

Project Title Code: 1.12	Development of research and teaching skills in experimental design and statistical analysis
Australian Personnel	Dr Peter Thompson
Australian Institution	University of Sydney
Vietnam Institution	Hanoi Agricultural University; Can Tho University
Project Duration	1 July 2000 to 20 June 2002

Project Description

Provide short courses in experimental design and statistical analysis. An introductory course will be run at Hanoi Agricultural University, with a subsequent more advanced course delivered at Can Tho University

Provide Visiting Scholarships to four Vietnamese participants to visit the University of Sydney for upto 13 weeks, to evaluate teaching methods used in applied statistics (biometry) courses, and to provide the opportunity to initiate common research interests.

Objectives

- a) To provide teachers of quantitative methods the skills to develop and deliver a modern course on applied statistical analysis and experimental design
- b) To assist junior and middle level researchers with the ability to successfully design and analyse their own experimental data

Outputs and Performance indicators

At the completion of each short course:

- ◆ A questionnaire will be circulated to each participant to provide feedback
- ◆ Each participant will have completed an analysis of data, and their overall performance used as a guide of course success.
- ◆ For research staff, an additional questionnaire will be sent six months later to assess their 'long term' benefit of the course.
- ◆ For teaching staff working on curriculum development, an additional questionnaire will be sent twelve months later to assess the implementation of changes
- ◆ In addition, a summary report showing gender, age group, and background of each participant will also be tabulated, to evaluate the 'mix' of participants

PROJECT COMPLETION REPORT

Executive Summary

The major activity of this project was the delivery of two short courses in applied statistics and experimental design. The first was conducted at Hanoi Agricultural University in March 2001, with a more advanced follow-up course at Can Tho University in December 2001. Industry standard software (*Minitab*, *GenStat*) was purchased for the courses and distributed to personnel at both universities at the completion of the courses.

A second activity involved bringing a Visiting Scholar from Hanoi Agricultural University to work at the University of Sydney for a three month period. The scientist involved was at an early career stage, and is likely to have a relatively “high impact” on his return.

1. Project Description

1.1 Background and preparation

In the agricultural sector, as in any enterprise, decisions need to be made, and it is essential that all available information be used in the best possible way to arrive at this decision. Where a decision is to be based on quantitative information, sound statistical methodology, backed up with appropriate – and preferably optimal – experimental designs – is clearly desirable to assist the decision making process.

The current situation of quantitative and statistical training in Vietnam is somewhat restricted. All students undertaking agricultural degrees receive a sound mathematical training, of which part would include some probability theory and statistical theory. Although such training is ideal for a student who wishes to pursue a career in the mathematical sciences, it is not the most appropriate training for agricultural and biological students who typically are “turned off” in a mathematical environment. This certainly is the situation in Australian institutions as well.

In general, the statistical training for a students in the biological sciences is to provide the means that will allow them in the easiest way to analyse their data – and consequently arrive reliably at the decision making process. The underlying theory and mechanics of the calculations is usually not of interest. Use of modern statistical computer software facilitates the student focusing on the results and interpretation of the analysis, rather than on the process of calculation. In addition, many modern statistical procedures are not feasible to undertake without the use of computing facilities.

Currently, as a result of lack of training in modern statistical techniques, and lack of availability of software, the capacity for staff to undertake research is compromised. Consequently, as well as issues of teacher training, there is a need to assist junior and middle level researchers to acquire statistical skills in order to assist development of their careers.

The partner institutions, Hanoi Agricultural University (HAU) and Can Tho University (CTU) are supportive of changes to facilitate this modern approach. However, this requires support for considerable curriculum development, as well as the availability of modern software.

To achieve this, the following major activities were planned:

- March 2001: Delivery of the first two-week course: *Development of Research and Teaching Skills in Experimental Design and Statistical Analysis. Part A: Basic Applied Statistics Using Minitab*
- December 2001: Delivery of the second two-week course: *Development of Research and Teaching Skills in Experimental Design and Statistical Analysis. Part B: Advanced Applied Statistics Using GenStat*
- Provision of up to four Visiting Scholarships to spend short study periods at the University of Sydney

1.2 Context and rationale

The content of the short courses was developed in consultation with the Vietnamese partner institutions. Each course involved a two-week period, with personnel from both institutions. The intensiveness of the short courses was advantageous, in that personnel were not involved in their routine duties, and hence were able to focus on the material. There was a very strong emphasis on the applied computing aspects, allowing the effort to be made on drawing conclusions from data, rather than on the mathematical calculations required for the analysis. This approach was seen as the most appropriate.

1.3 Project objectives and scope at design

The objectives were to (1) provide researchers with the skills to design and analyse their own experiments, and (2) to provide teaching staff with sketch of a curriculum and means of course delivery for the development of an applied courses in statistics.

1.4 Implementation arrangements

The following activities were undertaken by University of Sydney personnel:

- Course preparation, including preparation of course manuals
- Procurement of statistical software for the courses
- Administrative arrangements for transport to / from Vietnam
- Support and training of Visiting Scholar

The following activities were undertaken by HAU and CTU personnel:

- Software installation and computer preparation
- Administrative arrangements for transport within Vietnam
- Administrative arrangements for accommodation of “out of town” participants
- Translation and other support to visiting University of Sydney personnel

2. Appropriateness of Project Design and Objectives

2.1 Appropriateness of Objectives

Objective No (1, 2, 3, etc)	Objective description	Appropriateness Rating
1	To provide teachers of quantitative methods the skills to develop and deliver a modern course on applied statistical analysis and experimental design	4
2	To assist junior and middle level researchers with the ability to successfully design and analyse their own experimental data	4

2.2 Appropriateness of Design

Description of design feature	Appropriateness Rating
In country training: delivery of short courses	4
In Australia training: Visiting Scholars	3

5- Best Practice; 4- Fully Satisfactory; 3- Satisfactory overall; 2- Marginally Satisfactory; 1- Weak

3. Implementation Performance

3.1 Project Components and Outputs

Component No.	Component Description	Outputs	Performance Indicators	Performance Rating
1	Formal delivery of courses in Applied Statistics and Experimental Design	Two short courses delivered	Assessed by question-aires	4
2	Individualised discussion of research work	Short courses in Vietnam. Also by means of e-mail	Informal only	4
3	In Australia training	One Visiting Scholar brought to Univ. Sydney.	Informal	3

5: Exceeding time and quality targets, 4: Achieving time and quality targets and on budget; 3: Moderate progress towards targets, some issues about quality, budgets or costs but these are being adequately addressed; 2: Some progress towards targets, but slippage in schedule and cost overruns; & 1: Significant problems in achieving targets, quality outputs unlikely to be achieved and substantial cost increases affecting overall budget.

The delivery of the two short courses was the major component of this project. These were received extremely favourably by the staff at the Vietnamese institutions, as measured by numerous requests for follow-up short courses, either as repeat sessions, or for more advanced courses. The manuals provided at these short courses have also been used extensively since the delivery of these courses.

The second major component of this project was to involve bringing up to four Vietnamese personnel to work at the University of Sydney for up to a semester. However, difficulties were encountered in identifying suitable personnel sufficiently early, coupled with unanticipated teaching demands of key personnel in Australia. However, the Visiting Scholar who came to Australia was “ideal” in the sense that he is an early career scientist with a brief for developing teaching material for applied statistics and experimental design at HAU. During his stay, he was substantially involved with the Animal Genetics research group, and this association is likely to lead to longer term collaboration.

3.2 Project Outcomes

The two short courses were delivered as per schedule, with a formal review of the first, and informal review of the second. One Visiting Scholar attended the University of Sydney, and collaborated with the Biometry group (applied biological statistics) and also with the Animal Genetics group.

3.3 Sectoral Impact

Women – especially those under 35 – represented a considerable proportion of the participants from both short courses. Provided they are given the opportunity of time and ability to develop, these short courses should be of assistance to them in their career development. No other particular sectoral issues were identified.

3.4 Costs and Financing

The project was conducted according to the budget, being \$677 under the total budget of \$60,708.

3.5 Monitoring of project

Financial monitoring was conducted continuously to ensure no budget over-runs. The performance of the first short course was evaluated by post course questionnaires, conducted several months after the course. However, time limitations prevented a similar questionnaire for the second short course. Nevertheless, discussions – frequently by e-mail after my return – have indicated it was successful.

3.6 Technical Assistance, Training and Capacity Building

The short courses are currently being adapted by Mr Do Duc Luc – who was a Visiting Scholar from HAU – for use in teaching courses at that institution. I believe this demonstrates success. In addition, a number of scientists from Vietnam have been contacting us about their experimental designs. This is very satisfying, as it is so important to review procedures at the design stage of the experiment. During the visits to both countries, some good working relationships have been developed, and we would be keen on supporting their further development of these personnel.

However, the major risks for not delivering the potential of this project is the support to junior and middle level staff – they need time to develop their own skills, and they need time to review their teaching curricula.

3.7 Management of Constraints, Issues, Risks and Change

In terms of delivery of short courses, no major problems or obstacles were encountered. However, only one Visiting Scholar was brought to the University of Sydney rather than a maximum of four. This was a result of (1) difficulty in identifying personnel at a sufficiently early stage in the project that would benefit from the time in Australia; and (2) unanticipated teaching demand at home by local University of Sydney staff.

3.8 Project Management

Given the time availability of personnel from all three institutions (University of Sydney, Hanoi Agricultural University, and Can Tho University), I believe the performance was fully satisfactory (Rating 4).

5: Best Practice; 4: Fully Satisfactory; 3: Satisfactory Overall; 2: Marginally Satisfactory; 1: Weak.

4. Performance and Outcomes

4.1 Assessment of Performance Against Objectives and Design

I believe the overall objectives of the program have in general been met. Mid term evaluation by questionnaires indicated at the time the project was on track. However, I intend to informally review the process over the coming few years.

4.2 Sustainability

Financial.

Sustainability level assessment = 4

On completion of the program, no major financial constraints are foreseen to affect the sustainability of the project, in terms of dissemination and delivery of skills. As the major focus of this program is in information, there are no substantial on-going costs associated here. The statistical software purchased for the short courses and distributed to the two universities would be useful for at least five years, although in theory could be used indefinitely. While HAU currently has good computing facilities (through a World Bank grant), the ongoing supply of reliable computing equipment may need to be addressed.

Curriculum Reform.

Sustainability level assessment = 3

Implementing new teaching methods into a curriculum takes considerable time, and the very heavy teaching loads of teaching staff could delay or in worst case halt the effective implementation of curriculum reform. However, given the motivation of the course attendants, I believe this to be unlikely

Research Skills Development.

Sustainability level assessment = 3

Sound methods in experimental design and statistical analysis are essential parts of good scientific method. For staff already involved in research, no particular ongoing problems are foreseen. We have suggested that they contact us for biometrical advice when this is

needed. The issue of undertaking effective research in the first place is another issue, as resource shortages in many disciplines severely reduce their ability to undertake research.

Early Career Staff and Female Staff.

Sustainability level assessment = 3

For effective implementation of these programs, it is essential that female and early career teachers and researchers be given the opportunity to firstly acquire, then develop, and later pass on these skills. It is also essential then more senior academic and management staff are supportive of this process. Certainly, support for this was demonstrated by the demographics of course attendees and by informal discussions with more senior staff. However, it is difficult to comment on whether or not that environment of support might change.

5: Best Practice; 4: Fully Satisfactory; 3: Satisfactory Overall; 2: Marginally Satisfactory; 1: Weak.

4.3 Development Impact

With developments within the agricultural sector in Vietnam, there is a recognised need there to critically evaluate different agricultural practices, with the goal of lifting production levels, and at the same time to address critical environmental issues associated with this activity. Moreover, there is a clear understanding, especially with the junior and middle career personnel, that sound principles of experimental design and statistical analysis are essential for this evaluation process. So provided that sufficient resources – particular time – are given for the development and application of these methods, it is likely that in the short term (several year time scale) the basic scientific training of researchers will be lifted, and more importantly, in the longer time scale, application of these skills will result in a better organised agricultural sector.

5. Conclusions

5.1. Overall assessment

In recent years, there appears to be a developing interest in Vietnamese institutions in engaging in scientific research within the agricultural sector. However, in order to ensure that this progress is directed in the most meaningful way, it is essential that sound scientific methodology is incorporated into everyday research activity. A core component of scientific methodology is the fundamentals of experimental design and statistical analysis.

To date, most training in this field within Vietnamese institutions has been in two almost mutually exclusive areas. Mathematics departments frequently run courses in theoretical mathematical statistics, which while excellent for professional statisticians, is usually not appropriate for most would-be researchers. On the other hand, many applied biological departments run their own “in-house” courses that focus on some aspects of experimental design, without emphasising the statistical analyses that must accompany this. Consequently, there is a need to link the two areas of training, but in a very applied way, that will allow the student to develop skills of design and analysis. The short courses conducted in Vietnam, coupled with the course manuals, have provided a basis for how

this might be undertaken in future. Indeed, the course manuals are currently being translated into Vietnamese for incorporation into courses at HAU.

Overall, I believe the program has been successful. However, to ensure its longer term viability, it is my intention to continue contact with key personnel at HAU and CTU, and take the opportunity to present additional short courses in areas that the Vietnamese partner institutes identify as being of greatest need.

5.2. Lessons Learned

The most effective learning was achieved by the Vietnamese participants discussing problems amongst themselves and arriving at joint decisions. The role of the coordinator is then one of clarifying issues. Ultimately, it is all about providing the skills for the participants to direct their own teaching and research.