining Agriculture's Natural Resource Base
- Risk and Adaptation to Global Change
- Cross Cutting themes

Each theme has been subdivided into sub- themes. These may include disciplinary science areas that improve understanding of policy and regulatory approaches and the delivery of improved transdisciplinary understanding of science and scientific methods. The cross cutting themes include critical factors that may currently inhibit delivery of agricultural research outcomes, including issues relating to communication, science writing, research management, gender and youth, partnering and networking, and how agricultural R&D can be better linked to policy development. Several people interviewed also mentioned the issue of scaling out research and development findings, which indicates the necessity of future Master Classes being designed to have specific impact pathways that relate them to related work and innovative mechanisms for disseminating new information. The following sections briefly describe the key thematic areas and subsidiary areas that interviewees suggest the Crawford Fund should be focusing on in the development of its Master Class and training strategy.

Given the clear policy directions of the Australian Government's aid programs and the overall responses from interviewees, it is clear that:

- Greater interaction with the private sector, gender, and nutrition (feed the 9 billion, well) should be priorities for the Fund.
- The geographic focus should be aligned with DFAT's definition of the Indo-Pacific region, which includes eastern Africa. (unless novel funding opportunities suggest otherwise)
- ACIAR is keen for the Fund to ensure that private sector/science engagement including agribusiness research methods; soft science areas including communication, writing and science policy linkages; plant genetic resources; rangeland management; water policy and management; aquaculture disease outbreak prevention and management; crop modelling and biosecurity and impact pathways are considered across the Fund portfolio.
- The Fund should play to Australian strengths, *inter alia*, in policy development processes, biosecurity, biotechnology and genetic resources, water management, animal disease management, research management and agribusiness and innovation systems.

Appendix 5 tabulates the major suggestions put forward during the interview process using this thematic approach.

Market Access, biosecurity and food policy	Sustaining Agriculture's Natural Resource Base	Risk and Adaptation to global change	Cross Cutting Themes
Market Access	***Water***	***Closing the yield gap***	***Managing and Communicating Research***
-Trade policy and negotiations	- Policy and governance	- Plant, livestock and fish genetic improvement	- Science communication
-Animal Health and Welfare	- Catchment Management	- Biotechnology and plant breeding	- Science writing
- Non-tariff trade barriers	- Irrigation management	- Agricultural Systems (crops and forages)Improvement	- Research Management
Biosecurity policy and regulation		- Gene Technology Regulation	- Impact assessment
-Plant and animal health	***Soils***	***Climate Change and Variability***	- Research and policy interaction
- Emergency responses to plant and animal disease and pest incursions	Soil Productivity and Improvement	Modelling and adapting agricultural system responses	***Socio-economic issues***
-Quarantine procedures	Soil carbon sequestration and management -	Reducing emissions from deforestation and forest degradation (REDD)	-Gender and Youth
- Zoonotic disease management	***Vegetation and Biodiversity***	-Flood and drought management	- Participatory research and extension methods
Food safety and quality	- Ecosystem services	***Managing Business Risks***	***Research and Development structures and institutions***
- Traceability	- Rangeland management	-Agribusiness and Value Chain development	Public - Private partnership mechanisms
- Quality Management	- Native Fisheries management	-Business Risk management	ICT, big data and spatial analysis systems
- Nutrition	- Forest Management	-Innovation systems	

Table 1. Themes for potential Master Classes and Training Activities

Market access, biosecurity and food policy

Agricultural market access together with the science, assessment and administration of biosecurity measures were raised by Federal, State and private sector interviewees as being a significant issue across the three terms of reference of the review. Commonly held objectives of the agencies and individuals are to utilise training schemes in Australia and the Indo-Pacific region to enhance the competitiveness of Australia's agriculture, fisheries, forestry and food industries by:

- maintaining and improving market opportunities through policy and technical training to support participation in market access and trade agreements in bilateral, regional and global forums
- enabling safe trade while protecting Australia's plant, animal, environmental and human health through scientifically based biosecurity policies in Australia and overseas trading partners. A good example of this is the Fund's seminal involvement in the Australia Africa Biosecurity Partnership.
- ensuring Australia's clean and green food standards and production capacities are not undermined by exotic pests and diseases or lapses in quality standards.

As an active and efficient agricultural trading nation, Australia is widely regarded as having highly developed scientific, policy and institutional capabilities to address trade and biosecurity challenges which impact on both developed and developing countries. These skills can be further used to address ongoing training gaps affecting all parts of the value chain from farm level production through to processing and delivery systems in many countries. This is becoming more apparent with the signing of recent important Free Trade Agreements (FTAs) by Australia, the benefits of which could be limited if certification and biosecurity impediments are not understood and suitably managed to facilitate trade objectives.

Australian public and private organisations do undertake periodic training on these issues in developing countries, but there is a need for more common purpose and continuity in delivering capacity building on key subjects to ensure results and mutual understanding in areas of biosecurity sciences and management. Suggestions under this theme were varied, but matters such as market access analysis, diagnostics and surveillance methods were identified as being particularly important. This includes both individual and institutional training initiatives across the food chain to enhance capacity in monitoring and quarantine procedures, laboratory management, animal health and welfare processes, food safety and quality controls, data systems and information management and emergency response mechanisms for animal and plant diseases.

Survey participants expressed a general willingness to collaborate with the Crawford Fund in further refining and delivering on these priority courses in which Australia has a recognised comparative advantage. It was further acknowledged that partnerships with the Crawford Fund Master Classes and training modules could be beneficial given the Fund's recognised name and networks (in Australia and other countries), and demonstrated experience in delivering well targeted short courses to meet particular topical requirements.

It is considered that improved biosecurity scientific and management information transfer and uptake has the latent potential to generate significant and mutually advantageous agricultural aid and trade opportunities for Australia and developing country partners. As such this will be a key matter for early attention in the design and delivery of future Crawford Fund courses.

Sustaining Agriculture's Natural Resource Base

The key issue that defines this theme is how the productivity of the globe's natural resource base can be increased to feed 9 billion globally by 2050, without further degradation of its water, soil and vegetation resources. Multiple agencies and individuals interviewed pointed out that water scarcity and water contamination including pollution and salinisation are already critical issues in much of Asia and parts of

Africa. Furthermore, there was concern that water productivity, or lack of it, is one of the key issues contributing to yield gaps in agriculture. Several CGIAR centres and the Murray-Darling Basin Authority (MDBA) voiced the view that Australia has a track record, almost second to none, in developing and implementing a wide range of water policy, governance and management methodologies that, suitably adapted, may provide excellent models for application elsewhere. Master Classes in water policy including governance issues, institutional reform and water markets and trading, catchment modelling and management methods and irrigation management and technologies were suggested.

A second area of concern regarding food production is the extent to which soils have been degraded in many countries and are being lost at rates faster than those of soil formation. Soil health and productivity include a range of factors relating to chemistry, physics and microbiology. Australia has already played a leading role in developing new digital technologies for soil mapping and in overcoming some serious land degradation issues including erosion, acidification and salinisation as well as issues such as soil carbon sequestration. The development of a Master Class that combines raising awareness of the issues associated with losses in soil productivity and innovative methods to improve soil characterisation, mapping and management was considered a priority by NSW Department of Primary Industry (NSW DPI) and Sydney University and was also mentioned as a major issue by some CGIAR centres and Australian federal agencies including CSIRO. Also related to soil productivity were suggestions that the Crawford Fund should build on work already undertaken in Papua New Guinea and in Indonesia on forest productivity assessment and reducing emissions from deforestation and forest degradation (REDD).

Also included in this theme was a suggestion that a Master Class on wild fisheries management could be mounted that draws on Australian bureaucratic and scientific expertise of managing wild fishery stocks.

Finally, mention is included in this theme of biodiversity conservation and ecosystem services. These areas relate not only to conserving natural vegetation and genetic resources as agriculture is intensified, but also has linkages with areas of science exploring plant genetic resources for potential new food, forage and medicinal products. Similarly, developing an understanding of how ecosystem functions and agriculture can deleteriously and beneficially affected each other was raised as an important emerging issue by the International Water Management Institute (IWMI), MDBA and others.

Whilst the issue of sustainable intensification and improved management of agriculture's natural resource base is daunting, it also provides a major opportunity for Australian R&D to demonstrate that there are solutions. Consequently, this should be an important area for the Crawford Fund to focus on in training and Master Classes. We note that the topic for the Crawford Fund's 2015 Parliamentary Conference addresses this question.

Risk and Adaptation to Global Change

Almost all individuals interviewed talked about the challenges and risks facing agriculture in Australia and overseas from changing global environmental, social and economic factors. Broadly speaking the risks can be divided into those emanating from physical influences including climate change and variability and those resulting from changing global socio-economic and financial factors. Successfully dealing with both these areas covering biophysical and market variables is also dependent upon having well educated scientists, economists and farmers who are open to innovation.

Many respondents argued that the Crawford Fund should continue to support training and Master Classes in areas of agriculture that are focused on improving the plant genetic base and productivity so that yield gaps can be narrowed. The development of phenotypes that can better cope with factors like drought, floods and increasing temperature will be vital in terms of climate change and variability adaptation. Areas discussed included biotechnology and plant and animal/fish breeding (including the use of genetically modified organisms, the modelling and improvement of agricultural systems and rangeland and forage management with respect to animal production. To some extent, this area could also include work aimed at

improving nutrition and tackling lifestyle and diet related diseases (this area is also relevant to the Food Policy sub-theme).

The issue of climate change and climate variability was raised in many interviews, particularly how climate information can be localised to help farmers in adaptive decision making and best bet responses.

Similarly the development of tools for drought and flood impact prediction at more localised scales were also considered important. CSIRO and the Climate Change, Agriculture and Food Security initiative (partnership between CGIAR, the Earth Systems Science Partnership and several international universities) could be key potential partners.

Closely linked to the last area is that of innovation systems and platforms. CSIRO, DFAT, several CGIAR centres, NSW DPI and Grains Research and Development Corporation all indicated that a better understanding of how information flows and research outputs can be coupled with enterprises and institutions to foster innovative ways of dealing with new and emerging challenges will be critical for future well-being and livelihoods. This area is truly cross disciplinary and may present the Crawford Fund with a good opportunity to stimulate learning and adaptive responses to physical and economic challenges across both Australian and overseas agricultural systems.

A related area to innovation systems is that of helping everybody involved in agriculture and food production get a better understanding of supply and value chains. The rapid growth of agri-businesses especially in the emerging economies of the region, together with the globalisation of agricultural food chains suggests an increased demand for corporate training in this area. The Crawford Fund has already run a very successful Master Class in Agribusiness Research Methods. It has involved looking at value chains in a few commodities in Vietnam to determine where food production and distribution problems and bottlenecks occur and to help all involved in increasing the value of production and their own profitability. This training will be vital as production potentially moves from self-sufficiency at smallholder level to production from larger farms supplying growing cities with safe and nutritious food.

Cross Cutting Issues

Many stakeholders emphasised a number of important interdisciplinary issues where there is a need to increase skills and understanding of those designing, implementing and managing research programs, both in developing countries and in Australia. Some of these cross-cutting themes have been the subject of CF Master Classes and training in the past and our stakeholders see them as important in the future.

Science communication is of critical importance to help researchers and their managers engage with communities and policy makers at all levels. CF has run several MCs, now fully funded by stakeholders (ACIAR and others), with demand for more. Scientific writing training is still very much needed by junior researchers, ideally linked with e.g. ACIAR projects which are generating publishable data.

Research management is an important and complex area, where regional MCs for e.g. ASEAN or Pacific countries could be of value. There is a strong need to empower government and research managers as well as junior scientists with research impact assessment and evaluation skills which can be applied in the design of sound programs and not just retrospectively. Impact assessments can be used for both accountability and forward planning purposes by managers.

Social sciences and networking and partnership skills are recognised by ACIAR and other key stakeholders as assuming ever greater importance in the design and uptake of research initiatives. Non-technical guidance is needed to help scientists broaden their thinking to consider the human dimension of the problems they are addressing. The significance of women and young people in development is now well recognised and is a high priority for the Australian foreign aid program. Means of incorporating inclusive gender, youth and intergenerational strategies into agricultural development projects and programs are critical, as are means of identifying best bets which will impact them positively. Participatory rural appraisal and research

methodologies, and effective scale up and scale out strategies, need to be better understood and implemented by government and research managers, in program design, implementation and evaluation. Exposure of senior and middle managers to these approaches is particularly important to avoid overly top-down programs which underperform due to poor grass-roots engagement.

Public-private partnerships have a particular context in developing country agriculture as smallholders move from subsistence to market-focused agriculture and need to engage with commercial input suppliers and markets. Exploring the way this can become a win-win could form the topic of a valuable MC for the Mekong countries, potentially with agribusiness support. Several stakeholders commented on how Australia also has some unique institutional models for government -industry and science policy networking for RDE which deserve consideration in different country frameworks.

The information and communications technology (ICT) revolution has huge applications and potential benefits across all other theme areas. Opportunities mentioned include big data and bioinformatics, and spatial analysis systems, with a range of specific challenges around data integrity, data mining, individual privacy and national sovereignty. Examining successful models of mobile communications and marketing empowering smallholders could be very useful. Likewise, many computer/phone "apps" for agriculture are being developed in Australia, and a forum or competition could stimulate new country-specific apps as well as allowing developing countries to access some of the better Australian ones. A focus for Crawford Fund training in this area could, for example, concentrate on using mobile phone technology to improve delivery of information to and from farmers. The Fund should also be wary of the limitations faced by some smaller oversees countries in accessing the web and large files and also of problems understanding documents only provided in English.

An absolutely critical point from the perspective of the review team is that the Crawford Fund must consider exactly how any Master Classes and training activities in the above priority areas will fill key gaps in understanding, policy development and extension of R&D. Master Classes must not compete with training offered by other providers such as universities. They should deal with new and emerging issues, often in a cross disciplinary manner and/or they must help to develop scientific knowledge and policy understanding in areas where it will make a difference to livelihoods and the environment.

Based on the above analysis of the feedback and the fact that the fund has very limited current resources, the review team's recommendation is that the Fund prioritise the following key topics for investment in the development of new Master Classes:

- Market Access and Biosecurity issues including disease risk and management
- Water and soil management with respect to sustainable intensification of agriculture
- Research Management training
- Innovation systems and platforms including information technology and communication

This is not to diminish the importance of the other areas identified in Table 1. Rather, it is recommended that proposals for Master Classes and training in this areas should seek a higher proportion of co-sponsorship.

Differentiation of Master Classes and Training Activities

In most respects there should be a continuum between Master Classes and other training activities run by the Crawford Fund. To date, Master Classes have had the goal of strengthening the research, training and extension capabilities of developing countries. They are aimed at mid-career scientists and/or policy makers from developing countries who already have basic training in an appropriate, related field and are actively working in the Class's topic area.

Master classes have:-

- A **focused topic and program** run over a period of one to two not necessarily contiguous weeks, to bring participants (generally early to mid-career)graduates to a higher skill level within the field in which they actively work and are already trained;
- **Participants dedicated to improving their skills/ knowledge**, with good English or the appropriate language for the Master Class;
- **A champion with an established reputation** who will take responsibility for organising the course mechanics and content;
- **A host institution** with the facilities and administrative back-up to run the Master Class; and
- **Additional donor support** in funds and in kind to co-invest with Crawford Fund.

Up to now, Master Classes have predominantly been run and managed from the Crawford Fund's central office.

Crawford Fund training activities have, over the years, ranged from supporting individuals from Australia and overseas to attend conferences, workshops and related activities and mentoring to running training courses generally in Australia, similar to Master Classes. They have been predominantly funded by State and Territory Committees of the Crawford Fund. As discussed in the introduction, both Master Classes and training that occurs on an annual basis tend to be somewhat *ad hoc* and based on requests from suppliers and participants. In a sense, this encourages a high degree of flexibility and responsiveness. Importantly, the feedback from overseas trainees and Master Class attendees has generally been overwhelmingly positive. Similarly, Australian scientists involved in presenting have not only benefitted from the development of new scientific networks, but many have commented that seeing and learning how agriculture operates and develops solutions to problems overseas has helped them with their work in Australia.

Based on feedback from participants and the State and Territory committees, the review team consider that the Crawford Fund training and Master Class programs have been very successful. Furthermore, the costs of training seem to be low, largely because of the donation of considerable in-kind support to the Fund. Topics covered have evolved over the years to reflect emerging issues and the availability of supply-side expertise to conduct training. The review team believes that the entire program could be more tightly focused around the priorities presented in this report to become more strategic and link more strongly to the Australian government's foreign aid policies and Australian industry demands. Accordingly, the additional focus on market access and biosecurity, the emphasis on sustainable intensification and the natural resource base, the focus around risks and adaptation and continued development of Master Classes and training on the "softer" skills needed to underpin agricultural R&D.

The review committee proposes no major changes to the operational management of the Master Class and training programs, other than the priorities defined here being used as the strategic guidelines for future activities. It is recommended that the name "Master Class" be retained for the more expensive, higher level training classes, and that the Fund works to further develop the Crawford Fund Master Class brand to ensure that it is synonymous with excellence and quality in training content and delivery, and becomes even more respected by participants, foreign agencies, ACIAR and Australian stakeholders and sponsors. Similarly, the review team believes that there may be economies of scale and greater impact if Master Classes are developed and then delivered several times in different countries. The model for this is already apparent through the Science Communications Master Class. It is further recommended that if a training class developed by a State Committee meets the requirements and definition of a Crawford Fund Master Class it should be so named. The synergies between the Master Classes and State training classes can be enhanced with improved outcomes.

With respect to the State-based funding of many training activities, the review committee recommends that they use the priorities defined in this report to guide focus and funding deliberations, but that all proposals are considered. Specifically, State and Territory Committees should put more emphasis on whether proposed activities are aligned with the Crawford Fund's strategic directions as espoused here and in the Corporate Plan, and will provide benefits to international agricultural research and development including the strategic directions of the relevant State or Territory.

Funding availability will clearly limit the number and range of Master Classes and training activities that can be run annually. Just how the Crawford Fund should be looking to increase funding to extend its activities is considered in the next chapter. However, it is the review team's belief, based on discussions with stakeholders in the Rural Industry Research and Development Corporations, ACIAR, and commercial actors, that funds are more likely to flow to a strategic set of activities framed around the priorities and challenges described in this report. The review team, though recognising that limited resources may constrain these activities, suggests that further consideration is given to monitoring and evaluation of all Crawford Fund Master Class and training activities to better ascertain the range of international, national and state benefits.

RECOMMENDATIONS

1. Crawford Fund Master Classes and training activities should be strategically organised under the themes identified in the review; namely

a) Market Access and Biosecurity,
b) Sustaining Agriculture's Resource Base,
c) Risk and Adaptation to Global Change and
d) a set of Cross-Cutting Issues.

2. Gender and youth issues, economic diplomacy[7] and impact pathways should be considered and where possible incorporated in design and application of all Crawford Fund Master Class and training activities.
3. To be recognised as a Crawford Fund Master Class, activities must have a focused topic and program, participants dedicated to improving their skills and knowledge, a champion with an established reputation, a host institution and additional donor, client, corporate, sponsor or partner support.
4. State and Territory Committees should ensure that all future training activities are aligned with the strategic directions of the Crawford Fund adjusted at the discretion of the relevant State and Territory Committee to meet the capabilities and interests of each jurisdiction and the availability of partnering organisations and sponsors.

[7] Which in Crawford Fund terms means Doing Well by Doing Good

Chapter 4: Partnerships and Funding

A key characteristic of the Crawford Fund is that it is a non-profit company with charitable status. This gives it a degree of flexibility and independence compared with government agencies. Accordingly, the Fund's Master Classes and training programs have been able to respond relatively rapidly to the demand for short term practical training for men and women. This review has examined the means by which the Fund can build onto and extend the reach of such training to meet future demands in a changing domestic and international agricultural and food situation.

As a training facilitator the Crawford Fund fully recognises the imperative of a suitable mix of partnerships to ensure that courses are meeting stakeholder demands. Effective training cannot be undertaken in isolation, and consultations with collaborators are essential ingredients of the production, design, funding and delivery of the short courses. These established practices will be enhanced and refined to meet the future requirements of both public and private sector stakeholders on a timely basis.

Since its foundation the Fund has developed an acknowledged extensive research training network in many Asia-Pacific and African countries. This network has included a range of training providers and funders in Australia and overseas. The model to date has been driven to a large extent by research agencies and training providers, with somewhat less emphasis on market demand and the need for more continuity in the courses to improve results for individuals and institutions, although there are some key examples of long term mentoring which have strengthened institutions.

The new demand driven focus considered in this review will help to underpin ongoing partnerships by attracting additional financial support for training from Governments, public and private sector institutions, the philanthropic community and individuals seeking particular skills. Responses to the dialogue survey have confirmed that there is scope to further involve research and training institutions as well as private organisations in forward training plans, provided the products and partnerships meet their objectives. These opportunities and appropriate partnership models are the essential means by which more diverse funding sources can be harnessed to increase Australia's role in international agricultural research and training, to enhance economic diplomacy. Partnerships will remain an essential part of the core business of the Crawford Fund but will potentially come with higher transaction costs as the Fund becomes more of a brokering than funding agency. A separate paper on partnerships opportunities has been prepared for the June 2015 Meeting of the Crawford Fund Board.

Financial partnerships with the Crawford Fund's training program can be adjusted to the preferences of individual public or private organisations with training agreements designed to meet particular objectives. There are basically three types of funding pathways envisaged:

- payment for training services by international organisations, overseas and Australian institutions or individuals seeking to enhance their individual or corporate skill base;
- grants or sponsorships by Government or other agencies seeking to fund further research training for development, including successful tender applications submitted by the Crawford Fund and partners; and
- co-funding in-cash or in- kind by organisations that wish to join with Crawford Fund to deliver an agreed training module or platform (this can include training providers such as universities and government departments).

Past experience shows that these formulated training partnerships can help to address the capacity building priorities of developing countries while also providing benefits to Australian agricultural industries and institutions.

The quest for funding growth and diversity will of necessity require added attention to the preferences and funding modalities of for- profit and non-profit private (and public) contributors. Mechanisms of engagement can be varied but will generally include the following operational characteristics:

- single or multiple partner specific agreements with agreed milestones and deliverables on course content and objectives-suited to one off training undertakings
- business relationships underpinned by ongoing renewable contracts-suited to thematic and medium/long term training platforms
- establishment of unincorporated cost sharing joint ventures, including pooling of funds and challenge programs, involving one or more funding partners to manage a prescribed range or program of training modules
- service agreements with private providers to meet a user pays training requirement
- establishment of joint company (generally companies limited by guarantee) involving the Crawford Fund and private members as a basis for continuing training ventures over a longer time horizon.

The above broad options can have applicability in Australia and/or in a developing country, including both national and multilateral collaborators such as CGIAR Centres or regional organisations. The choice of model will vary according to circumstance but governance, funding schedules, effective management provisions and clear understandings on partner roles are essential requirements.

Based on these alternatives, the Crawford Fund will now move forward to widen communication and diversify collaborative arrangements to stimulate more investment in international agricultural research training, using Australia's training advantages and skills to improve agricultural and food prospects in Australia and developing countries. Potential strategies are listed in the related Board paper on partnership opportunities.

An additional point of concern to the review team is the low level of core funding currently available to Master Classes. As the fund seeks to attract new partners and sponsors to grow its Master Class program it will need to sustain its current funding base at around $100,000 per annum for the next two or three years, tapering down progressively thereafter. This will enable the Fund to seed new classes in the emerging areas identified and to build its reputation in some of the new key areas identified by this review. If successful it is anticipated that demand to attend classes will increase and new partners will want to collaborate and invest in these classes.

RECOMMENDATIONS

1. the Crawford Fund should give added focus to seeking additional funding from the private sector based on demand from that sector, and linkages to Australia's economic diplomacy objectives. Similarly, training activities should also seek to include co-sponsorship wherever appropriate, including for selected scholarships and fellowships awarded by the Fund, *and wherever practicable give priority to training investments that generate a return for the Fund*.
2. Crawford Fund Master Classes and Training activities should have clearly defined mechanisms for risk and cost sharing between the Crawford Fund and partner organisations.
3. Subject to annual budget considerations, Crawford Fund contributions to Master Classes, subject to annual budget considerations, be restored to at least $100,000 per year with the clearly defined objective of the developing new high profile classes capable of attracting external sponsorship. The level of this core support should progressively taper down as the Fund attracts new partners and sponsors. *No single Master Class topic should receive core support for a period of more than two or three years*.

Chapter 5. Strategic Directions, Business Planning and Immediate Actions

The previous chapters of this report defined four key themes that should provide focus on issues that are both aligned with Australia's foreign policy objectives and key issues in international agricultural research and development agendas. These areas are:

- Market Access, Biosecurity and Food Policy
- Sustaining Agriculture's Natural Resource Base
- Risk and Adaptation to Global Change
- Cross Cutting Themes - Managing and Communicating R&D, Social Sciences and ICT applications

All four of these areas are highly relevant to agricultural productivity and trade in Australia and its neighbouring countries. Furthermore they also are areas in which Australian R&D has demonstrated considerable prowess and international relevance.

It is proposed that these four areas become the themes around which all Crawford Fund Master Classes and training activities are organised. Furthermore, it is suggested that initially the Fund's focus should be on developing new Master Classes in:

- Market Access and Biosecurity issues including disease risk and management
- Water and soil management with respect to sustainable intensification of agriculture
- Research Management training
- Innovation systems and platforms including information technology and communication

Ideally, most training activities should also be easily related to the identified themes and priorities. However, the Crawford Fund should retain a degree of flexibility so that as new issues and sponsorship and partnership opportunities emerge, they may also be the foci for new training activities.

Noting the strong interest in market access and biosecurity amongst many agencies interviewed, a high priority for the fund will be to develop and run Master Classes in these areas. This will, of course, be contingent on the fund's ability to broker sufficient funding in these areas.

Given the imperative for new sponsorship, the most immediate tasks for the Fund are to identify co-sponsors for a range of prioritised Master Classes. A key task will be to enhance existing and new revenue streams and especially from new markets and the private sector. Based on the interviews conducted and the development of a more focused and strategic direction for Master Classes, a number of agricultural companies and government agencies have been identified who should be approached to seek input into and payment for potential classes through sponsorship and/or fee for service. As well as looking to traditional research and development funders and partners, the Crawford Fund should attempt to attract sponsorship and funding from public agencies and private companies with an interest in enhancing the production and sale of Australian goods and services. This might lead to Master Classes designed at least in part to service Australian clients as well as overseas nationals. Finally, the Crawford Fund should also be prepared to invest initially to establish the new Master Class programs, but ideally, it will be advantageous to bring in partners to share the costs and risks implicit in new directions.

Based on the interview process and discussion with State Committees, a number of Master Classes have already been identified as prospective for the coming 12-24 months. These include

1. Catchment Management (under development by ANU; co-sponsored by The Thai Embassy in Canberra)
2. Soil Productivity (co-sponsored by NSW DPI and USYD USSC; 2015 is International Year of the Soil)

3. Demand-led plant breeding in collaboration with Syngenta Foundation and African Universities (late 2015)
4. Mango Production Systems (NT Crawford Committee – seeking sponsorship)
5. GRIN Global data base management for plant genetic information
6. Research Management (initial focus in Indonesia – seeking sponsorship),

Of these, numbers 1 and 2 fit under the high priority area in the theme on Sustaining Agriculture's Natural Resource Base. Number 3 fits well under the theme focusing on Risk and Adaptation to Global Change. Numbers 5 and 6 fit well under the Cross-Cutting Theme with respect to innovation and research management respectively. Number 4 can be considered as a lower priority, as it is more focused on Australian production. However, it could still be a relevant area if significant co-sponsorship is forthcoming.

It is also probable that there will be ongoing demand for further Master Classes in Science Communication and in Agribusiness Research Methods, which would both fit in the high priority areas identified.

This review focused primarily on interviewing existing sponsors and partners. Consequently, the review team recommends that particular emphasis be placed immediately on developing dialogues with key private sector players in Australia and overseas. These dialogues should focus around the identified high priority areas. Whilst an increase in funding to around $100,000 per annum for the next two or three years is recommended to attract new partners and sponsors to grow these priority areas, success in this regard will then allow tapering down of core funding progressively thereafter.

To facilitate the business planning process, a key task over the next 6 months is for the Crawford Fund to locate champions, presenters and co-sponsors for the priority Master Classes identified here. Part of this process will also include looking at how linkages can be developed with other Australian run training initiatives led by DFAT and other government agencies, the universities and non-government organisations such as the Australian Rural Leadership Program. Similarly, the Fund will need to canvass potential interest in emerging Master Classes with regional National Agricultural Research and Extension Services and groups such as the Asia Pacific Association of Agricultural Research Institutions (APAARI).

Finally, based on the findings of this report a template for proposed Master Classes has been developed and is shown in Appendix 7.

RECOMMENDATION

1. Over the next two to three years, focus should be given to brokering and running Master Classes and training activities in:
   i) market access and biosecurity;
   ii) water and soil management with respect to sustainable intensification of agriculture;
   iii) research management training and innovation systems; and
   iv) platforms including information technology and communication.
2. Master Classes must be evaluated and the impact measured through post-Master Class monitoring and evaluation.
3. The term Crawford Fund Master Class can only be affixed to a training activity by the Crawford Fund CEO, or delegate.

Appendices

Appendix 1. Master Classes conducted since 1992

Date:	**Topic:**	**Institutions involved:**	**Participant Countries:**	**Participants**	**Place:**	**Report**
Nov-92	Microbial and plant molecular genetics	ACIAR	India, Sri Lanka, Thailand, Malaysia, Indonesia, Philippines, China	14	Department of Genetics and Developmental Biology, Monash University	Y
Nov-93	Microbial and plant molecular genetics	Monash University, ACIAR, Monash Centre for Agricultural Biotechnology	Thailand, Nepal, Mauritius, India, Sri Lanka, Bhutan, Philippines, China, Malaysia, Brazil, Vietnam, Australia	17	Department of Genetics and Developmental Biology, Monash University	Y
Nov-94	Microbial and plant molecular genetics	ACIAR	Australia, Bangladesh, India, Vietnam, Malaysia, South Korea, Brazil, Nepal, Philippines, Bhutan, China, Sri Lanka	18	Department of Genetics and Developmental Biology, Monash University	Y
Feb-95	Modern Dairy Technology	La Trobe University	Nepal, Malaysia, Indonesia, Philippines, Thailand, Vietnam, Australia	15	La Trobe University, Bundoora, Victoria	Y
Jun-95	Advanced Reproduction Technologies: New Avenues for Livestock Improvement	CSIRO, QLD DPI, CQU	Australia, China, Indonesia, Malaysia, Philippines, Thailand, Vietnam	15	Tropical Beef Centre, Rockhampton	Y
Nov-95	The Use of DNA Technologies in Biodiversity, Plant Breeding and Biosafety	ICGEB, NCGEB, UNIDO, UNEP	Australia, China, India, Indonesia, Nepal, Philippines, Sri Lanka, Vietnam, Thailand,	27	National Centre for Genetic Engineering and Biotechnology (NCGEB), Bangkok, Thailand	Y

Dec-95	Plant Gene Technology	CRC for Plant Science	Malaysia, Philippines, India, Sri Lanka, Vietnam, China, Thailand, Australia	18	Green Machine Education Centre	No
Jun-96	Bacterial Molecular Genetics	Asian Vegetable Research and Development Centre	Philippines, Taiwan, Thailand, Vietnam, Indonesia, South Korea, Malaysia	12	The Asian Vegetable Research and Development Centre, Shanhua, Taiwan	Y
Nov-96	Microbial and plant molecular genetics	Monash University, ACIAR	Malaysia, Pakistan, Vietnam, Philippines, Thailand, Indonesia, South Africa, Australia	12	Monash University	Y
May-97	New Technologies for the Measurement of Biodiversity	Federation of Asian Societies and Academies of Science, BCSS, BG, EA, DEST, ISTP, DI, ST, AAS	Malaysia, Philippines, Vietnam, Nepal, China, Sri Lanka, Indonesia, Thailand	15	University Putra Malaysia	y
Jun-97	New Technologies for the Diagnosis of Tropical Disease	ACIAR, IRRI, ARBN, JNIAR	China, Philippines, India, Indonesia, Taiwan, Iran, Thailand, Malaysia, Vietnam	15	International Rice Research Institute, Los Banos, Philippines	y
Oct-97	Vertebrate Pest Management	CSIRO, AusAID, MARDI, ACIAR	Malaysia, India, Tanzania, China, South Africa, Nepal, Thailand, Sri Lanka, Vietnam, Indonesia, Burma, Laos	12	Canberra, Australia	y
Jul-98	Biotechnologies in Food Processing and their Impact on Crop Production	CRC for Wheat Products and Processes, GRDC, CSIRO Division of Plant Industry, NTU, ANGIS, BRI Australia Ltd, ACIAR, Goodman Fielder Limited	Bangladesh, Indonesia, Philippines, China, Australia, Singapore	10	Northern Territory University, Darwin; CRC for Wheat Products, and Processes, Sydney, Australia	Y

Oct-98	New Tech for Plant Quarantine Management	The Malaysian Department for Agriculture, Universiti Putra Malaysia, AQIS, Macquarie University Key Centre for Bio-diversity and Resources, ANU, CSIRO, Agriculture Victoria Institute for Horticultural Development, ANGIS, AAS		15	Training Centre of the Department of Agriculture, Serdan, Malaysia; Universiti Putra Malaysia	Y
Nov-98	Microbial and Plant Molecular Genetics	ACIAR	Australia, Indonesia, Malaysia, Philippines, Ghana, Thailand, India, Venezuela	12	Monash University, Victoria, Australia	Y
Dec-99	Intellectual Property Rights in Agricultural Technology	The Asia Pacific Intellectual Property Law Institute of Murdoch University, ACIAR, AMRAD, IWOKRAMA, CIMMYT	Indonesia, Thailand, Papua New Guinea, Philippines, China, India, Australia, Guyana, Vietnam, Mexico, Turkey, Malaysia, Laos	20	Murdoch University, Perth, WA, Australia	Y
Mar-00	Biodiversity Assessment	DIWPA, Rainforest CRC, James Cook University, Griffith University	Samoa, Japan, Suriname, Singapore, PNG, Sri Lanka, Vietnam, Germany, Russia, Malaysia, Thailand, Indonesia, Singapore, China	27	North Queensland, Australia	Y
Sep-00	Rhizobium Technology	Murdoch University, INIA, GRDC, CRS, Agriculture Western Australia		15		Y
Nov-00	Molecular Plant Breeding	ACIAR, Agriculture Victoria, Natural Resources and Environment, GRDC, Southern Cross University, Cooperative Research Centre Molecular Plant Breeding	China, Thailand, Indonesia, Iran, Mongolia, Oman, Syria, Turkey, Vietnam Australia	15	The Waite Campus, University of Adelaide, SA; The Plant Biotechnology Centre, La Trobe University	Y
Dec-00	Soil borne Fungal Pathogens			21	University of Sydney	Y

Mar-01	Economic Policy Modelling		China, Indonesia	20	Hotel Santika, Yogyakarta, Indonesia	No
Oct-01	Research management in Agriculture 1			23	Sydney, in collaboration with University of New England	Y
Sep-02	Research management in Agriculture 2			24	Sydney, in collaboration with University of New England	No
May-03	Rodent Ecology and Management	ACIAR, IRRI, CSIRO	Australia, Bangladesh, India, Indonesia, Lao PDR, Burma, PNG, Philippines, Portugal, Sudan, Tanzania	25	IRRI, Los Banos, Philippines	Y
Jun-03	Soil-borne Pathogens of Cereals	CIMMYT, ICARDA, University of Sydney,	Afghanistan, Australia, India, Iran, Kazakhstan, Morocco, Tunisia, Turkey, Uzbekistan	23	Turkey	No
Sep-03	Agricultural Biosecurity	DAFS, Crawford Fund	Argentina, Chile, China, East Timor, Fiji Islands, Indonesia, Malaysia, Mexico, Philippines, Thailand, Vietnam	23	Sydney and Canberra	Y
Feb-04	Third Master Class in Research Management	University of New England	Cambodia, Colombia, Indonesia, Kenya, Papua New Guinea, China, Philippines, South Africa, Sri Lanka, Vietnam, Zimbabwe	20	Armidale	Y
May-05	Soil-borne Pathogens of Wheat	CIMMYT, Henan Agricultural University, University of Sydney, SARDI, CSIRO	China	21	Zhengzhou	Y
Dec-05	Computable General Equilibrium Modelling	The Australian National University, Chulalongkorn University	China, Thailand, Indonesia, Vietnam	32	Bangkok	Y

Aug-06	Aquaculture Nutrition	NSW Dept. Primary Industry, Asian Institute of Technology, NACA	Cambodia, Papua New Guinea, Vietnam, Indonesia, India, Thailand, Laos, Philippines, Fiji, New Caledonia, Bangladesh	27	Bangkok	Y
Oct-06	Landcare	University of New England, Landcare Australia	Fiji, Tonga, Nauru, Solomon Islands, Philippines, Puerto Rico, South Africa, Tanzania, Kenya, Uganda, Sri Lanka, United States of America, United Kingdom	23	Melbourne	Y
Nov-07	Fish Health	Murdoch University, NACA, AAHRI, Intervet	Bangladesh, Cambodia, China, India, Indonesia, Myanmar, Nepal, Sri Lanka, Philippines, Singapore, Thailand, Vietnam	19	Bangkok	Y
May-08	Soil-borne Pathogens of Wheat	CIMMYT, ICARDA, INRAT, Univ. Southern Queensland, SARDI, Univ. of Sydney	Algeria, Australia, Iran, Kazakhstan, Libya, Morocco, Syria, Tunisia, Turkey,	20	Tunis	Y
Jun-08	Plant Biosecurity	CABI, CRC Biosecurity, Malaysian Department of Agriculture and Agro-Industries	Malaysia, Bangladesh, Thailand, Vietnam, Philippines, Singapore, Laos, Cambodia, Burma, India	16	Kuala Lumpur	Y
Mar-09	Agricultural Research Evaluation and Impact Assessment	ICRISAT, ACIAR	Bangladesh, China, India, Indonesia, Iraq, Papua New Guinea, Philippines, Sri Lanka, Thailand	20	Hyderabad	Y
Jun-10	Soil borne pathogens of cereals	CIMMYT, ICARDA	Afghanistan, Algeria, Australia, Iran, Iraq, Morocco, Nepal, Tunisia, Turkey, USA	24	Eskisehir	Y
Nov-10	Collaborative plant breeding	University of Western Australia, ICARDA	Afghanistan, Australia, Bangladesh, China, Ethiopia, East Timor, India, Indonesia, Iraq, Nepal, South Africa, Tanzania,	20	Perth	Y

Jan-11	Citrus diseases - HLB	University of Western Sydney, Gadja Madah University	Australia; Bhutan; Brazil; Cambodia; China; Fiji; India; Indonesia; Laos; Malaysia; Pakistan; Thailand; Timor Leste; Tonga; Viet Nam	46	Yogyakarta	Y
Mar-11	Risk management and systems modelling	QAAFI, SIMLESA, CIMMYT, ACIAR	Ethiopia, Kenya, Tanzania, Malawi, Mozambique, Mali, Ghana, Cameroon, Burkina Faso, Colombia, and Zimbabwe	26	Addis Ababa	Y
Nov-11	Science Communication	Crawford Fund, Econnect	India, Thailand, Sri Lanka, Nepal, Philippines, Indonesia, Vietnam, Pakistan, Bangladesh	18	Chiang Mai	Y
Nov-11	Plant Health Clinic	CABI	Zimbabwe, Cote d'Ivoire, Mozambique, DRC, Ethiopia, Rwanda, Sierra Leone, Zambia, Kenya and Uganda	20	Nairobi	Y
Nov-11	Management of climate variability	QAAFI, SIMLESA, CIMMYT, ACIAR	Ethiopia, Kenya, Tanzania, Malawi, Mozambique, Sudan and Botswana	24	Morogoro	Y
Aug-12	Policy Analysis for REDD+ within a Decentralised Context	ANU, Research Centre for Climate Change, University of Indonesia, Forestry Research and Development Agency	Indonesia	20	Jakarta	Y
Dec-12	The isolation, identification and utilisation of root nodule bacteria (rhizobia) in promoting sustainable agricultural productivity	Research Center for Climate Change Research of the University of Indonesia	Sri Lanka	22	Kandy	Y

Apr-13	Communicating Research to Stakeholders	ILRI Campus	Ethiopia	20	Addis Ababa	Y
Aug-13	Adaptation to drought	UWA, Murdoch University, DAFWA, GRDC , FAO	Argentina, Australia, Azerbaijan, Bangladesh, Burkina Faso, Kenya, India, Iraq, Pakistan, Sudan, and Tanzania	19	Perth, WA	Y
May-14	*Communicating Research to Stakeholders*	*CF, Econnect*	*Pacific countries*	*20*	*Nadi, Fiji*	
June- & Sept-14	*Agribusiness Research Methods*	*University of Adelaide*	*SE Asia*	*25*	*Hanoi*	
15-Mar	*Communicating Research to Stakeholders*	*CF, Econnect*	East Africa	20	Nairobi	

Appendix 2. Sources of income for Master Classes: 2009-2015

	Support over 6 year period	Average annual support
Total Crawford Fund Master Class Support	**$736,744**	**$122,791**
Crawford Fund State and Territory Support	**$52,517**	**$8,753**
Total Crawford Fund (Net of States) Master Class Support	**$684,227**	**$114,038**
Total additional ACIAR Master Class Funds	**$68,874**	**$11,479**
Total Other Master Class Funds	**$54,097**	**$9,016**

Appendix 3. State and Territory Training Income and Expenditure 2010-2015

State and Territory Training Income and Expenditure								
1 July 2010 to 31 Mar 2015								
	Account	**2015**	**2014**	**2013**	**2012**	**2011**	**Total Income**	**Total Expenditure**
VICTORIA								
Income	Grants - VIC Govt	$50,000	$50,000	$50,000	$50,000	$50,000		
	Distribution VIC	$30,000	$30,000	$40,000	$40,000	$40,000		
Total Income		**$80,000**	**$80,000**	**$90,000**	**$90,000**	**$90,000**	$430,000	
Expense	VIC Training Awards	$72,000	$88,433	$81,593	$35,356	$91,262		$368,644
NSW								
Income	Project -ACIAR & MC others		$10,000					
	Grants - NSW Govt	$50,000	$30,000	$30,000	$30,000	$30,000		
	Distribution NSW	$30,000	$30,000	$40,000	$40,000	$40,000		
	Donations Individual NSW	$1,000	$1,000	$1,000	$1,000	$1,000		
Total Income		**$80,000**	**$71,000**	**$71,000**	**$71,000**	**$71,000**	$364,000	
Expense								
	NSW Training Awards	$55,400	$73,209	$33,804	$59,221	$84,791		$306,425
QUEENSLAND								
Income	Grants - QLD Govt	$40,000	$37,000	$70,000	$70,000	$70,000		
	Distribution QLD	$30,000	$30,000	$40,000	$40,000	$40,000		

Total Income		**$77,000**	**$67,000**	**$110,000**	**$110,000**	**$110,000**	$474,000	
Expense	QLD Training Awards	$60,500	$21,448	$114,480	$117,395	$90,600		$404,423
SOUTH AUSTRALIA								
Income	Grants - SA Govt	$15,000	$15,000	$15,000	$15,000	$15,000		
	Distribution SA	$30,000	$30,000	$40,000	$40,000	$40,000		
	Donation-Individual SA *	$1,100	$1,000	$0	$1,000	$0		
Total Income		**$45,000**	**$46,000**	**$55,000**	**$56**	**$55,000**	$201,056	
Expense								
	SA Training Awards	$42,000	$40,777	$26,799	$42,817	$40,697		$193,090
Northern Territory								
Income	Distribution NT	$25,000	$30,000	$40,000	$40,000	$40,000	$175,000	
Total Income		**$25,000**	**$30,000**	**$40,000**	**$40,000**	**$40,000**		
Expense								
	N.T Training Awards	$23,000	$7,655	$20,328	$9,506	$55,035		$115,524
WESTERN AUSTRALIA								
Income								
	Grants - WA Govt	$30,000	$30,000	$30,000.00	$30,000	$30,000		
	Distribution WA	$30,000	$30,000	$40,000.00	$40,000	$40,000		
	Donation Corporate - WA	$30,000	$38,600	$28,000	$28,000	$28,000		
Total Income		**$90,254**	**$98,600**	**$98,000**	**$98,000**	**$98,000**	$482,854	

Expense	WA Training Awards	$81,000	$53,611	$88,163	$104,781	$65,031		$392,586
AUSTRALIAN CAPITAL TERRITORY								
Income	Distribution ACT	$25,000	$30,000	$40,000	$40,000	$40,000		
	Donations Individual ACT-IFPRI	$5,934	$7,212	$0	$5,000			
Total Income		**$30,934**	**$37,212**	**$40,000**	**$45,000**	**$40,000**	$193,146	
Expense	ACT Training Awards	$23,100	$69,834	$15,913	$38,331	$28,409		$175,587
TASMANIA								
Income	Grants TAS Govt	$15,000	$15,000.00	$15,000	$20,000			
	Distribution TAS	$30,000	$30,000.00	$40,000	$40,000	$10,000		
Total Income		**$45,500**	**$45,000.00**	**$55,000**	**$60,000**	**$10,000**	$215,500	
Expense	TAS Training Awards	$4,501	$78,799	$11,958	$67,463	$0		$162,721
Total Training Income							**$2,535,556**	
Total Training Expenditure								**$2,118,999**

Appendix 4 Agencies and Individuals Interviewed

Agency	Persons Interviewed
Federal Agencies and Companies **Department of Foreign Affairs and Trade**	Dr Jim Woodhill, Senior Adviser Russell Rollason, Water Resource Management Stephanie Lee, Water Resource Management
Australian Centre for International Agricultural Research	Dr Nick Austin, CEO David Shearer Mike Nunn, John Dixon, Ejaz Qereshi, Rodd Dyer, Richard Markham, Robert Edis, Eric Huttner, Andy Heaney, Evan Christen
Murray Darling Basin Authority	Dr Rhondda Dickson, CEO
CSIRO **Grains Research and Development Corporation**	Dr Christian Roth (Land and Water and Agricultural Flagship) and Dr Dan Walker (Chief, Ecosystem Sciences) Dr Martin Blumenthal, Senior Manager Natural Resources Ken Young, Senior Manager Crop Protection Paul Meibusch, Meeting Market Requirements Theme Coordinator
Federal Office of the Gene Technology Regulator	Michael Dornbusch Paul Keese
Federal Department of Agriculture	Ian Thompson, FAS Sustainability and Biosecurity Dr Ian Naumann Director, Capacity Building, Plant Health Policy Branch Director Animal Biosecurity
Department of the Prime Minister and Cabinet	Paul Morris, Agriculture White Paper Task Force

Rural Industries R&D Corporation	Craig Burns, Managing Director
Dairy Australia	Robert Condron, Manager Risk Analysis
Horticulture Innovation Australia Ltd	David Moore, GM R&D Services Sharyn Casey, Communications and Education Manager
Rural Skills Australia	Tony Dwyer, a/g CEO
National Farmers Federation	Tony Mahar Dpty. CEO Jaqueline Knowles, NRM specialist
Meat and Livestock Australia	Terry Longhurst, Manager Strategic Science Des Rinehart, Feedlot R&D Manager Peter Dundon, Manager Livestock Exports
Australian Rural Leadership Program **Grain Corp**	Matt Linnegar, CEO Klaus Pamminger, Group General Manager-Marketing
CBH	Colin Tutt
Crawford Fund State Committees and State Agencies **Queensland Crawford Committee** **SA Crawford State Committee** **ICEWaRM** **Rural Solutions SA** **SARDI** **Tasmanian Crawford State Committee** **WA Crawford State Committee** **WA Department of Agriculture and Food** **NSW Crawford Fund Committee** **NSW Department of Primary Industries** **The University of Sydney Plant Breeding Institute** **The University of Sydney, US Study Centre** **ACT Crawford Committee**	 Dr Bruce Pengelly Dr Roger Wickes Dr Richard Hopkins, CEO Daniel Casement Dr Neville Mendham Dr James Ridsdill-Smith Dr Helen Scott-Orr Dr Scott Hansen, Director General Dr Bruce Christie, Deputy Director General Biosecurity and Food Safety Prof Peter Sharp, Director Prof Bill Rathmell Andrea Koch, Director Soil Carbon Initiative Dr Tony Fischer

Victorian Crawford State Committee **Tasmanian Department of Primary Industry, Parks, Water and Environment** **Tasmanian Forestry Practices Division**	Ted Hayes Deidre Wilson, Director, Agri-Growth Division Sarah Munks Peter McIntosh
CGIAR Centres and International Agencies **International Rice Research Institute** **International Water Management Institute** **International Food Policy Research Institute** **International Centre for Arid Research in the Dry Areas** **International Crops Research Institute for the Semi -Arid Tropics** **International Livestock Research Institute/ Biosciences eastern and central Africa (ICIPE)** **World Fish** **CABI (formerly Commonwealth Agricultural Bureau International)**	 Noel Magor, Impact Acceleration Leader Dr Andrew Noble, Director, Water Land and Ecosystems Dr Suresh Baba, Head of Capacity Building Kamel Shideed, Assistant Director General for International Cooperation and Communication, Charles Kleinermann Dr Anthony Whitbread Iain Wright, Deputy Director General, Dr Ethel Makila, Dr Iddo Dror Dr Stephen Hall, Director General Dr Trevor Nicholls, Director General
Dr Jim McWilliam	Retired, former CEO of ACIAR

Appendix 5. Key strategic priorities suggested by agencies and individuals interviewed

	Key Issues Raised
Federal Agencies	
DFAT (Agriculture)	Trade policy; connecting farmers to markets; foresighting and risk management; agricultural produce standards
DFAT (Water)	Water-food-energy nexus; water policy, governance and management; links between WASH and water and agriculture
ACIAR	Private sector/science engagement including agribusiness research methods; soft science areas including communication, writing and science policy linkages; plant genetic resources; rangeland management; water policy and management; aquaculture disease outbreak prevention and management; crop modelling and biosecurity; impact pathways
OGTR	Regulatory frameworks for GMOs; Phytosanitary and sanitary considerations; linking science to policy and social norms
CSIRO Agriculture Flagship	Traceability and livestock systems ; Climate variability/climate change adaptation/greenhouse gas emissions; Agricultural R&D in innovation systems; Ag systems modelling thru to management ; nutritional security; sustainable intensification
CSIRO Land and Water	Water and water policy issues; innovation systems; climate change modelling; adaptation to pressures and risks; cross disciplinary approaches
DAF	
GRDC	Explaining how Australia deals with biosecurity; pesticide residue issues; biotech and GMOS and impacts on export markets; phone apps for information exchange; science communication; gender and intergenerational issues
MDBA	Water governance; river basin management; adaptation to climate variability and change; water markets; salinity management
PM&C	Agri-food skill sets; development of business skills for farmers; training in areas where Australia has competitive advantage re free trade agreements
RIRDC	Tech transfer and scaling out; water; science policy linkages; agribusiness research methods; role of cooperatives
HIAL	Biosecurity e.g fruit fly training in Pacific (with Israel); high level trade and research collaboration with India on mango genomics and production
MLA	Live export value chains esp. to SE and East Asia; animal welfare assessment and management tools; biosecurity; future HR development - co-training of O/S and Australian students
Dairy Australia	Animal Welfare in live export trade
State Agencies and CSIRO Regional Laboratories	
NSW DPI	Productive soils; innovation networks and development; Mobile phone apps and technologies; big data; biosecurity and food safety QA in value chains;
USYD	Agribusiness as innovation brokers; mentoring agricultural curriculum development; biosecurity, plant and animal.

Tasmania	
Inst of Ag, Univ of Tas	Water resources and irrigation; enabling small farmers via innovative technologies; science communication and writing;
Department of Primary Industry, Parks, Water and Environment	Irrigation and water resources; fishery issues
Tasmanian Forest Practices Authority	Communication, planning, GIS skills and use of other new technology; REDD issues; soils and biodiversity in forestry
CSIRO L&W Hobart	Wood plantation productivity. APSIM modelling
CSIRO Marine Hobart	Science on genetics, chemistry, GIS etc to give an equivalent to the "paddock to plate" approach in agriculture; science writing and communication
South Australia CF Committee	Scientific writing; agribusiness development in PNG; water management; disease management in field crops; food sciences; biosecurity
Western Australia CBH, DAFWA, UWA, Curtin, Murdoch Unis	Biosecurity for pest and disease control for post harvest grains; Value chain training courses contributing to food security and sustainability; Biosecurity Threat and Invasions; Innovations in selection of plants for saline environments; Assessment of fish stocks in Indonesia; Writing up research and statistical methods; Building networks to better manage fish diseases in SE Asia.
Queensland	Adoption/change/private sector in IAR4D , forages; systems modelling
NT	No response
ACT	Biotechnology and GMO regulation
Victoria	No response
Univ of Melbourne Vet School	Animal health and responses to emergency animal disease outbreaks.
Commercial Agencies and NGOs	
NFF	Animal welfare; biosecurity; GMOs; land and water management
Graincorp	Biosecurity and market access; facilitation of science; bureaucracy and commercial agency interactions; trade-politics interactions

International Agencies	
IRRI	Trade; drought and floods; bioinformatics and big data; water governance and irrigation management; science policy linkages; public-private partnerships
IWMI	Management of water in large scale irrigation schemes; improving water productivity in rainfed systems; food security and water issues
World Fish	Biosecurity in aquaculture; disease management and responses to risks of and outbreaks of disease; Best practice management to manage against disease; Crisis responses; genetic improvement in aquaculture; biosecurity
IFPRI	Water policy, wise river and groundwater management through to food security are critical regional issues; policy development relating to fertilisers, and seed technology regulation, particularly re overuse and subsidies of fertilisers; Biosecurity and GMO regulation
ICARDA	Water resource management and adaptation to climate change and drought management ; dryland biodiversity collection, characterisation and utilisation and integration of crop and livestock systems; Sustainable intensification under scarce water resources; genetic enhancement of food legumes in conservation agricultural systems; biosecurity and GMOs; standards and regulatory frameworks for agricultural imports
ICRISAT	Ag systems analysis; crop breeding technologies, seasonal weather forecasting, climate risk and variability management; cash crop and value chain analysis
ILRI/BECA	"Soft" skills including problem identification, writing skills and partnership skills; science leadership training; Regional trade is expanding in Africa and issues such as biosecurity, regulation and traceability are becoming more important; rangeland management

Appendix 6. Examples of the type of questions asked during interviews.

Appropriate alignment

- DFAT , ACIAR, DAFF
    - DFAT - Given the CF's track record in training and Masterclasses, how can the CF align its programs to support the government's stated agricultural aid and economic diplomacy objectives?
    - Which areas of the global food security agenda are most likely to impact Australia and are there training needs to build skills here and overseas in these areas (e.g. biosecurity, water management, etc.)?
    - What are the key issues and gaps in program delivery that can be enhanced by the CF increasing efforts on training and capacity building?
    - Are there specific areas of concern to Australia with respect to increasing awareness of key issues such as biosecurity, GMO safety etc in which the CF could raise awareness and skills in neighbouring countries via targeted training programs?
    - The provision of training to support ODA is a relatively crowded space – do you have suggestions as to whom the CF should be partnering with to build on the CF's existing track record and to deliver enhanced, high quality outcomes in support of Australia's foreign policy objectives?
    - What areas of capacity building in neighbouring countries would specifically assist Australia's agricultural and agricultural trade goals?
    - What areas of capacity building would specifically enhance the private and Not-for-Profit sectors' ability to increase trade and service delivery in the agricultural sector.
    - We may need more clarity over the issue of mutual Australian and developing country benefits from Crawford Fund master class courses. As with ACIAR research programs, the core objectives are to assist developing country partners, but with concurrent gains for Australia a legitimate and added benefit. We need to be clear in a Crawford Fund context how this dual objective can be managed as it will guide the approach to attracting new cash or in-kind funding partners.

Strategic Focus

- What do you consider to be the most important issues that will impact on Australia's agricultural production systems and food exporting opportunities in the next decade?
- Are you aware of specific training needs both in Australia and overseas that would help enhance our ability to build strong market linkages with overseas customers?
- How can training programs enhance Australia's ability to build effective and long-lasting relationships with key overseas country food producers, importers and scientific/agricultural production professional, policy and support staff?
- Where do you see key gaps/needs etc in terms of the above question?
- Where do you see opportunities for the CF to facilitate partnerships and cooperation with your own organisation that will lead to benefits to Australia and our Asian neighbours in terms of the international food security agenda?
- Do you see a particular niche for the Crawford Fund that builds on it experience in delivery of Master Classes that would build on Australia's comparative advantages in the agriculture, fisheries and forestry sectors?

- *For the private sector and NFP sectors*– Are their ways in which the CF can use its networks and expertise in training to help facilitate opportunities for improved aid and trade and relationships with overseas customers? What training programs would enhance your abilities to operate in overseas markets (e.g. agribusiness/ value chain training, biosecurity, water management/irrigation etc)? Would you be willing to help support well targeted training courses in these areas?
- *For the CG centres* (probably restrict our audience to (IFPRI, IWMI, WorldfFish, IRRI, ICRISAT, and CIMMYT??) How could the CF help broker effective training programs with the NARES and where do you perceive the most significant demand? Would you be able to assist in raising funds via the new CRPs to support well targeted training programs that enhance our joint ability to take R&D to the end users?

Specific Products and Market Opportunities

Current best bets are:

Current potential best bets include:

- Biosecurity
- Mentoring
- Water in agriculture
- Indonesian Beef
- Research management
- Communications/science writing
- Agribusiness

Does the draft list of best bets look to include classes that you would support financially?
Can you suggest additional high priority areas for focus?

Are there specific partnerships and strategic alliances that you suggest would enhance our delivery of training and master classes and chances of success?

Appendix 7. Template for Master Class Proposals

1. Proposal title
2. Indicate which theme and subtheme of the Crawford Fund Master Class Strategy this proposal fits under
3. Background and Justification
    a. Define the key issues that the Master Class will tackle
    b. Explain why these need promotion e.g. a lack of policy understanding; a lack of process understanding; the need for technical assistance to raise standard; improving capacity of scientists and bureaucrats to deal with emerging issues; introduction of emerging science and agribusiness concepts to a new audience; promotion of trade; livelihood enhancement etc.
    c. Indicate how and why a Master Class will fill the specified gap or niche
4. Master Class Objectives
5. Who will run and organise the Master Class
6. Intended participants – numbers, level / type, nationalities of trainees e.g. 15 mid-career research managers from …. (expected organisation types and countries)
7. Proposed reporting e.g. final report (required), workshop proceedings, training materials
8. Expected outcomes and impact pathways including any gender and youth impacts, and any means of post-MC monitoring and evaluation
9. Expected benefits to participants, their organisations and to Australia
10. Dates, location, venue and accommodation
11. Presenters
    a. Include half page cv's
12. Proposed Budget (indicate which funding model will be followed) [8]
    a. Total costs including air fares, accommodation and food, venue fees, presenter fees
    b. Cost of administration support required (if any)
    c. Anticipated funding sources including value of in-kind provision, co-sponsorship and participant fees
    d. Amount requested from the Crawford Fund
13. Draft Master Class Outline
14. Indicate if there is interest in having a communication module attached to the workshop[9]

[8] payment for training services by institutions or individuals seeking to enhance their individual or corporate skill base; grants or sponsorships by Government or other agencies seeking to fund further research training for development; co-funding in-cash or in- kind by organisations that wish to join with Crawford Fund to deliver an agreed training module or platform (this can include training providers such as universities and government departments).

[9] There is a possibility that a 1 day communication workshop could be added to the Master Class to assist participants in communicating their science to relevant audiences.