Teaching agronomy in the highlands of Papua New Guinea

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Abstract

This paper outlines the methods used to design a revised curriculum for the Post Certificate Diploma in Agriculture at the Highlands Agricultural College, Mount Hagen, Papua New Guinea. The general course is briefly described with more specific details on the teaching of Crop Production, including a subject outline and the implications for resource requirements.

Introduction

A curriculum review and design for Highlands Agricultural College (HAC) of Papua New Guinea was completed as part of the New Zealand funded Agricultural Institutional Strengthening Project (AISP). A team of Lincoln International consultants completed the review and design based on their mission to HAC in November 1993, incorporating the results and recommendations of a previous Training Needs Analysis (TNA) done for the AISP (Fleming *et al.*, 1993).

The purpose of the AISP is described in detail in the May 1992 project appraisal and design report (Pittaway *et al.*, 1993). A key recommendation from this analysis was the need for a curriculum review for the HAC.

This paper describes how the curriculum was reviewed and designed with emphasis on the agronomic aspects.

Methods

The TNA recommendations and terms of reference for the curriculum review team provided the overall guidelines which underpinned this review. These recommendations and terms of reference were divided into two groups depending on whether they had implications for the whole course or for individual disciplines.

The course in question is the Post-Certificate Diploma (PCD) in Tropical Agriculture at HAC. For the purposes of review and analysis, the PCD course was divided into the disciplines of Soils and Crops, Animal Production, Rural Engineering, Management, Extension and Rural Sociology.

The review and its relationship with the course were presented to and discussed with academic staff at HAC and with staff of the PNG Department of Agriculture and Lands (DAL). These discussions formed the basis of the analysis and review of the curriculum.

For curriculum revision, detailed subject outlines were drawn up under the following headings:

- Subject Title
- Term
- Hours/week (hours lectures and hours practicals)
- Subject Aims
- Subject Objectives
- Assessment
- Recommended Textbooks and Further Reading
- Subject Content and Structure
- Comments and Resource Requirements

Results - The Revised Curriculum

I Aims

The aims of the PCD are to produce a middle level agricultural graduate who has:

1. an understanding of PNG agriculture, its management and sustainability.
2. competencies and understanding of practical and management skills in agriculture, and advanced skills and knowledge in a specialist field of study.
3. an understanding of the technology of the disciplines and their integration.
4. a sensitivity to cultural differences within PNG society.
5. a realistic awareness of the importance of women in agriculture in the PNG society.
6. an ability to communicate with all sectors of the community.

7. the ability to be useful to an employer without further substantial training.

II Teaching Hours

The revised course structure is based on:

- Four nine-week terms of formal teaching
- Thirty hours/week of teaching
- Lecture periods of 50 minutes with a break of ten minutes between lectures
- Laboratories/field work/tutorials of up to 3 hours.

All material taught in the first three terms is core (compulsory), with Management and Extension and Rural Sociology in Term IV also part of the core. The remainder of Term IV is allocated to elective subjects, whereby the students choose to study one subject from Crops, Animal Production or Rural Engineering.

Details of the revised course structure have been published elsewhere (Scott *et al.*, 1993). Within the Soils and Crops discipline the core subjects Soils, Principles of Crop Management and Crop Protection are taught for 6 hours per week over Terms I, II and III respectively. For the sake of brevity the subject outlines for these subjects are not presented here. However the subject outline for the main crop agronomy subject Crop Production is presented below.

III Subject Outline

Subject: Crop Production
Term: IV
Hours: 12 hours/week (42 hours lectures, 42 hours practical, 24 hours special topics)

Aims:

For students to gain a thorough understanding of the production, harvesting and processing of several major crops grown in PNG. In addition, for students to gain an advanced knowledge of one particular crop of their own choosing.

Objectives:

The student should be able to:

1. identify major crops and describe their main botanical features.
2. assess the suitability of the soil and climate for the crops.
3. choose the most suitable cultivars to meet the farmer's objectives.
4. propagate the crops from seed, tubers, cuttings, budding or grafting.
5. prepare the land and soil for planting/sowing.
6. decide when the soil and environmental conditions are suitable for planting/sowing.
7. plant/sow the crops at the correct plant spacing and population.
8. recognise, anticipate and control common weeds, pests and diseases.
9. interpret soil tests results, cropping histories and nutrient deficiency symptoms to formulate an optimum fertiliser programme.
10. use water storage and irrigation practice to optimise plant water use.
11. assess the optimum time of harvest for both quality and yield: implement the harvest.
12. handle, process and store the crops to maintain yield and quality.
13. assess the real costs and profitability of cropping enterprises.
14. identify the key factors influencing profitability, and use these factors in field practice.

Assessment:

Term tests (2)	10 %
Assignments	15 %
Practicals	15 %
Personal Topics	20 %
Final Examination	40 %

Recommended textbooks and further reading:

Purseglove, J.W. (1974) *Tropical Crops - Dicotyledons.* Longman: London.

Purseglove, J.W. (1974) *Tropical Crops - Monotyledons.* Longman: London.

Harman, H.J. and Kester, D.E. (1983) *Plant propagation - principles and practices.* Prentice Hall: Englewood Cliffs.

Wills, R.H.H., Lee, T.H., Graham, D., McGlasson, W.B. and Hall, E.G. (1981) *Post harvest.* NSW University Press, Australia.

Williams, C.N., Chew, W.Y. and Rajaratnam, J.A. (1989) *Tree and field crops of the wetter regions of the tropics.* Longman: Essex.

Further Explanation:

The formal teaching in this subject is designed around several major crops grown in PNG, the actual crops being decided upon after discussion with the class. In addition, students spend 24 hours on a personal topic. The husbandry of each crop is taught under fifteen separate headings:

1. Botanical features
2. Soil and climatic requirements
3. Choice of cultivar
4. Place in rotation
5. Nursery design and construction
6. Sowing/planting time
7. Land, soil, seedbed preparation
8. Sowing/planting
9. Plant cultivation, pruning, cover cropping
10. Plant protection
11. Fertilisers and liming
12. Irrigation
13. Time and method of harvest
14. Crop handling, processing and storage
15. Yield and costs.

The subject outline for crop production is given in Table 1. In the table, subtopics are referred to as 1-15 rather than being repeated for every crop.

Comments on crop production: resource requirements

This elective subject has been designed to allow students with an interest in crops to gain detailed knowledge and skills in the production, handling and storage of several crops. The actual choice of crops will be decided after discussion with the class, taking into account factors such as innovation, local adaptability, importance to PNG and whether or not training in these crops is being conducted by private enterprise in large commercial organisations.

As will all subjects in the curriculum, this subject contains increased emphasis on active learning in

Table 1. Subject content and structure: crop production

	Lecture Topics	Laboratories / Tutorials	Field Work / Trips
1	Coffee Subtopics 1-15	Observe, identify and draw the key features of arabica and robusta coffee. Calculate the requirements for establishing a coffee nursery. Assess the quality of a range of beans. Design an ongoing management programme for 1 ha of coffee including fertilisation, pruning, shading and plant protection	Select, clear and prepare land for a coffee nursery. Set up coffee nursery. Set up coffee nursery, sow seeds in correct growing medium and place polybags at correct spacings. Prune coffee plants to encourage reproductive yield. Visit local coffee processing warehouse.
6 hr		**2hr**	**5hr**
2	Cocoa Subtopics 1-15	Observe, identify and draw the key morphological features of cocoa. Calculate the requirements for establishing 1 ha of cocoa. Design an ongoing management programme for 1 ha of cocoa, including fertilisation, pruning shading and plant protection. Design a plant protection programme for 1 ha of cocoa and calculate the amounts of agri-chemical to apply.	Assess pod and bean quality and maturity in a range of pods and beans supplied by a research station.
2 hr		**2 hr**	**2 hr**
3	Coconuts Subtopics 1-15	Observe, identify and draw the key morphological features of standard and hybrid coconuts. Note the difference between male and female flowers.	
2 hr		**2 hr**	**2 hr**

Table 1. Continued.

Lecture Topics		Laboratories / Tutorials	Field Work / Trips
4	Vegetables	Prepare propagating material for several vegetable crops. Assess the suitability of vegetable cultivars for the local environment.	Sow/plant vegetables in suitably prepared media.
4.1	Sweet potato Subtopics 1-15		
4.2	Irish potato Subtopics 1-15	Sterilise growing medium for use in nursery.	Plant cassava cuttings from different parts of the stem and assess growth.
4.3	Brassicas Subtopics 1-15	Construct a nursery seedbed and seed boxes for the nursery.	Carry out plant protection on vegetable plots.
4.4	Tomato Subtopics 1-15		
4.5	Cassava Subtopics 1-15	Prepare serial planting and a sustainable crop rotation for a group of vegetables.	Assess maturity and optimum time of harvest of vegetables in the serially planted plots. Harvest, handle and package the crops, using appropriate techniques.
4.6	Onions Subtopics 1-15		
4.7	Maize Subtopics 1-15		
20 hr		**5 hr**	**12 hr**
5	Spices Subtopics 1-15	Calculate the requirements for establishing 1 ha of the spices listed.	Set up a cardamon nursery and sow seeds in the correct growing medium. Visit local cardamon driers and storage sheds.
5.1	Cardamom Subtopics 1-15	Design an ongoing management programme, list and cost out the resources required to implement this programme.	Assess maturity, harvest, handle and package the species listed using appropriate techniques.
5.2	Vanilla Subtopics 1-15		
5.3	Pepper Subtopics 1-15	Assess the quality of cardamom and chilli samples.	Carry out plant protection on the spice plots.
5.4	Chilli		
5 hr		**2 hr**	**4 hr**
6.	Fruits	Calculate the requirements for establishing 1 ha of citrus.	Set up a root stock nursery for citrus and guava. Select suitable scion material from desirable mother plants. Implement the budding and marcotting.
6.1	Citrus Subtopics 1-15		
6.2	Pineapples Subtopics 1-15	Design an ongoing management programme, list and cost out the resources required to implement this programme.	Carry out plant protection on citrus, guava and pineapple.
6.3	Guava Subtopics 1-1		Compare reproductive growth, development and yield of pineapples with and without treatment with flowering hormone.
4 hr		**2 hr**	**4 hr**

practical sessions. The integration of the lecture programme with the laboratory and field programme requires considerable forward planning and technical assistance. Even in this cool tropical environment, most vegetable crops do not mature within the nine-week teaching term. If students are to observe and handle crops from establishment to maturity, then serial plantings well ahead of the teaching term will have to be made. Such plantings also require regular maintenance and plant protection by a technical assistance.

Crop Production will have an annual land requirement of 3 ha of land ploughed out of cowpea cover crop. The present 6.8 ha in coffee needs to be retained for both production and teaching purposes. The spices require 1 ha of land, 0.5 ha of which will be established in cardamom and 0.25 ha in each of chilli

and ginger. Citrus, guava, passion fruit, papaya, banana, mango, avocado and pineapple each require 0.25 ha making the total land requirement for fruit crops 2 ha.

References

Fleming, N.D., Kuso, J., Diugo, J. and Imine, S. 1993. PNG: Agricultural Institutional Strengthening Project, Training Needs Analysis. Lincoln International Ltd. 55 pp.

Pittaway, S., Williams, L. and Foster, I. 1992. New Zealand Overseas Development Assistance Agricultural Institutional Strengthening Project. New Zealand Ministry of Agriculture and Fisheries International. 63 pp.

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