

**South Pacific Board
For
Educational Assessment**



**SOUTH PACIFIC FORM SEVEN
CERTIFICATE**

**AGRICULTURAL
SCIENCE
PRESCRIPTION**

Prescription Effective as from 1st January 2005

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SOUTH PACIFIC FORM SEVEN CERTIFICATE

AGRICULTURAL SCIENCE

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AGRICULTURAL SCIENCE

Preamble

This prescription defines the requirements for the South Pacific Form Seven Certificate Agricultural Science examination.

Each of the student outcomes for the course is to be read in conjunction with the Explanatory Notes given for each outcome in this prescription.

Students also require knowledge and understanding of outcomes from the Pacific Senior Secondary Certificate or an equivalent certificate, which are related to the specific outcomes of this prescription.

This prescription is derived from the New Zealand University Entrance, Bursaries and Scholarships Agricultural and Horticultural Science as well as the NCEA Level 3 Agricultural and Horticultural Science Achievement Standards as published by NZQA.

The course is designed for students within the Pacific Islands who may undertake further studies in a tertiary institution as well as for those students who will complete their formal education at the end of Form 7.

Aims

This course of study in applied agriculture is designed to stimulate student interest in, and an enjoyment of, primary production in agriculture. This will be achieved by:

- understanding the relationships between consumer requirements and sustainable primary production;
- recognising and understanding the biological, environmental and economic principles involved in the production of marketable primary produce, and to apply these principles to selected examples;
- recognising and understanding the value and importance of sustainable primary production principles to the Pacific Islands;
- understanding the regulatory controls that affect primary production;
- applying scientific methods in local field and laboratory studies of selected types of primary production;
- fostering a continuing interest in primary production and an awareness of the diversity of vocational opportunities.

Objectives

On completing this course of study students will be expected to:

- have a knowledge of the ways in which biological, environmental and economic factors can be manipulated to affect the sustainable production and supply of primary products to the consumer

- have an understanding of the ways in which market forces determine the supply and quality of primary products
- have a knowledge of the ways management and decision-making can influence the production and supply of primary products to the consumer at a profit
- apply scientific methods to problems related to primary production
- conduct independent and cooperative investigations
- make independent and logical decisions
- communicate information logically, appropriately and accurately.

Outcomes

CONTENT AREAS

The course content consists of the following five sections:

1. Primary production
2. Sustainable primary production
3. Production management
4. Practical investigation
5. Case study

In meeting the outcomes of this course it is expected that examples of local plants and animals will be used. Suggestions for suitable plants and animals are given in the Advisory Section.

SECTION 1: Primary Production

Outcome 1:

- Examine local and export primary production and analyse the influence of market controls

In meeting this outcome students are expected to consider primary production in general and use specific examples where relevant.

Explanatory Notes

1. In examining primary production, students need to identify the range of local and export market opportunities available and match these to selected primary products. Students need to:

Describe what is produced:

- the range of products produced for local markets
- the range of products produced for export markets.

Identify where primary products are marketed:

- describe the market opportunities available for local primary products.

Explain how factors influence primary production:

- needs of people and future prospects
 - effect of supply and demand on returns
 - effect of seasonality on supply and demand
 - effect of competition from imports
 - market quality requirements
 - market access
 - product storage/shelf life
 - transport methods
 - market channels.
2. In analysing the influence of market controls, students need to identify market controls and explain how these controls affect local and export primary production. Students need to consider the effect of:
- biosecurity regulations - quarantine
 - trade agreements eg WTO, PICTA, bilateral trade agreements
 - local/national controls/regulations/policy
 - import/export controls and regulations
 - grower organisations
 - marketing organisations.

SECTION 2: Sustainable Primary Production

Outcome 2:

Analyse primary production practices that ensure sustainable primary production

In meeting this outcome students are expected to consider the use of selected primary production practices and illustrate these with specific primary products where relevant.

Explanatory Notes

In analysing primary production practices, students need to:

1. Identify and explain how management practices are used to maintain sustainable production. Management practices include:
 - soil management practices, including: cultivation, fertility, productivity, conservation
 - water management, including: supply, irrigation, runoff
 - waste management
 - labour availability.
2. Identify and explain how husbandry/agronomy practices ensure the capability of long term primary production. Production practices include:
 - pest, disease and weed control
 - cultivation eg crop rotation, intercropping

- fertiliser/feed application
 - hygiene eg certified seed
 - genetic selection.
3. Identify how global agricultural issues affect local primary production. Global agricultural issues include:
- biodiversity and invasive species
 - genetic resource conservation
 - introduction of new species
 - genetic engineering
 - organic husbandry
 - pollution.

SECTION 3: Production management

Outcome 3:

Explain the production and marketing of a locally produced animal primary product and of a locally produced plant primary product

In meeting this outcome students are expected to study in depth one specific animal, and one specific plant, that each produce local and/or export primary product(s). Both the animal and the plant should be available to the students and are able to be grown/studied during the teaching period.

Explanatory Notes

In explaining the production and marketing of each primary product, students need to:

1. Describe the steps in the schedule of operations. The steps include:
 - site selection
 - cultivar/breed selection
 - establishment, including: soil/crop preparation; planting/rearing
 - management (eg irrigation/water; pest and disease control; weed control; fertility/nutrition; light/temperature)
 - harvest/slaughter timing and method
 - post harvest, including: quality control/grading and sorting; packaging and handling; storage
 - marketing.

2. Evaluate how specific factors influence selected steps of the schedule of operations. Each factor needs to be considered against at least one step of the schedule of operations. The specific factors to be considered include:
 - land availability

- capital
- market demand
- yield
- labour availability
- specialist/technical information/advice
- technology
- profitability (farm production function/marginal analysis).

SECTION 4: Practical Investigation

Outcome 4:

Students will be able to carry out and report on a practical investigation with guidance to determine the effect of altering one aspect of the production process for a primary product

1. Explanatory Notes
1. An investigation is an activity covering the complete process from planning to reporting and will involve students in the collection of primary quantitative data.
2. Students will investigate one aspect of the production process that influences the supply/demand/profitability of the primary product. A possible structure for the investigation is provided in the Advisory Section.
3. The investigation will be conducted with teacher guidance. This means the teacher is supporting the student throughout the investigation but the whole process is student driven. Teacher's support gives general information only e.g. broad questions, resource suggestions or possible new directions.
4. Students should be provided with the opportunity to undertake research into their primary product and some form of trialling or checking before developing their plan into a method.
5. Students are required to produce a written report. The report will include:
 - Introduction: brief information on the plant or animal and its production process.
 - Hypothesis/Aim/Prediction
 - Method used.
 - Results: Recorded observations, measurements and data. The data needs to be systematically recorded using tables and/or graphs. Processing of data is expected to involve use of simple statistical procedures.

- Interpretation of processed data to show trends, relationships and patterns.
 - Conclusions relevant to data and linked back to the hypothesis.
 - Discussion of the relationship of the results to the background information and the experimental results.
 - Evaluation of the investigation which considers:
 - ❑ Validity and reliability of the results
 - ❑ Limitations and difficulties encountered in the investigation and suggested solutions
 - ❑ Significance of the findings in relation to the aspect of the production process being studied.
 - Bibliography/references/acknowledgements.
6. Logbooks must be kept by all students and must contain all rough data and notes. Logbooks are a working record of all the work students do, and are used for authenticity. Logbooks should be regularly checked by the teacher.
7. Students are expected to have carried out formative work before attempting the practical investigation. The practical investigation is to be completed individually over a period of time eg 4 to 6 weeks. A typical time period would include 10-12 hours of classroom time. Students would be expected to do work at home.

SECTION 5: Case Study

Outcome 5:

Students will be able to complete and report on two case studies that analyse specific aspects of agricultural production.

Explanatory Notes

1. Students are to complete two case studies.
2. Each case study will be conducted with teacher guidance. This means the teacher is supporting the student throughout the investigation but the whole process is student driven. Teacher's support gives general information only e.g. broad questions, resource suggestions or possible new directions.
3. The case study will focus on a specific aspect of agricultural production. This may include a judgement about the appropriateness or effectiveness of a practice or procedure. The judgement must be supported with referenced or quoted information from more than one secondary source.

4. Ideas for the Case Studies are given in the Advisory Section. The topic may be set by the teacher or agreed by negotiation with the student. The student is required to develop the question related to the topic.
5. The case study will be a structured written document that shows evidence of:
 - information gathering
 - information processing
 - interpretation.
6. In a case study, the student may collect and interpret information from secondary sources and from primary sources.
7. The case study is to be completed individually and would include about 5 hours of classroom time. Students would be expected to do work at home.

ASSESSMENT

The assessment of the prescription is in two parts (external and internal assessment).

1. External Assessment: 75%
2. Internal Assessment: 25%

The principal, or his/her nominee, will certify that the prescription requirements have been fulfilled.

External Assessment

This will be a 3-hour written examination.

The external written examination will assess the following:

Primary Production	(20%)
Sustainable Primary Production	(30%)
Production Management	(50%)

Questions may require students to give objective, sentence or short paragraph answers or to draw and interpret diagrams, tables and graphs, or complete calculations. Questions may be resource based; some questions will require reference to specific plants or animals studied during the year.

All questions are COMPULSORY.

Internal Assessment

The internal assessment will be on the following:

Practical investigation	(15%)
Case studies (two at 5% each)	(10%)

a) Investigation

- It is expected that the investigation will require about 10-12 hours of class time.
- The investigation must be carried out independently.
- Students must maintain a logbook that should be submitted together with the completed report.
- The investigation must produce quantitative data and use simple statistical procedures (e.g. mean, standard deviation).
- A list of suggested topics is provided in the Advisory Section (students are not restricted to these topics).

- Assessment will be made using the criteria specified in the Assessment Schedule: *Practical Investigation* in the Appendix.

b) Case Study

- It is expected that each case study would require about 5 hours of class time.
- A list of suggested topics is provided in the Advisory Section (students are not restricted to these topics). Students need to have access to a range of sources of information on the topic.
- Assessment will be made using the criteria specified in the Assessment Schedule: *Case Study* in the Appendix.

Authenticity

Authenticity is very important in internal assessment. This can be determined by:

- Regular checking of logbooks
- Interviewing the student
- Signed agreements with the student and / or parents or caregivers.

General:

Course work requirements, the assessment tasks and weightings given to each task should be clearly explained to students at the beginning of the year's course. Results must be clearly recorded and maintained by teachers so that accurate information on each student's progress is readily available.

At the beginning of each year, each school presenting students for the South Pacific Form Seven Certificate Agricultural Science assessment must complete an Internal Assessment Summary Form (**AGR-IA**) and forward to SPBEA by the date set down by the Director.

At the start of the year students should be given a copy of the assessment statement to be used. The assessment statement needs to identify when assessments will occur in the year, the weighting for each assessment, and details of how each activity will be assessed.

The assessment statement and copies of all assessment tasks and assessment schedules used, as well as a sample of student responses to all internal assessment work undertaken, must be available for verification on request until 30 November of the year of the examination.

The moderation of Internal Assessment will be done in accordance with SPBEA policy as specified from time to time.

Assessment Schedule for Agricultural Science: *Practical Investigation*

	Acceptable	Merit	Excellent
PLANNING & DESIGN (14 marks)			
<i>Purpose / Hypothesis / Aim</i>	Statement/prediction/question on a relationship or variable relevant to the investigation context. 1	Statement/prediction/question based on a measurable relationship or measurable variables. 2	Statement/prediction/question making a measurable relationship between two measurable variables that can be investigated. 3
<i>Variable testing / Trialling</i>	Evidence of trialling of at least one variable. 1	Evidence of trialling shows: <ul style="list-style-type: none"> Testing to determine the range of the independent variable OR <ul style="list-style-type: none"> Testing to determine the best way to measure the effect on the dependent variable. 3	Evidence of trialling shows: <ul style="list-style-type: none"> Testing to determine the range of the independent variable AND <ul style="list-style-type: none"> Testing to determine the best way to measure the effect on the dependent variable. 5
<i>Method</i>	<i>A feasible method.</i> Relates to the question / statement / prediction but lacks the details needed for repetition of the procedure by someone else ie: <ul style="list-style-type: none"> how the dependent variable will be measured is evident range given for the independent variable some procedures stated some controlled variables are identified. 2	<i>A valid method.</i> Procedures can be followed to achieve similar results ie: <ul style="list-style-type: none"> how the dependent variable will be measured is clear and appropriate appropriate range given for the independent variable most procedures stated appropriate values of controlled variables are given. 4	<i>A valid and reliable method.</i> Procedure can be followed to achieve similar and reliable results ie: <ul style="list-style-type: none"> as for achievement with merit how the dependent variable will be measured is clear and appropriate appropriate range given for the independent variable all key procedures stated in detail. 6

INFORMATION GATHERING (10 marks)			
<i>Background Information (Context)</i>	Limited information relevant to the investigation context, OR Research information but has limited relevance to the investigation context. 1	Range of information relevant to the investigation context. 3	Wide range of information relevant to the investigation context. Information is sufficient to enable the results to be explained. 5
<i>Experimental Data</i>	Some quantitative data collected which is appropriate (or relevant) to the aim/purpose/hypothesis. 1	Quantitative data collected and based on the manipulation of one variable over a range appropriate to the aim/purpose/hypothesis. Raw data can be accessed for processing. 3	Sufficient quantitative data collected to enable a valid, reliable conclusion to be made. Data lies within typical limits of accuracy of method and equipment. 5
PROCESSING (7 marks or 12 marks if calculations included)			
<i>Tables / Graphs and Statistical Analysis</i>	Self-contained tables or graphs as appropriate for the data collected. <ul style="list-style-type: none"> Graphing conventions followed Some minor errors may be evident. 2	Systematic and accurate processing of data. Analysis not completed to the point where the trend or relationship can be determined. (minor errors acceptable) 5	Data is processed to enable relevant trend/relationship/pattern (linear or non-linear) to be accurately determined. All graphical/table conventions are accurately applied. (minor errors acceptable) 7
<i>Calculations (If relevant)</i>	Some attempt to complete relevant calculations (ignore minor errors) (1)	Relevant calculations completed accurately. Correct units given. (ignore minor errors in calculation) (3)	Relevant calculations completed accurately. Units, significant figures and errors indicated appropriately. The trend/relationship is stated as a s mathematical statement. (ignore minor errors in calculation) (5)

INTERPRETING (13 marks)			
<i>Discussion</i>	Description of the results and or conclusion. 1	Links background information or the results to the context of the investigation. 3	Explanation of the relationship between background information, experimental results and the context of the investigation. 5
<i>Conclusion</i>	Conclusion drawn from data. 1	Conclusion drawn from data and linked to the purpose/hypothesis/aim. 2	Valid conclusion drawn from data and linked to the purpose/hypothesis/aim. 3
<i>Evaluation</i>	Describes errors or problems relevant to the purpose/hypothesis/aim. 1	Explains errors or problems in terms of validity and reliability. 3	Critically evaluates the method in terms of accuracy, reliability and validity of the findings, sources of error and limitations of the investigation. Justifies the improvements/ modifications for further research. 5
REPORTING (6 marks)			
<i>Format/Presentation</i>	Report is organised in an appropriate format. 1	Report is complete and references listed. 2	Report is complete and full list of references in the approved format is given. 3
<i>Communication</i>	Can be read but spelling and grammatical errors significantly affect overall understanding. 1	Report sectioned and complete in own words, has errors of spelling, grammar, units, or repetition without affecting understanding. 2	Report clear, concise and well organised in all sections. No repetition or irrelevant information – very few minor errors. 3

Notes: 1) Failure to reach acceptable level gains a zero mark.

2) Assessment judgement is to the best performance standard. No marks other than those given in each section of the assessment schedule should be awarded.

(Total: 50 marks / 55 marks if Calculations included)

Assessment Schedule for Agricultural Science: Case Study

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ASPECT	Acceptable	Merit	Excellent
Purpose/ Question	Purpose/question is relevant to the topic. 1	Purpose/question that can be researched using primary or secondary information sources. 2	Purpose/question that can be researched using primary and secondary information sources. 3
Information Gathering	Some information is collected which is relevant to the purpose/question. 1	Information relevant to the purpose/question is collected from primary or secondary sources 3	Information relevant to the purpose/question is collected from primary and secondary sources. the information is sufficient for the purpose. 5
Processing Information	Information from primary and/or secondary sources is presented. 2	Information from primary and/or secondary sources is processed to address the purpose/question. Processing is not complete. 4	Information form primary and secondary sources is fully processed to address the purpose/question. 6
Interpretation	<i>Ideas presented.</i> The report presents relevant ideas based on the primary or secondary information sources 3	<i>Ideas described.</i> The report describes relevant ideas based on the primary and secondary information sources. 5	<i>Ideas discussed.</i> The report discusses ideas based on the primary and secondary information sources. 7
Report	The report is presented and can be read, but spelling and grammatical errors significantly affect the overall understanding. Significant portions may be copied. 1	The report is organised and complete, largely in the student's own words. A bibliography is provided. Errors in spelling and grammar do not affect understanding. 2	The report is clear, concise and well organised. Bibliography follows accepted conventions. No repetition or irrelevant information. 4

Total: 25 marks

- Notes: 1) Failure to reach acceptable level gains a zero mark.
2) Assessment judgement is to the best performance standard. No marks other than those given in each section of the assessment schedule should be awarded.

SOUTH PACIFIC FORM SEVEN CERTIFICATE

Internal Assessment Summary Form

AGRICULTURAL SCIENCE

Country: _____ **School:** _____

Task	Brief Description	Start Date	End Date	Weighting
1. Practical Investigation				15%
2. Case Study 1				5%
3. Case Study 2				5%
	Total			25%

List of topics for Case Study

1.
2.
3.
4.
5.
6.

- Note:**
1. Be specific about dates, not just Week 3 Term 1, etc.
 2. Assessment schedules for the 2 tasks are provided in the prescription. Teachers must use these.

Teacher: _____

ADVISORY SECTION

1. Practical Investigation

Teacher Guidelines:

The following guidelines are supplied to enable teachers to carry out valid and consistent assessment.

- This study is designed to be an investigation of a specific plant or animal.
- This investigation requires students to:

Process information from background reading and observations to briefly describe relevant aspects of the production process for the plant or animal. This will form the introduction section of the student report and should be brief (about one page in length). It is not intended to be a major part of the study but to provide the background from which the student will select an aspect for further investigation.

Investigate in detail one particular aspect of the production process and determine the effectiveness of a manipulation. The manipulation needs to have an impact on the attributes of the primary product. Students should focus on one aspect of: *environment* eg wind, light, temperature, soil, space; *cultivar or breed selection*; *crop or livestock production techniques* eg fertiliser rates, pasture composition, fruit thinning, grazing or planting density, pest or disease control; *post harvest* eg chemical treatment, storage, heat treatment, drying method

- Students are required to keep a logbook in which all ideas, rough notes, brainstorming, possible investigations, collection of data and observations, research and planning, failure, successes, tentative conclusions should be kept. It is a working document and its neatness is not important – its function is to record all findings and show the student’s investigative skills.

It is from this that students will write the formal report and it will be used to ensure authenticity as well as support the students’ final assessment for this achievement.

Suggested Plants and Animals

The following list contains suggestions only. Other plants or animals locally available can be used. Suggestions of other suitable plants or animals should be made to SPBEA.

Plants

Vegetables: eg Beans, Peanuts, Cabbage, Tomatoes, Cucumber

Crops: eg Kumala (sweet potato), Maize, Squash

Non-food: eg Kava, Vanilla
Forestry

Animals

Meat: eg Beef, Poultry, Pork, Goat
Animal product: eg Poultry, Dairy

Marine/Aquatic

Any shellfish, Prawns, Fish (farmed), Crabs

Ideas For Investigation

The following list contains ideas that could be used or modified for the investigation. Teachers are free to use other ideas.

- The effect of plant spacing on the yield of a vegetable
- The effect of different rates/types of fertilisers on the yield of a plant
- Comparison of growth rates for different pasture species/cultivars
- Comparison of an animal's growth rate with different feeds
- Effect of stocking rate on production (eg milk volume, eggs)
- Effect of an aspect of housing on egg production
- Comparison of the moisture content of copra using different drying methods
- Comparison of storage life of taro under different conditions
- Effect of pruning on fruit size/yield
- Effect of different mulching practices on crop growth
- Comparison of the effect of different treatments on the propagation of cassava
- Comparison of the effectiveness of different pest or disease controls
- Comparison of fruit fly species and/or numbers collected over a period of time

2. Case Study

Teacher Guidelines:

The following guidelines are supplied to enable teachers to carry out valid and consistent assessment.

- The case study is designed to be an open context as long as information is available to the student.
- The study is designed to be individually researched and completed over a period of time. A typical time period would include about 5 hours of classroom time.
- Students need access to a library, and internet if possible.

- Teachers should note that students are expected to have done some formative research before attempting something of this magnitude.
- Teachers could provide a list of approved topics from which the students can choose. Students may choose their own topic, but must have their topic approved by the teacher to decide if the topic is feasible or workable.
- The format of the case study is open, but could be a survey, cost analysis, scrap book, research task, poster/pamphlet, schedule of operations, power point presentation, audio-visual presentation, or annotated model.

Suggested Topics:

- Consumer survey eg consumer preference for different cultivars/attributes
- Market analysis eg comparison of profitability of different market opportunities
- Pest Control eg the extent of use of organic husbandry techniques in different crops/islands
- Quarantine controls eg the effect these have on pest/disease occurrence in different islands
- Analysis of a schedule of operations for the production of a particular primary product
- Sustainability eg the effect on long term productivity of an aspect of atoll agriculture
- Genetically Modified Organisms eg a scrap book on the pros and cons of the introduction of GMO organisms within the Pacific Islands
- Conservation of biological diversity in an aquatic environment
- Interview and analysis of a successful farmer
- Pest/Disease control eg survey on the attitude to, and use of, safety equipment by farmers
- Analysis of the attributes of different breeds/cultivars
- Analysis of the effect of trade agreements on local export production
- Research on the impact of fruit flies on primary production within the Pacific Islands

3. Investigation Guidelines

The following guidelines are provided for teachers to carry out valid and consistent assessment and are to be modified for specific investigations.

Teacher Guidenotes:

Context/setting:

Students may choose their own practical investigation or choose from a list given by the teacher. Students must have their topic approved by the teacher to decide if the topic is feasible or workable.

Conditions:

This investigation is to be done individually over a period of time. A typical time period would include 5-6 weeks in total and 10-12 periods of classroom time. Students will be expected to do work outside of class time.

Additional information:

Students will need to submit a logbook with their report. Logbooks are a working record of all a student does to complete the investigation.

Logbooks should be substantially hand-written and students must put into their logbook any notes, research and photocopies they collect.

Logbooks should be checked by the teacher at regular intervals throughout the investigation to assist authenticity.

Student Guidenotes

1. Choose your topic for your practical investigation. This work will take about 5-6 weeks including 10-12 hours of class time. You will be expected to do work in your own time. You will be provided with a suggested list of topics to choose from but you may include a topic of your own. Have your topic checked and approved by your teacher. You must work independently.
2. You are to investigate one aspect of the production process that influences the supply/demand/profitability of one primary product.
3. You **must** keep a logbook. This logbook must contain all your rough notes. You should put photocopied material into it or an accompanying folder. This logbook will be checked by your teacher at regular intervals and is part of the authentication process. **The logbook must be handed in along with your report.** It does not have to be neat.

The stages of the task:

Planning the investigation:

1. Do some initial research to determine the suitability of your topic. Collect any relevant background information. Record this in your logbook.
Decide the purpose of your investigation.
2. Work out the key variables for your investigation, that is, an independent and dependent variable (the key factors to be compared).
3. Write a hypothesis/prediction – a statement describing what you predict the relationship / pattern between the chosen variables for your investigation will be.

4. Now design a method for your investigation.

The method needs to detail the procedures to follow. It needs to produce sufficient, appropriate and consistent data to produce a valid and reliable conclusion, e.g. by repeated measures, considering sample sizes, eliminating errors, etc.

Your method needs to specify:

- The independent variable and how it will be controlled.
- The range for the independent variable.
- The dependent variable and how it will be measured.
- Fixed values for and ways of controlling other variables or factors that could influence the investigation.

5. Start trialling your plan to see if it will work. This will also help you to refine your method. Record evidence of trialling and any changes you make to your plan in your logbook.

Collecting Data

1. Follow your plan and start collecting data. Your raw data should be put into your logbook in a systematic way, e.g. tables. It does not have to be tidy. Record everything that you do.
2. Your plan may need modifying. Record any modifications in your logbook, explaining why you changed your plan. You may need to trial your method first.
3. Indicate and record any trends you see developing in your data.
4. Make sure that you have sufficient, accurate and valid data to meet the purpose of the investigation. Review your data as you progress. You may need to collect more by repeating your method, increasing the range of key variables or factors, and/or eliminating extremes. Processing your data will indicate what is needed.
5. Record any changes to your method in your logbook.

Processing data:

After you have gathered all your raw data you now process it. This will help you to identify patterns and trends in your data.

1. Process your data:
 - To make sure that you have collected the right data for your investigation, that is, **valid** data.
 - To make sure that you have collected enough data – that is, **sufficient** data. If you don't, go back and gather some more.
 - To make sure that you have collected **accurate** data.

- To indicate any trends, patterns or relationships – these should relate back to your hypothesis or aim but they may show you something that you hadn't thought of.
2. Data is processed to ensure sufficient, accurate and valid interpretations by some or all of the following techniques:
 - Averaging of repeated measurements.
 - Exclusion of extreme/odd data.
 - Statistical analysis eg mean and standard deviation.
 - Using relevant calculations.
 - Drawing relevant graphs.

Interpreting your data:

1. Now look at your processed data and identify any trends, patterns or relationships that you can see. These should relate back to your hypothesis or aim. Describe these in your logbook.
2. This may mean that you have finished your data collecting and processing or that you need to go back and collect some more data.
3. If you have enough **sufficient, accurate and valid data** it is time to write up the report.

Writing up the report:

1. You are to present your investigation as a scientific report. Your report will need to communicate information clearly.
2. Your report must include the following sections:
 - ***Introduction/background*** – brief information on the plant or animal and its production process, and any relevant background information.
 - ***Hypothesis/aim/prediction*** – a statement describing what you think the relationship between the chosen variables or factors for your investigation will be.
 - ***Method*** – The method written up here is the final method that you used after all the modifications. This explains how you collected and recorded sufficient, accurate and valid data. Your method should be clear and concise so that another person exactly repeating your procedures could produce the same results. Include the key variables or factors and their ranges and how you controlled for other variables or factors.
 - ***Results*** – The report only needs to contain the processed data, recorded in a systematic format, e.g. the raw data should have been

put into clear tables showing the averages etc, graphed or statistically analysed where appropriate.

- **Interpretation** – Any trends patterns or relationships shown by your results.
- **Discussion** – This will include the interpretation, conclusion and the evaluation of the investigation
- **Conclusion:** This summarises what you have found out and relates back to the hypothesis/prediction or the aim/purpose, background information and experimental results.
- **Evaluation:** This includes
 - The limitations and reliability of the investigation.
 - Why your initial method was modified.
 - Errors that may have affected the results
 - Suggestions for improvements that may have made the conclusions more valid.
 - Comments on the accuracy of the method
 - Comments on the validity, accuracy and sufficiency of the data.
 - Suggestions and justifications for further investigation.
- **References** – All references must be listed using an approved system.

A Sample Agriculture Programme Timeline

Week	Term 1	Term 2	Term 3
1	Staff/student planning and orientation	↓	
2	Section 1	Section 3 - Plant	
3		↓	
4		↓	
5		↓	↓
6	Case Study 1	Mid-Year Examinations	
7	↓	Mid-Year Examinations	End-Year Examinations
8	↓	Practical Investigation	Revision
9	Section 2		
10			External Examinations
11		↓	
12	Case Study 2		
13		Section 3 - Animal	
14			
	Term Break	Term Break	

- Note:** 1) The above is just a suggested guideline. Teachers are free to adapt this.
 2) One week in Term 1 has been allowed for planning and orientation.

Useful References for Year 13 Agriculture

1. Henry D Foth 8E, *Fundamentals of Soil Science*, John Wiley & Sons
2. J. A. Sutherland, *Understanding Farm Animals*, McGraw-Hill Book Co, Sydney
3. *Plant Protection in the Pacific Islands – a course for senior high-schoolers*, Macpherson, Colin, SPC Plant Protection Services
4. Brown L, Hindmarsh R, McGregor R, *Dynamic Agriculture Book 1, 2, 3, &4*
5. *An Introduction to Animal Husbandry in the Tropics*, Payne, ELBS (Longman) 0582212758
6. *Pacific Agroforestry – An information kit*, Pacific Regional Agricultural Programme, SPC, 982-343-038-1
7. *Agroforestry – A Way to Better farming Module 1 and Module 2*, I Ratukalou, T Nakalevu, J Waradi, H Hartel, H Raedler, E Reigber, MAFF Fiji, 982-209-005-6
8. Animal Production, SPC Paravet
9. *Pacific Kava – A Producer’s Guide*, SPC 982-203-810-0
10. *Farm Management Handbook*, Queensland Department of Primary Industries, Brisbane, 074217355
11. *Livestock Husbandry Techniques*, McNitt, Collins, 0003831337
12. *An Introduction to Economics for Students of Agriculture*, Berkeley Hills, Pergamon Press
13. Jarvis S 2000 *Biotechnology Techniques and Issues* New House
14. Jones RN, Karp A and Giddings G 2001 *The Essentials of Genetics Advanced Biology Readers* John Murray

Student

15. *Certificate Agricultural Science*, Akinsanmi, Longman 0582003407
16. *Agriculture for South Africa*, Elliot, Slout Collins Education 0003222322
17. *The Tropical Vegetable Garden*, Messiaen, Macmillan 0333570774

Other Support Material:

1. Secretariat of Pacific Community (SPC)

A wide range of support material and specialist information and advice for teachers and students is available. Contact the Librarian.

Private Mail Bag

Suva

FIJI

www.spc.int

2. Internet Resources

- www.spc.int
- www.usp.ac.fj
- www.biozone.co.nz
- www.nzqa.govt.nz

3. Scientific Periodicals / Magazines / Journals

- South Pacific Agricultural News
- Pacific Pest Info (SPC)
- Pest Alert (SPC)
- Pest Advisory Leaflet (SPC)
- New Scientist
- Scientific American
- National Geographic

4. Video

- Video Education Australia
P.O. Box 4390
Shortland St, Auckland, NZ
- BBC
Endeavour / Roadshow Entertainment
Private Bag 56905
Dominion Road, Auckland
- Educational Media Australia
7 Martin St
South Melbourne, Victoria 3205
- SPC
Private Bag
Suva
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GLOSSARY

Experimental terms:

Hypothesis	a prediction/statement which can be tested by experimentation.
Dependent variable	variable whose value is determined by one or more other (independent) variables.
Independent variable	variable whose value is set over a range to produce a measured effect on the dependent variable.
Controlled variables	variable whose values are set throughout an experiment to prevent any effect on the dependent variable.
Valid	measures what is intended.
Reliability	probability that the same result can be produced again.
Primary data	original data obtained by direct measurement or observation of the event.
Secondary data	data from another source.

Assessment terms:

Describe	requires the student to recognise, name, state the features or characteristics (of an object or process).
Explain	requires the student to show an understanding by stating what happens or giving reasons for an event or observation.
Discuss	requires the student to show an understanding by linking ideas. Usually an extended answer that explores concepts and issues and uses examples in the explanation.
Informed judgement	opinion based on an understanding of the facts/information.
Reasoned judgement	opinion based on an analysis of the facts/information.
Critically evaluate	form an opinion by comparing and contrasting information/opinions/viewpoints.
Concise	information presented clearly in few words.
Systematic (record)	record that follows a set plan or system.

Other terms:

<i>Attribute</i>	property of the primary product normally present in the product at harvest.
<i>Export product</i>	any locally produced primary product which is exported.
<i>Genetic engineering</i>	any process that modifies or alters the genetic makeup of an organism

<i>GMO</i>	genetically modified organism: an organism that is modified by the transfer of specific genes to a new host organism
<i>Local product</i>	any primary product produced within the students local region.
<i>Market opportunity</i>	any point of sale of the primary product. This covers a wide range, including: gate sales, local retailer, export wholesaler, processing, direct selling.
<i>Marketing technique</i>	any practice used by the producer to influence supply or demand for the primary product.
<i>Primary product</i>	unprocessed plant or animal crop produced by the grower from the land.
<i>Production process</i>	the complete process for production of the primary product from establishment to the market.
<i>Resources</i>	includes the physical environment as well as the availability of labour and technical/specialist advice. This includes the role of government and non-government agencies.
<i>Schedule of operations</i>	identifies the husbandry practices used in the production process and identifies when they occur within the process.
<i>Sustainable production</i>	Production that is able to meet consumer demand without affecting the long term ability of the environment to produce (no environmental degradation).