Economic model of coconut based farming systems. A guide

C0345
ECONOMIC MODEL OF COCONUT BASED FARMING SYSTEMS

- A GUIDE -

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Appendix 1: The Model (print-out of empty Excel programme)
Appendix 2: Sample forms for data collection in the field

Abbreviations

ARI	Agricultural Research Institute (formerly NCDP and CCTP)
BEAM	Bio-economic agro-forestry modelling
CBA	Cost-benefit-analysis
CCTP	Cashew and Coconut Treecrops Project
CIRAD	Centre de coopération internationale en recherche agronomique pour le développement
DRC	Davao Research Centre
IRR	Internal Rate of Return
NCDP	National Coconut Development Programme
NPV	Net present value
NRI	Natural Resources Institute
PCA	Philippine Coconut Authority
PRA	Participatory Rural Appraisal
RRA	Rapid Rural Appraisal

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In addition, the model benefited from substantial inputs and ideas provided by the BEAM Project of the University of Wales (Bangor).

Introduction

The model presented in this short guide is the result of the project 'Coconut-Based Farming Systems - Functioning and Economic Analysis Models', which was funded by the European Commission (DGXII), co-ordinated by CIRAD, and undertaken in collaboration with the Philippine Coconut Authority (PCA), and the Agricultural Research Institute (ARI) of Tanzania. For more background information it is recommended to consult the annual project reports prepared by CIRAD and NRI.

The guide was prepared with a view to accompany the Excel 5.0 version of the model entitled 'coco-eco.xls'. It provides an overview of the key features of the model, and aside from general spreadsheet tips, leads through the various components of the model. The appendices contain a printout of the empty model.

The sections on 'Basic Principles of the Model' and 'Main Indicators' only highlight the key elements of the model without going into great detail. More information is contained in the section guiding through the various sheets of the model. The tables in the latter section are first of all for illustration purposes, and are to some extent based on dummy data.

Originally, in collaboration with the BEAM Project of the University of Wales, an attempt has been made to create a more comprehensive model allowing an economic and labour analysis over a period of up to 60 years for situations with and without coconut based intercropping. Unfortunately, due to time and budget constraints it was not possible to finalise this larger model prior to the end of the project. Time permitting, BEAM will complete and disseminate it during the course of 1998.

This led to the creation of the current model, which, despite of being a smaller version, is very much in line with the data to be generated by the bio-physical CIRAD model. The current model is entirely NRI's responsibility.

A final reminder to the reader of this guide. The model primarily focuses on economic aspects of coconut based intercropping systems. However, depending upon the circumstances, farmers may also have other priorities such as food security, or labour saving agricultural practices. This can lead to situations where economic profitability may only be a secondary objective for the farmer.

Basic Principles of the Model

The model builds on a comparison of monoculture coconut (i.e. mature trees) with polyculture scenarios over a 15-year period.

A one-hectare intercropping scenario is used as the baseline situation. From this, figures will be generated for the entire intercropping plot.

In order to be able to create an intercropping scenario, it is necessary to obtain the following data:

Pre-harvest:	Inputs and outputs per tree ----> Coconut,
	Inputs and outputs per hectare --> Intercrops,
Post-harvest:	Inputs and outputs per 1000 nuts harvested-->Coconut,
	Inputs and outputs per tonne harvested ----> Intercrops.

Other information required includes:

Prices for inputs and outputs,

Interest Rate (Discount Rate) if several years are analysed,

Labour costs per hour (assumed to be the same for hired and family labour),

Investments, Maintenance, and Residual Values.

Main Indicators

Net Present Value (NPV), calculated on the basis of Incremental Net Benefits,

Internal Rate of Return (IRR), equally based on Incremental Net Benefits,

Gross Margins, and Net Benefits for both scenarios, leading to:

----------> Incremental Net Benefits

Sensitivity Analysis, based on increase or decrease of product prices and physical input costs.

Labour Supply and Demand, on an annual basis.

Gross Margin (GM) per Family Labour-Day for both scenarios.

Labour Chart, in particular to compare family labour requirements and availability per annum.

Structure of the Model

Overview and Results:

Home page

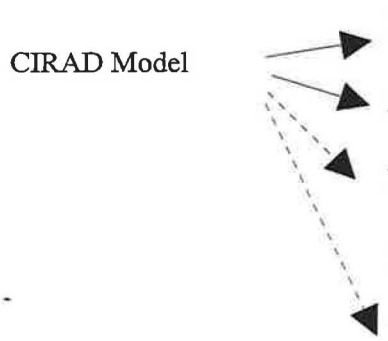
The farm

Financial results

Summary monoculture

Summary polyculture

Data Templates:



Bio-physical data, monoculture

Bio-physical data, polyculture

Input data, monoculture pre-harvest

Input data, monoculture post-harvest

Input data, polyculture pre-harvest

Input data, polyculture post-harvest

Investments

Coconut utilisation

Prices

Residual values of investments (in year 15)

Appendices:

Summary (detailed summary of one-hectare polyculture plot)

Farm labour

Labour chart

Spreadsheet Tips

The original of the model is contained in an Excel workbook called: 'Coco-eco.xls'.

For different scenarios, it is recommended to save the model under different names, and keep the original.

Only write in the yellow shaded cells. If you don't have a colour screen, these will be the lightly shaded cells which are not protected.

Including the 'Home' page, the model contains 18 worksheets. It is possible to access all sheets from the 'Home' page by clicking on the relevant buttons. To move around between different sheets, return to the home page and access the new page, or use the sheet bar at the bottom of your Excel window.

Tips for fields with numerical data:

- Don't put descriptive information, and
  Don't delete information using the 'tab' key.
  In both cases, error messages such as '#Value!' will appear.
  If you use the 'tab' key for deleting it will be difficult to locate the problem because you cannot see it.
- Don't forget to put a figure for the size of the intercropping plot on the farm data sheet.
- Don't forget to put figures for 'hours/per working day' on the farm labour sheet. Otherwise error messages such as '#Div/0!' will appear, and the labour graph will be distorted.
- The cell 'Farmer's share, %' in the 'Price' page has to be filled in, otherwise the revenue of a crop will not be calculated.

Percentage figures should be put as '.2' instead of '20%'. Only the latest versions of Excel allow to write percentage figures in their original form.

Problems can occur with the calculation of the Internal Rate of Return (IRR), for example if there is no negative value for the incremental net benefit for the first years of a project. The result will be an error message '#Value!'. The same thing may happen if there are changing signs for the cumulative incremental net benefit.

Other possible error messages may include '#Div/0'. This may be the case if you have forgotten to indicate the size of the intercropping plot in the worksheet entitled 'The farm'.

Try to respect the format of the yellow shaded cells. Unlike the rest of the workbook, they are not protected and as a consequence borders or other formats can be changed. This may also happen if text overshoots the size of a cell.

The error message '#####' may appear if the column width prevents a figure from full display. This can be corrected by deprotecting the worksheet (Tools menu) and enlarging the column. Protect the sheet again once finished!

Don't rename the sheets. The macros to locate them directly from the 'Home' page won't work any more.

The 'Print this page' button may not always work. It is not compatible with all print set-ups. In this case use the usual steps to print the page (Excel print button).

Guide through the Model

Home page

The home page provides an overview of all the worksheets making up the model. It allows direct access to the other sheets by clicking on the relevant buttons.

The farm

This sheet contains the basic information of the farm. The information related to the intercrops and the size of the intercropping plot is linked to the other sheets and should therefore be stated in the correct form.

Farming system information and intercrops are of a descriptive nature whereas farm size and size of the intercropping plot are numerical.

Financial results

This sheet provides an overview of the key financial indicators such as the Net Present Value (NPV), Internal Rate of Return (IRR), Gross Margins, Net Benefits and Incremental Net Benefits.

The main variables to be filled in on this sheet include the interest rate (i.e. discount rate), the currency, and the cost of labour (per hour). The latter will be used to calculate the cost of hired labour, and to value family labour. It is assumed that the opportunity cost of family labour is the same as the cost of hired labour.

The NPV is the net present worth of the incremental net benefit stream. It is calculated by using a discount rate (i.e. interest rate) corresponding to the marginal cost of money to the farm or, in other words, opportunity cost of capital. Often, the real interest rate is used in this context, that is, the nominal interest rate minus the rate of inflation. As a guideline, discount rates normally used are of the order of 10 - 20%. In case of a high risk project higher discount rates may be used.

As a rule of thumb, unless there are other major non-economic factors, an intercropping system should only be recommended if the NPV is positive. Exceptions to this rule may for example include a food security motive for intercropping.

If the NPV is negative at a given discount rate, this could mean that:

- intercropping is not more profitable than monocropping, or
- intercropping is not more profitable than alternative investments, or
- if the money is borrowed, that the farmer could not service his debt.

The IRR corresponds to the interest rate at which the value of the NPV becomes zero. A project is considered worthwhile if the IRR exceeds the opportunity cost of capital.

As already mentioned, in our case the latter corresponds to the interest rate (i.e. discount rate) used for calculating the NPV.

The IRR is a useful measure of project profitability, but please note that its calculation is not always straightforward, sometimes leading to error messages such as '#Value!' or '#Num!'. This will certainly be the case if all values of the incremental net benefit stream are positive. Also, there is the possibility of more than one IRR if positive values of the incremental net benefit alternate with negative ones. This will also lead to error messages. In such a case, there is not much you can do but ignore the indicator.

Variables		**Results**	T. Shs
Interest rate	**12.0%**	**Net Present Value**	**13,544**
Currency	**T. Shs**	**Internal Rate of Return**	**23.9%**
Labour costs (per hour)	**15.0**		
		Sensitivity analysis	
		Increase/decrease in:	
		Product prices by:	**8.0%**
		Physical input costs by:	**10.0%**
		Net Present Value	**23,881**
		Internal Rate of Return	**31.2%**

Standard situation; Figures are for entire intercropping area; **T. Shs**

Year	Monoculture Gross Margin	Monoculture Net Benefit	Polyculture Gross Margin	Polyculture Net Benefit	Incremental Net Benefit
1	304,041	285,509	287,121	262,240	-23,269
2	304,041	288,134	350,714	295,138	7,004
3	304,041	288,134	350,714	292,938	4,804
4	304,041	288,134	350,714	295,138	7,004

Sensitivity analysis; Figures are for entire intercropping area; **T. Shs**

Year	Monoculture Gross Margin	Monoculture Net Benefit	Polyculture Gross Margin	Polyculture Net Benefit	Incremental Net Benefit
1	327,841	309,309	309,633	284,752	-24,557
2	327,841	311,934	376,455	320,879	8,945
3	327,841	311,934	376,455	318,679	6,745
4	327,841	311,934	376,455	320,879	8,945

NPV and IRR are only useful if you look at a project (i.e. new cropping system as compared to monocropping) covering several years. Also, NPV and IRR should be ignored if coconut monoculture is compared with an intercropping system including a mature perennial crop (e.g. cocoa). This is due to the fact that the investment element during the establishment and early growth years of the perennial, when no additional revenue will be accrued, does not form part of the analysis.

For a more detailed discussion of financial appraisal and project measures, please consult standard text books such as J. Price Gittinger (1982)[1] or discuss the problem with the economists in your organisation.

The Gross Margin and the Net Benefit are standard indicators used in farm budget analysis. They allow to compare the profitability of monocropping with intercropping on an annual basis. The figures are for the entire intercropping area.

A sensitivity analysis can be undertaken to assess the implications of an increase or decrease in product prices or physical input costs. A decrease would be expressed by a negative percentage figure (e.g. -10%), and an increase by a positive value (e.g. 15%). A sensitivity analysis is useful if for example a farmer would like to know to what extent an intercropping system would still be profitable if the costs of the physical inputs would increase by, for example, 10%.

The results of the sensitivity analysis are also expressed as Net Present Value and Internal Rate of Return. At the same time, there is a second table indicating the Gross Margins and Net Benefits for each year based on the assumptions of the sensitivity analysis (i.e. increase/decrease of product prices or physical input costs).

Summary monoculture, and Summary polyculture

These are identical sheets for the monoculture and polyculture scenarios. For each year, and on a one-hectare basis, they show the main elements leading to gross margins and net benefits. The gross margin is calculated by deducting physical inputs and costs for hired labour from the revenue. The net benefit in a particular year is the result of the gross margin minus the values of family labour, investments, and maintenance of the latter.

NB. Figures are for one hectare only Currency: **T. Shs**

Years	**Revenue**	Physical inputs	Hired labour	**Gross Margin**	Family labour	Invest-ment	Mainten-ance	**Net Benefit**
1	**342,500**	36,000	2,460	**304,041**	15,907	2,500	125	**285,509**
2	**342,500**	36,000	2,460	**304,041**	15,907	0	0	**288,134**
3	**342,500**	36,000	2,460	**304,041**	15,907	0	0	**288,134**
4	**342,500**	36,000	2,460	**304,041**	15,907	0	0	**288,134**

[1] J. Price Gittinger (1982), Economic Analysis of Agricultural Projects, Johns Hopkins University Press, USA.

It ought to be noted that the revenue of year 15 includes the residual value of investments.

Bio-physical data, monoculture

The data in this template should come from the bio-physical model developed by CIRAD.

The data should correspond to a **one-hectare** monocropping scenario, i.e. number of trees per hectare, yield per tree, and yields of up to two by-products (e.g. leaves or wood).

	Coconut Normal year (mature trees)			
Year	No of trees / ha	Yield nuts/tree	BP 1 kg/tree	BP 2 kg/tree
1	100.0	40.0	15.0	
2	100.0	40.0	15.0	

Bio-physical data, polyculture

Again, the data should come from the bio-physical model. In this template, the user will compose the polyculture system through the number of coconut trees and the area dedicated to the intercrops.

In total, this template contains space for the following:

- Coconut, normal year (mature trees)
- Perennial crop:
    - Establishment year
    - Early growth year
    - Normal year (mature plants)
    - Final year (up-rooting)
- Biennial crop:
    - Establishment year
    - Normal year
- Annual crop 1
- Annual crop 2
- Annual crop 3
- Annual crop 4
- Annual crop 5.

The names of the intercrops come directly from 'The farm' sheet, and cannot be changed here. They are highlighted in red.

Aside from coconut (per tree basis), the yield data for the main and by-products are on a per hectare basis.

The polyculture system can be composed through the number of coconut trees and the area occupied by the intercrops. **It is important to bear in mind that this should correspond to a <u>ONE HECTARE</u> intercropping plot.**

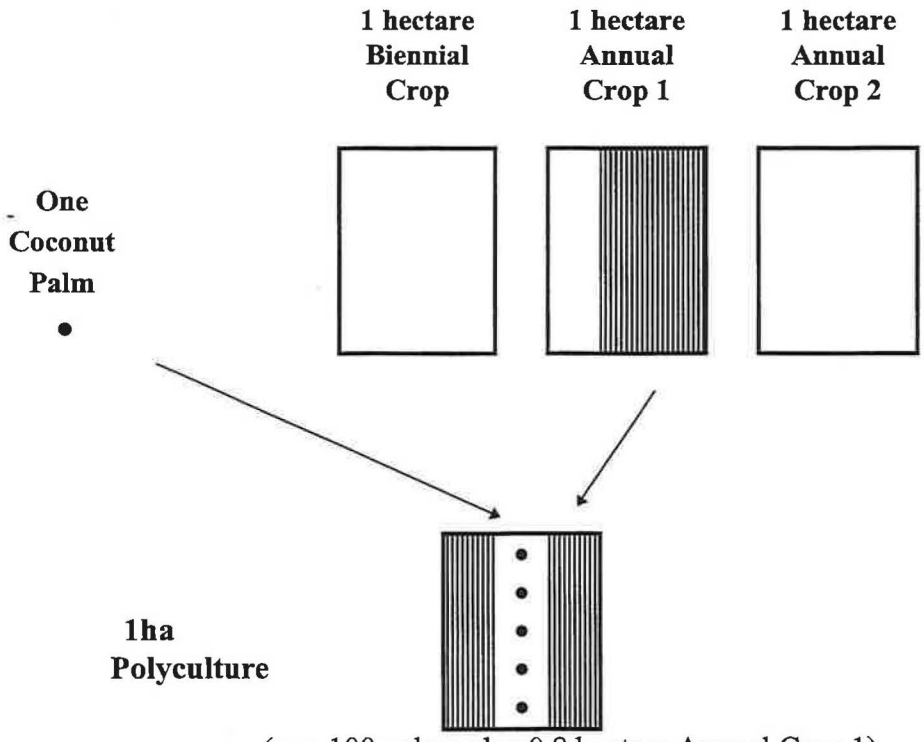
For example, in a given year, one hectare of land intercropped with coconut and two annual crops planted in two different seasons can be expressed as follows:

1 Hectare = 100 Coconut palms + 0.8 ha Annual-1 + 0.8ha Annual-2.

In the next year, due to crop rotation, this may look as follows:

1 Hectare = 100 Coconut palms + 0.8 ha Annual-3 + 0.8ha Annual-4.

Principle of Combining Crops for Polyculture System



(e.g. 100 palms plus 0.8 hectare Annual Crop 1)

It is also possible, to have more than one intercrop at a time, and this may lead to the following:

1 hectare = 100 coconut palms + 0.4 ha A-1 + 0.4 ha A-2 + 0.8 ha A-5

where Annual 1 (i.e. A-1) and Annual 2 (A-2) are intercropped with coconut in the same season.

Depending upon the nature of the crops, some perennials are likely to require a conversion from a per tree basis into a per hectare basis to include them into the model.

Input data, monoculture pre-harvest

All the physical inputs and labour requirements per annum per coconut palm will be entered here.

The physical inputs can include animal power and machinery expressed in minutes per tree.

Two rows of physical input may look as follows:

	Coconut Normal year				
Item	Type of input	Quant. per tree	Unit	Price/ unit	Cost/tree Peso
1	Herbizide	0.006	litre	430.0	2.6
2	Urea	1.0	kg	6.5	6.5

Labour inputs are on a per tree basis.

	Coconut Normal year		
No	Activities	Family min/tree	Hired min/tree
1	Herbicide appl.		8.4
2	Fertiliser appl.	5.6	

Input data, monoculture post-harvest

All the data are per **1000 NUTS harvested** and include both physical inputs as well as labour requirements.

It is important to **avoid double counting**. For example, if a farmer produces more than one product from coconuts it is advised not to enter for each one the post-harvest inputs per 1000 fresh nuts.

This problem can be overcome as follows: If we know that throughout a year a farmer will sell half his crop in the form of fresh nuts and half of it in the form of oil, the physical input and labour data should then be for 500 nuts in each case.

Post-harvest activities for by-products can only be entered indirectly. For example, if leaves are sold and this requires substantial inputs then this should be included as part of the post-harvest activities related to the main product.

Input data, polyculture pre-harvest

The data for coconut is not necessarily the same as for coconut monoculture. This will in particular be the case if the introduction of an intercropping system will lead to a change in agricultural practices (e.g. more pruning).

As compared to coconut, which is on a per tree basis, for the intercrops the data should cover all the physical inputs and labour requirements for one hectare of a particular crop. An extrapolation will be necessary if data can only be obtained for a fraction of a hectare. For example, if the information originates from an intercropping plot, and effectively only corresponds to 0.5 hectare, then the input data has to be doubled.

Care may be required if an annual crop can be planted in more than one season. Aside from the fact that this would lead to a double yield per annum it is also likely to imply higher if not double the amount of inputs.

If the input and output structure of a crop is very different for the two seasons it may be required to handle them as separate crops, i.e. Maize I (Annual Crop Season I) and Maize II (Annual Crop Season II). This step is also recommended if the crop does not occupy the same space in the two seasons (e.g. 0.4 ha in Season 1, and 0.8 ha in Season 2).

If there are inputs requiring animal power or machinery, try to use hiring costs and avoid dealing with it as an investment. In the same light, try to use the principle of opportunity costs as much as possible.

Input data, polyculture post-harvest

For coconut, the same applies as above for coconut monoculture, i.e. all the post-harvest inputs are on a per **1000-Nuts** basis. But bear in mind that a change of cropping patterns may also lead to a change in post-harvest activities.

All the other crops data are on a **per TONNE harvested** basis.

As already mentioned, please avoid double counting if there is more than one final product.

Investments and Maintenance

This sheet should be used if a cropping system, be it a monoculture or polyculture scenario, requires an investment. The latter can include small tools which are used over several years on the farm including on other fields aside the coconut plot. At the same time it can also be used for bigger investments such as an irrigation system or a major piece of post-harvest equipment.

Each year allows the input of up to 3 investment items. It is required to indicate the proportional use of the equipment in the coconut system (i.e. percentage figure).

Working capital can be a form of investment required at the start of an enterprise.

Most physical investments require a minimum of regular maintenance to keep them in working order. Often this is expressed as a small percentage of the original investment cost (i.e. normally 5 - 10%).

Don't forget to enter the data for both mono- and polyculture. A change in agricultural system is likely to lead to different investments. At the same time, if there are very little or no investments, don't force yourself to fill in the table. It may well be possible to cover quite a few items in the input data templates (see above) by using the principle of opportunity costs.

Output Coconut

Again, the data needs to be entered for both scenarios, i.e. mono- and polyculture. In each case the table is separated into, (1) coconut utilisation, and (2) coconut conversion. In the case of (1), the top row should be filled in for the main products to be produced and sold by the farmer. **This row must add up to 100%.**

The by-product yields are equally expressed in % terms and indicate what proportion of the coconut used for example for copra will be used for the production of a by-product such as charcoal. Please consult the example below for illustration purposes.

1. Coconut Utilisation **Proportion of total to end use and by-product yield**				
Main products:	Copra	Fresh nuts	Oil	Desiccated
% use of nuts by product				
	60%	40%		
by-product yield in process (% of potential yield)				
Charcoal	100%			100%
Powder				
Coir			100%	80%
Copra cake			100%	

At the same time, please bear in mind that the production of certain by-products may exclude another (e.g. charcoal and powder). On the other hand, owing due to the versatile nature of this crop it is possible to obtain several by-products from the same nut (e.g. charcoal and coir).

Again, the figures should reflect what kind of outputs and products a farmer is likely to produce.

The sub-table 'coconut conversion' provides an overview of the conversion rates, i.e. potential output per 1000 nuts. For example about 220 kg of copra and 60kg of charcoal may be produced from 1000 fresh coconuts.

Actual output corresponds to what on average 1000 nuts will be used for on a farm throughout a year. This is conditioned by the percentage rates in the utilisation sub-table.

The output value and the farmer's share is the product of the actual output and data from the 'price' sheet.

2. Coconut conversion

Product output, value, and farmer's share PER 1000 NUTS harvested

Product	Unit/ 1,000 nuts	Potential output	Actual output	Output value Peso	Farmer's share Peso
Copra	kg	220.0	132.0	1,419	1,277
Fresh nuts	nuts	1,000.0	400.0	1,118	1,006
Oil	l		0.0	0	0
Desicc. coconut	kg		0.0	0	0
Charcoal	kg	60.0	36.0	225	225
Powder	kg		0.0	0	0
Coir	kg		0.0	0	0
Copra cake	kg		0.0	0	0
			Total	2,762	2,508

Product prices

The sheet 'Product prices' is fairly self-explanatory. However, it is important to respect the units and include the farmer's share. The latter applies to a situation of tenancy where farmers only keep part of the crop. The model will not work if the farmer's share is not filled in (even if it is 100%) because the revenues will not be calculated.

In the case of home consumption, the principle of opportunity cost should be applied (i.e. how much the farmer has to pay to obtain the same product to feed her family).

Residual Value at the End of Project (i.e. Year 15)

This corresponds to the situation where an investment has still some value left (i.e. it is not fully depreciated) at the end of year 15, which in our case corresponds to the end of project. The residual value (sometimes also called scrap value) adds to the revenue in Year 15.

If at an earlier stage in the project there was an investment in the form of working capital this should be recovered in Year 15 in the form of a 'Residual Value'.

If there were investments under both scenarios, i.e. mono- and polyculture, think about the possibility of residual values in both cases.

Summary

This sheet provides more detailed summary information for the polyculture scenario. For each crop, there is a table for revenue, physical inputs, hired labour, and family labour. The data is for a one-hectare intercropping plot.

Aside from results on a per crop basis, the tables in this sheet may also allow the user to spot errors or omissions in entering the data.

Labour Supply and Demand, and Gross Margin per Family Labour-Day

This sheet is particularly relevant for those interested in an analysis of labour supply and demand and the calculation of gross margins per family labour day spent on the coconut intercropping plot.

The data to enter in this sheet is related to farm labour supply in any year of the project. A number should be put for each category of family member available to do farm work.

Farm labour supply

Category	No	Available %
Adult male	2	30%
Adult female	1	40%
Children (12 - 15 yrs)	2	10%

Working days/month	25.0
Hours/working day	7.0

Total farm labour available: **330** Person-days per annum

The percentage figures reflect their availability to work on the intercropping plot. This may be restricted by other activities such as off-farm work, work on other fields of the farm, or household activities. It is important to include the corresponding percentages, as well as 'working days/month', otherwise the total farm labour available will not be calculated.

The 'Hours/working day' allow the conversion of labour data from a per hour basis into a per day basis.

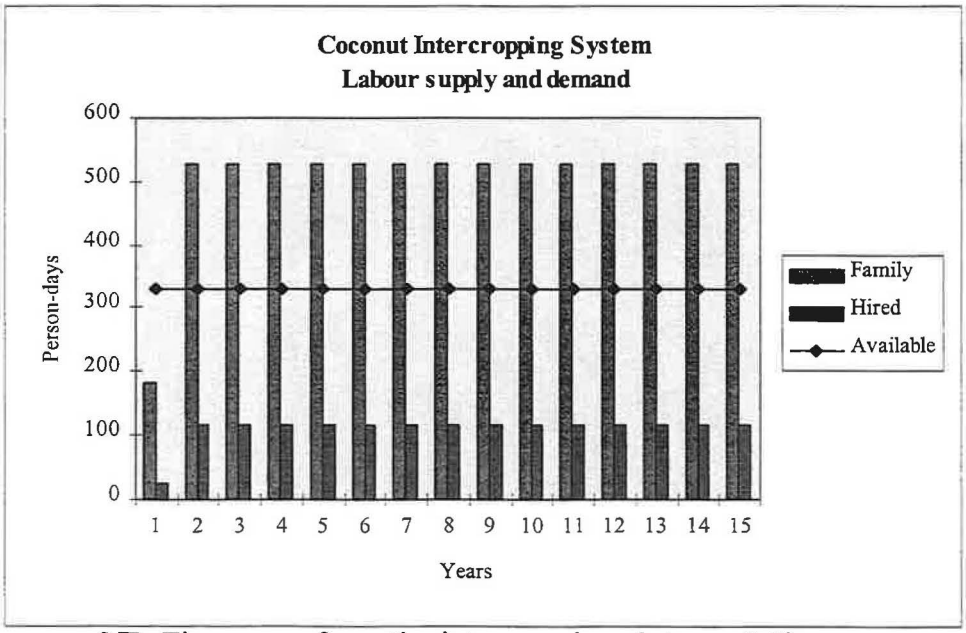
The labour supply and demand table for polyculture feeds into the labour chart on the following sheet.

In particular, in the case of labour intensive agricultural practices, it may be interesting to know the return on family labour spent on the intercropping plot. For any given year, the table allows a comparison between monoculture and polyculture scenarios. The indicator used is Gross Margin (GM) per Family Labour-Day.

Labour Chart

This chart provides an overview of the annual requirements of family and hired labour as compared to the farm labour available.

Due to the fact that the analysis is only done on an annual basis, it is not possible to identify seasonal labour patterns. It is recommended to undertake a more thorough labour analysis if there is the possibility of seasonal labour shortages during certain months of the year.



NB, Figures are for entire intercropping plot: 2.5ha

Data Collection

Three sources of information will have to be considered in gathering the data for the economic model. As a first step, it is important to make adequate use of already existing material in the form of published or 'grey' literature. Secondly, expert advice has to be sought where appropriate. Steps one and two need to be complemented with information to be obtained directly from farmers.

At this point, no attempt will be made to go through all the details of information required. This is already covered in the various sections on the model and in the Appendices providing samples of data forms.

It is suggested that data collection methods should concentrate on Rapid Rural Appraisal techniques. In particular, semi-structured interviewing is likely to be of use to obtain information at farm level. Interviews may be held with groups of farmers or individuals depending on the circumstances. There may be cases where only one farmer needs an analysis of his/her coconut growing area.

If the survey has to cover a larger number of farms, it is important to follow the stratification rules outlined in most RRA manuals. The stratification criteria will depend upon the conditions prevailing in the study area. For example, if a region consists of different farming systems or agro-ecological zones this has to be adequately taken into account in the sample. At the same time a balance needs to be struck between villages with and without market access.

There may also be cases where within one village different farmer groups have to be interviewed. This may include small-scale farmers on the one hand, and larger scale ones on the other one. Depending on cultural circumstances, it may sometimes be necessary to have separate interviews with women farmers and men.

Given the working conditions in the field it is likely to be more useful to collect the data through an RRA in the first place, and use a second step, preferably in the office, to put the information into the computer model. Often, the information originally collected in the field will not be in the right form to be used in the model and as a consequence conversions are necessary.

A sample check-list is presented below. It was developed in Tanzania, but with minor modifications may also be used in other countries. The check-list also includes points which are not directly required for the economic model but which are nonetheless important for the understanding of the farming system under consideration.

If required, manuals on Rapid Rural Appraisal can be provided by NRI. The manuals provide an overview of issues, techniques, and tools to be considered when doing an RRA.

Checklist for RRA to Collect Data

General information

Location
Agro-ecological zone, seasons, site characteristics
Market accessibility
Farming system
Household size (M, W, C)
Other important facts

Farming system information

Farm size
Number of plots
Plot sizes
Crops grown per plot
    Perennials, biennials, annuals
    Rotations, and sequences
Motivation to grow crops (cash, subsistence, other)

Detailed information on intercropping plot
(i.e. plot where coconut production already takes place,
and where intercropping will be introduced)

Plot size

Proportion of plot occupied per crop

Per month, starting with the 1st month of the agricultural calendar, identify:
    Each operation per crop
    Resources employed
        Family labour (hours/area or minutes/tree)
        Hired labour (hours/area or minutes/tree)
        Animal draft power (hours/area)
        Motorised machinery (hours/area)
    Physical inputs
        Type
        Quantity/area or tree
        Units
    Investments (e.g. irrigation system or processing equipment)

    In the case of post-harvest activities identify in the same manner:
        Labour requirements
        Animal draft power requirements
        Machinery requirements
        >> per 1000 nuts harvested (in the case of coconut) or per
            tonne (in the case of the intercrops).

At the end, information should be available on all pre- and post-harvest operations (i.e. until the point of sale) related to the crops grown on the "intercropping plot".

If there is more than one season, this will reflect on annual crops grown (i.e. 2 or more crops grown on the same piece of land in any one year).

In addition, in the case of perennial crops, aside from a normal year, also try to obtain the same type of information on establishment, early growth and final years. Information for biennials will cover establishment and normal years (i.e. up to 24 months).

Yields

Crop yields (e.g. bags per area)
Tree yields (nuts or fruits per tree)

Products

Main products and by-products per crop
Utilisation (e.g., % of nuts sold fresh or processed into copra or oil)
Conversion ratios (e.g., kg of copra per 1000 nuts)

Price information

Outputs (in particular, prices for crops grown on coconut plot)
- Coconuts and coconut products
- Intercrops

Inputs
- Resources
  - Hired labour
  - Hired animal power
  - Hired machinery
- Physical inputs
  - Seeds, fertiliser, etc.
- Investments

Prices should reflect what farmers actually have to pay for inputs or what they receive for their produce. In the case of home consumption, the principle of opportunity cost should be applied (i.e. how much a farmer has to pay to obtain the same product).

Discussion with farmers of pros and cons of intercropping with coconuts

(Appendix 2 contains samples of data entry forms to be used for data collection. Please feel free to adapt).

APPENDICES

Appendix 1: The Model (printout of empty Excel programme)
Appendix 2: Sample forms for data collection in the field

Appendix 1

The Model
(printout of empty Excel programme)

Economic Model of Coconut Based Farming Systems

Home Page

Click here	Click here
The farm	Input data, polyculture, post-harvest
Financial results	Investments
Summary monoculture	Coconut utilisation
Summary polyculture	Prices
Bio-physical data, monoculture	Residual values
Bio-physical data, polyculture	Summary
Input data, monoculture, pre-harvest	Farm labour
Input data, monoculture, post-harvest	Labour chart
Input data, polyculture, pre-harvest	

Farm data

Farming system	
Type of coconut stand	
Intercrops	
Perennial	
Biennial	
Annual 1	
Annual 2	
Annual 3	
Annual 4	
Annual 5	
Farm size (ha)	
Size of intercropping plot (ha)	

Financial results

Variables		Results	Peso
Interest rate	12.0%	Net Present Value	#DIV/0!
Currency	Peso	Internal Rate of Return	#VALUE!
Labour costs (per hour)	0.0		

Sensitivity analysis

Increase/decrease in:	
Product prices by:	0.0%
Physical input costs by:	0.0%
Net Present Value	#DIV/0!
Internal Rate of Return	#VALUE!

Standard situation; Figures are for entire intercropping area; **Peso**

	Monoculture		Polyculture		Incremental
Year	Gross Margin	Net Benefit	Gross Margin	Net Benefit	Net Benefit
1	0	#DIV/0!	0	#DIV/0!	#DIV/0!
2	0	#DIV/0!	0	#DIV/0!	#DIV/0!
3	0	#DIV/0!	0	#DIV/0!	#DIV/0!
4	0	#DIV/0!	0	#DIV/0!	#DIV/0!
5	0	#DIV/0!	0	#DIV/0!	#DIV/0!
6	0	#DIV/0!	0	#DIV/0!	#DIV/0!
7	0	#DIV/0!	0	#DIV/0!	#DIV/0!
8	0	#DIV/0!	0	#DIV/0!	#DIV/0!
9	0	#DIV/0!	0	#DIV/0!	#DIV/0!
10	0	#DIV/0!	0	#DIV/0!	#DIV/0!
11	0	#DIV/0!	0	#DIV/0!	#DIV/0!
12	0	#DIV/0!	0	#DIV/0!	#DIV/0!
13	0	#DIV/0!	0	#DIV/0!	#DIV/0!
14	0	#DIV/0!	0	#DIV/0!	#DIV/0!
15	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

Sensitivity analysis; Figures are for entire intercropping area; **Peso**

	Monoculture		Polyculture		Incremental
Year	Gross Margin	Net Benefit	Gross Margin	Net Benefit	Net Benefit
1	0	#DIV/0!	0	#DIV/0!	#DIV/0!
2	0	#DIV/0!	0	#DIV/0!	#DIV/0!
3	0	#DIV/0!	0	#DIV/0!	#DIV/0!
4	0	#DIV/0!	0	#DIV/0!	#DIV/0!
5	0	#DIV/0!	0	#DIV/0!	#DIV/0!
6	0	#DIV/0!	0	#DIV/0!	#DIV/0!
7	0	#DIV/0!	0	#DIV/0!	#DIV/0!
8	0	#DIV/0!	0	#DIV/0!	#DIV/0!
9	0	#DIV/0!	0	#DIV/0!	#DIV/0!
10	0	#DIV/0!	0	#DIV/0!	#DIV/0!
11	0	#DIV/0!	0	#DIV/0!	#DIV/0!
12	0	#DIV/0!	0	#DIV/0!	#DIV/0!
13	0	#DIV/0!	0	#DIV/0!	#DIV/0!
14	0	#DIV/0!	0	#DIV/0!	#DIV/0!
15	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

Financial Summary - Monoculture

NB. Figures are for one hectare only Currency: **Peso**

Years	**Revenue**	Physical inputs	Hired labour	**Gross Margin**	Family labour	Invest-ment	Mainten-ance	**Net Benefit**
1	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
2	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
3	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
4	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
5	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
6	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
7	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
8	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
9	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
10	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
11	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
12	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
13	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
14	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
15	**#DIV/0!**	0	0	**#DIV/0!**	0	#DIV/0!	#DIV/0!	**#DIV/0!**

NB. The revenue of year 15 includes the residual value of investments

Sensitivity Analysis, Monoculture

Increase/decrease in:	
Product prices by:	0.0%
Physical input costs by:	0.0%

NB. Figures are for one hectare only Currency: **Peso**

Years	**Revenue**	Physical inputs	Hired labour	**Gross Margin**	Family labour	Invest-ment	Mainten-ance	**Net Benefit**
1	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
2	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
3	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
4	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
5	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
6	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
7	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
8	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
9	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
10	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
11	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
12	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
13	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
14	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
15	**#DIV/0!**	0	0	**#DIV/0!**	0	#DIV/0!	#DIV/0!	**#DIV/0!**

NB. The revenue of year 15 includes the residual value of investments

Financial Summary - Polyculture

NB. Figures are for one hectare Currency: **Peso**

Years	**Revenue**	Physical inputs	Hired labour	**Gross Margin**	Family labour	Invest-ment	Mainten-ance	**Net Benefit**
1	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
2	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
3	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
4	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
5	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
6	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
7	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
8	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
9	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
10	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
11	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
12	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
13	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
14	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
15	**#DIV/0!**	0	0	**#DIV/0!**	0	#DIV/0!	#DIV/0!	**#DIV/0!**

NB. The revenue of year 15 includes the residual value of investments

Sensitivity Analysis, Polyculture

Increase/decrease in:	
Product prices by:	0.0%
Physical input costs by:	0.0%

NB. Figures are for one hectare only Currency: **Peso**

Years	**Revenue**	Physical inputs	Hired labour	**Gross Margin**	Family labour	Invest-ment	Mainten-ance	**Net Benefit**
1	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
2	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
3	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
4	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
5	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
6	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
7	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
8	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
9	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
10	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
11	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
12	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
13	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
14	**0**	0	0	**0**	0	#DIV/0!	#DIV/0!	**#DIV/0!**
15	**#DIV/0!**	0	0	**#DIV/0!**	0	#DIV/0!	#DIV/0!	**#DIV/0!**

NB. The revenue of year 15 includes the residual value of investments

Bio-physical template: Coconut monoculture

BP = By-product

Year	**Coconut** Normal year (mature trees) No of trees / ha	Yield nuts/tree	BP 1 kg/tree	BP 2 kg/tree
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Bio-physical template: Polyculture

BP = By-product; The area data for a given year has to match a ONE- HECTARE intercropping plot including the coconut palms.

	Coconut				Perennial			0					
	Normal year (mature trees)				Establishment year			Early growth year			Normal year (mature plants)		
Year	No of trees	Yield nuts/tree	BP 1 kg/tree	BP 2 kg/tree	Area ha	Yield kg/ha	BP kg/ha	Area ha	Yield kg/ha	BP kg/ha	Area ha	Yield kg/ha	BP kg/ha
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													

If required, allow for more than one season in the case of annual cr

			Biennial		**0**				**Annual 1**	**0**		**Annual 2**	**0**	
Final year			Establishment year			Normal year								
Area ha	Yield kg/ha	BP kg/ha	Area ha	Yield kg/ha	BP kg/ha	Area ha	Yield kg/ha	BP kg/ha	Area ha	Yield kg/ha	BP kg/ha	Area ha	Yield kg/ha	BP kg/ha

ps.

Annual 3	0		Annual 4	0		Annual 5	0		
Area ha	Yield kg/ha	BP kg/ha	Area ha	Yield kg/ha	BP kg/ha	Area ha	Yield kg/ha	BP kg/ha	Year
									1
									2
									3
									4
									5
									6
									7
									8
									9
									10
									11
									12
									13
									14
									15

Input data: Monoculture, pre-harvest

[Note: the data is for physical and labour inputs per annum, and not per month]

Physical inputs: pre-harvest (including animal power and machinery, in minutes per tree)

Coconut
Normal year

Item	Type of input	Quant. per tree	Unit	Price/ unit	Cost/tree Peso
1					0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
			Total:		0

Labour requirements: pre-harvest (minutes per tree)

Coconut
Normal year

No	Activities	Family min/tree	Hired min/tree
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
	Total:	0.0	0.0

Input data: Monoculture, post-harvest

[Note: the data is for physical and labour inputs per annum, and not per month]

Physical inputs: post-harvest (including animal power and machinery, in minutes or hours per 1000 nuts harvested)

Item	Coconut Type of input	Normal year Quant./ 1,000 nuts	Unit	Price/ unit	Cost/1,000 nuts Peso
1					0
2					0
3					0
4					0
5					0
6					0
7					0
8					0
9					0
10					0
11					0
12					0
13					0
14					0
15					0
16					0
	Total:				0

Avoid double counting if there are several end products.

Labour requirements: post-harvest (hours per 1,000 nuts)

No	Coconut Activities	Normal year Family h/1,000 nuts	Hired h/1,000 nuts
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
	Total:	0.0	0.0

Input data: Polyculture, pre-harvest

[Note: the data is for physical and labour inputs per annum, and not per month;
Aside from coconut, each crop is dealt with separately on a one-hectare basis]

Physical inputs: pre-harvest (including animal power and machinery, in minutes per tree or hou

	Coconut Normal year					**Perennial** Establishment year			**0**
Item	Type of input	Quant. per tree	Unit	Price/ unit	Cost/tree Peso	Type of input	Quant. per ha	Unit	Price/ unit
1					0				
2					0				
3					0				
4					0				
5					0				
6					0				
7					0				
8					0				
9					0				
10					0				
11					0				
12					0				
13					0				
14					0				
15					0				
16					0				
			Total:		0			Total:	

Labour requirements: pre-harvest (minutes per tree in the case of coconut, and hours per hecta

	Coconut Normal year			**Perennial** Establishment year			**0**
No	Activities	Family min/tree	Hired min/tree	Activities	Family h / ha	Hired h / ha	
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
	Total:	0.0	0.0	Total:	0.0	0.0	

rs per hectare)

				0					0
	Early growth year					Normal year (mature plants)			
Cost/ha Peso	Type of input	Quant. per ha	Unit	Price/ unit	Cost/ha Peso	Type of input	Quant. per ha	Unit	
0					0				
0					0				
0					0				
0					0				
0					0				
0					0				
0					0				
0					0				
0					0				
0					0				
0					0				
0					0				
0					0				
0					0				
0					0				
0					0				
0					0				
0	Total:				0	Total:			

e for the other crops)

				0					0
	Early growth year					Normal year (mature plants)			
	Activities	Family h / ha	Hired h / ha			Activities	Family h / ha	Hired h / ha	
	Total:	0.0	0.0			Total:	0.0	0.0	

					0					
		Final year					**Biennial** Establishment year			
Price/ unit	Cost/ha Peso	Type of input	Quant. per ha	Unit	Price/ unit	Cost/ha Peso	Type of input	Quant. per ha	Unit
	0					0			
	0					0			
	0					0			
	0					0			
	0					0			
	0					0			
	0					0			
	0					0			
	0					0			
	0					0			
	0					0			
	0					0			
	0					0			
	0					0			
	0					0			
	0					0			
	0	Total:				0			Total:

				0				0
	Final year				**Biennial** Establishment year			
	Activities	Family h / ha	Hired h / ha		Activities	Family h / ha	Hired h / ha
	Total:	0.0	0.0		Total:	0.0	0.0

0					0		Annual 1			0
Price/ unit	Cost/ha Peso	Normal year Type of input	Quant. per ha	Unit	Price/ unit	Cost/ha Peso	Type of input	Quant. per ha	Unit	Price/ unit
	0					0				
	0					0				
	0					0				
	0					0				
	0					0				
	0					0				
	0					0				
	0					0				
	0					0				
	0					0				
	0					0				
	0					0				
	0					0				
	0					0				
	0					0				
	0					0				
	0					0				
	0			Total:		0			Total:	

		0			Annual 1		0
	Normal year Activities	Family h / ha	Hired h / ha		Activities	Family h / ha	Hired h / ha
	Total:	0.0	0.0		Total:	0.0	0.0

Cost/ha Peso	Annual 2 Type of input	Quant. per ha	Unit	Price/ unit	0 Cost/ha Peso	Annual 3 Type of input	Quant. per ha	Unit	Price/ unit	0 Cost/ha Peso
0					0					0
0					0					0
0					0					0
0					0					0
0					0					0
0					0					0
0					0					0
0					0					0
0					0					0
0					0					0
0					0					0
0					0					0
0					0					0
0					0					0
0					0					0
0					0					0
0			Total:		0			Total:		0

Annual 2 Activities	0 Family h / ha	Hired h / ha	Annual 3 Activities	0 Family h / ha	Hired h / ha
Total:	0.0	0.0	Total:	0.0	0.0

Annual 4			**0**	
Type of input	Quant. per ha	Unit	Price/ unit	Cost/ha Peso
				0
				0
				0
				0
				0
				0
				0
				0
				0
				0
				0
				0
				0
				0
				0
				0
				0
Total:				0

Annual 5			**0**	
Type of input	Quant. per ha	Unit	Price/ unit	Cost/ha Peso
				0
				0
				0
				0
				0
				0
				0
				0
				0
				0
				0
				0
				0
				0
				0
				0
				0
Total:				0

Annual 4	**0**	
Activities	Family h / ha	Hired h / ha
Total:	0.0	0.0

Annual 5	**0**	
Activities	Family h / ha	Hired h / ha
Total:	0.0	0.0

Input data: Polyculture, post-harvest

[Note: the data is for physical and labour inputs per annum, and not per month;
Each crop is dealt with separately on a one-tonne basis, except coconut which is on a 1000-nuts basis]

Physical inputs: post-harvest (including animal power and machinery, in minutes or hours per tonne harve

Item	Coconut Type of input	Quant./ 1,000 nuts	Unit	Price/ unit	Cost / 1,000 nuts Peso	Perennial 0 Type of input	Quant. per to	Unit	Price/ unit	Cost / to Peso
1					0					0
2					0					0
3					0					0
4					0					0
5					0					0
6					0					0
7					0					0
8					0					0
9					0					0
10					0					0
11					0					0
12					0					0
13					0					0
14					0					0
15					0					0
16					0					0
			Total:		0			Total:		0

Labour requirements: post-harvest (hours per tonne harvested, except coconut which is on a 1000-nuts basi

No	Coconut Activities	Family h/1,000 nuts	Hired h/1,000 nuts	Perennial 0 Activities	Family h / to	Hired h / to
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
	Total:	0.0	0.0	Total:	0.0	0.0

ted, except coconut which is per 1,000 nuts)

Biennial				**0**	**Annual 1**				**0**
Type of input	Quant. per to	Unit	Price/ unit	Cost / to Peso	Type of input	Quant. per to	Unit	Price/ unit	Cost / to Peso
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
Total:				0	Total:				0

s])

Biennial		**0**	**Annual 1**		**0**
Activities	Family h / to	Hired h / to	Activities	Family h / to	Hired h / to
Total:	0.0	0.0	Total:	0.0	0.0

Annual 2				0	**Annual 3**				0
Type of input	Quant. per to	Unit	Price/ unit	Cost / to Peso	Type of input	Quant. per to	Unit	Price/ unit	Cost / to Peso
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
Total:				0	Total:				0

Annual 2		**0**	**Annual 3**		**0**
Activities	Family h / to	Hired h / to	Activities	Family h / to	Hired h / to
Total:	0.0	0.0	Total:	0.0	0.0

Annual 4			0		**Annual 5**			0	
Type of input	Quant. per to	Unit	Price/ unit	Cost / to Peso	Type of input	Quant. per to	Unit	Price/ unit	Cost / to Peso
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
				0					0
Total:				0	Total:				0

Annual 4		0	**Annual 5**		0
Activities	Family h / to	Hired h / to	Activities	Family h / to	Hired h / to
Total:	0.0	0.0	Total:	0.0	0.0

Investments and Maintenance: Monoculture coconuts

Size of intercropping plot: 0.0 hectare

Year	Investment 1 Item	Cost Peso	Ann. Maint. % of invest. cost	Use in coconut syst., %	Investment 2 Item	Cost Peso	Ann. Maint. % of invest. cost	Use in coconut syst., %	Investment 3 Item	Cost Peso	Ann. Maint. % of invest. cost	Use in coconut syst., %	Investment per hectare Peso	Maintenance per hectare Peso	Total investment Peso	Total maintenance Peso
1													#DIV/0!	#DIV/0!	0	0
2													#DIV/0!	#DIV/0!	0	0
3													#DIV/0!	#DIV/0!	0	0
4													#DIV/0!	#DIV/0!	0	0
5													#DIV/0!	#DIV/0!	0	0
6													#DIV/0!	#DIV/0!	0	0
7													#DIV/0!	#DIV/0!	0	0
8													#DIV/0!	#DIV/0!	0	0
9													#DIV/0!	#DIV/0!	0	0
10													#DIV/0!	#DIV/0!	0	0
11													#DIV/0!	#DIV/0!	0	0
12													#DIV/0!	#DIV/0!	0	0
13													#DIV/0!	#DIV/0!	0	0
14													#DIV/0!	#DIV/0!	0	0
15													#DIV/0!	#DIV/0!	0	0

Investments and Maintenance: Polyculture

Size of intercropping plot: 0.0 hectare

Year	Investment 1 Item	Cost Peso	Ann. Maint. % of invest. cost	Use in inter-cropping syst., %	Investment 2 Item	Cost Peso	Ann. Maint. % of invest. cost	Use in inter-cropping syst., %	Investment 3 Item	Cost Peso	Ann. Maint. % of invest. cost	Use in inter-cropping syst., %	Investment per hectare Peso	Maintenance per hectare Peso	Total investment Peso	Total maintenance Peso
1													#DIV/0!	#DIV/0!	0	0
2													#DIV/0!	#DIV/0!	0	0
3													#DIV/0!	#DIV/0!	0	0
4													#DIV/0!	#DIV/0!	0	0
5													#DIV/0!	#DIV/0!	0	0
6													#DIV/0!	#DIV/0!	0	0
7													#DIV/0!	#DIV/0!	0	0
8													#DIV/0!	#DIV/0!	0	0
9													#DIV/0!	#DIV/0!	0	0
10													#DIV/0!	#DIV/0!	0	0
11													#DIV/0!	#DIV/0!	0	0
12													#DIV/0!	#DIV/0!	0	0
13													#DIV/0!	#DIV/0!	0	0
14													#DIV/0!	#DIV/0!	0	0
15													#DIV/0!	#DIV/0!	0	0

Output Coconut

Monoculture

1. Coconut Utilisation

Proportion of total to end use and by-product yield

Main products:	Copra	Fresh nuts	Oil	Dessicated
% use of nuts by product				
by-product yield in process (% of potential yield)				
Charcoal				
Powder				
Coir				
Copra cake				

2. Coconut conversion

Product output, value, and farmer's share PER 1000 NUTS harvested

Product	Unit/ 1,000 nuts	Potential output	Actual output	Output value Peso	Farmer's share Peso
Copra	kg		0.0	0	0
Fresh nuts	nuts	1,000.0	0.0	0	0
Oil	l		0.0	0	0
Dessicated coconut	kg		0.0	0	0
Charcoal	kg		0.0	0	0
Powder	kg		0.0	0	0
Coir	kg		0.0	0	0
Copra cake	kg		0.0	0	0
			Total	0	0

Polyculture

1. Coconut Utilisation

Proportion of total to end use and by-product yield

Main products:	Copra	Fresh nuts	Oil	Dessicated
% use of nuts by product				
by-product yield in process (% of potential yield)				
Charcoal				
Powder				
Coir				
Copra cake				

2. Coconut conversion

Product output, value, and farmer's share PER 1000 NUTS harvested

Product	Unit/ 1,000 nuts	Potential output	Actual output	Output value Peso	Farmer's share Peso
Copra	kg		0.0	0	0
Fresh nuts	nuts	1,000.0	0.0	0	0
Oil	l		0.0	0	0
Dessicated coconut	kg		0.0	0	0
Charcoal	kg		0.0	0	0
Powder	kg		0.0	0	0
Coir	kg		0.0	0	0
Copra cake	kg		0.0	0	0
			Total	0	0

Product prices

* In the case of tenancy, the % of the production kept by the farmer

Coconut products

Product	Unit	Sales value per unit Peso	Farmer's share* %
Copra	kg		
Fresh nuts	nut		
Oil	l		
Dessicated coconut	kg		
Charcoal	kg		
Powder	kg		
Coir	kg		
Copra cake	kg		
By-product 1	Kg		
By-product 2	Kg		

Intercrops

	Product	Unit	Sales value per unit Peso	Farmer's share* %
Perennial	**0**			
	Main product	kg		
	By-product	kg		
Biennial	**0**			
	Main product	kg		
	By-product	kg		
Annual 1	**0**			
	Main product	kg		
	By-product	kg		
Annual 2	**0**			
	Main product	kg		
	By-product	kg		
Annual 3	**0**			
	Main product	kg		
	By-product	kg		
Annual 4	**0**			
	Main product	kg		
	By-product	kg		
Annual 5	**0**			
	Main product	kg		
	By-product	kg		

Residual value of Investments at the End of Project (i.e. Year 15)

Monoculture coconuts

No	Item	Residual value of item Peso	Use in coconut system %	Residual value in coconut system Peso
1				0
2				0
3				0
4				0
5				0
6				0
7				0
8				0
9				0
10				0
Total				0
Total per hectare				#DIV/0!

Residual value: Polyculture

No	Item	Residual value of item Peso	Use in coconut system %	Residual value in coconut system Peso
1				0
2				0
3				0
4				0
5				0
6				0
7				0
8				0
9				0
10				0
Total				0
Total per hectare				#DIV/0!

Finanacial Summary Information: Polyculture

Revenue One-hectare plot Currency: Peso

Year	Coconut	Perennial 0	Biennial 0	Annual 1 0	Annual 2 0	Annual 3 0	Annual 4 0	Annual 5 0	TOTAL	Year
1	0	0	0	0	0	0	0	0	0	1
2	0	0	0	0	0	0	0	0	0	2
3	0	0	0	0	0	0	0	0	0	3
4	0	0	0	0	0	0	0	0	0	4
5	0	0	0	0	0	0	0	0	0	5
6	0	0	0	0	0	0	0	0	0	6
7	0	0	0	0	0	0	0	0	0	7
8	0	0	0	0	0	0	0	0	0	8
9	0	0	0	0	0	0	0	0	0	9
10	0	0	0	0	0	0	0	0	0	10
11	0	0	0	0	0	0	0	0	0	11
12	0	0	0	0	0	0	0	0	0	12
13	0	0	0	0	0	0	0	0	0	13
14	0	0	0	0	0	0	0	0	0	14
15	#DIV/0!	0	0	0	0	0	0	0	#DIV/0!	15

NB. The revenue of year 15 includes the residual value of investments

Physical Inputs One-hectare plot Currency: Peso

Year	Coconut	Perennial 0	Biennial 0	Annual 1 0	Annual 2 0	Annual 3 0	Annual 4 0	Annual 5 0	TOTAL	Year
1	0	0	0	0	0	0	0	0	0	1
2	0	0	0	0	0	0	0	0	0	2
3	0	0	0	0	0	0	0	0	0	3
4	0	0	0	0	0	0	0	0	0	4
5	0	0	0	0	0	0	0	0	0	5
6	0	0	0	0	0	0	0	0	0	6
7	0	0	0	0	0	0	0	0	0	7
8	0	0	0	0	0	0	0	0	0	8
9	0	0	0	0	0	0	0	0	0	9
10	0	0	0	0	0	0	0	0	0	10
11	0	0	0	0	0	0	0	0	0	11
12	0	0	0	0	0	0	0	0	0	12
13	0	0	0	0	0	0	0	0	0	13
14	0	0	0	0	0	0	0	0	0	14
15	0	0	0	0	0	0	0	0	0	15

Hired labour One-hectare plot Hours

Year	Coconut	Perennial 0	Biennial 0	Annual 1 0	Annual 2 0	Annual 3 0	Annual 4 0	Annual 5 0	TOTAL	Year
1	0	0	0	0	0	0	0	0	0	1
2	0	0	0	0	0	0	0	0	0	2
3	0	0	0	0	0	0	0	0	0	3
4	0	0	0	0	0	0	0	0	0	4
5	0	0	0	0	0	0	0	0	0	5
6	0	0	0	0	0	0	0	0	0	6
7	0	0	0	0	0	0	0	0	0	7
8	0	0	0	0	0	0	0	0	0	8
9	0	0	0	0	0	0	0	0	0	9
10	0	0	0	0	0	0	0	0	0	10
11	0	0	0	0	0	0	0	0	0	11
12	0	0	0	0	0	0	0	0	0	12
13	0	0	0	0	0	0	0	0	0	13
14	0	0	0	0	0	0	0	0	0	14
15	0	0	0	0	0	0	0	0	0	15

Family labour One-hectare plot Hours

Year	Coconut	Perennial 0	Biennial 0	Annual 1 0	Annual 2 0	Annual 3 0	Annual 4 0	Annual 5 0	TOTAL	Year
1	0	0	0	0	0	0	0	0	0	1
2	0	0	0	0	0	0	0	0	0	2
3	0	0	0	0	0	0	0	0	0	3
4	0	0	0	0	0	0	0	0	0	4
5	0	0	0	0	0	0	0	0	0	5
6	0	0	0	0	0	0	0	0	0	6
7	0	0	0	0	0	0	0	0	0	7
8	0	0	0	0	0	0	0	0	0	8
9	0	0	0	0	0	0	0	0	0	9
10	0	0	0	0	0	0	0	0	0	10
11	0	0	0	0	0	0	0	0	0	11
12	0	0	0	0	0	0	0	0	0	12
13	0	0	0	0	0	0	0	0	0	13
14	0	0	0	0	0	0	0	0	0	14
15	0	0	0	0	0	0	0	0	0	15

Labour Supply and Demand, and Gross Margin per Family Labour-Day

Farm labour supply

Category	No	Available %
Adult male		0%
Adult female		0%
Children (12 - 15 yrs)		0%

Working days/month	
Hours/working day	

Total farm labour available: **0** Person-days per annum

NB: It is assumed that children would count half an adult

Labour Supply and Demand Polyculture

Person-days per annum; entire intercropping plot

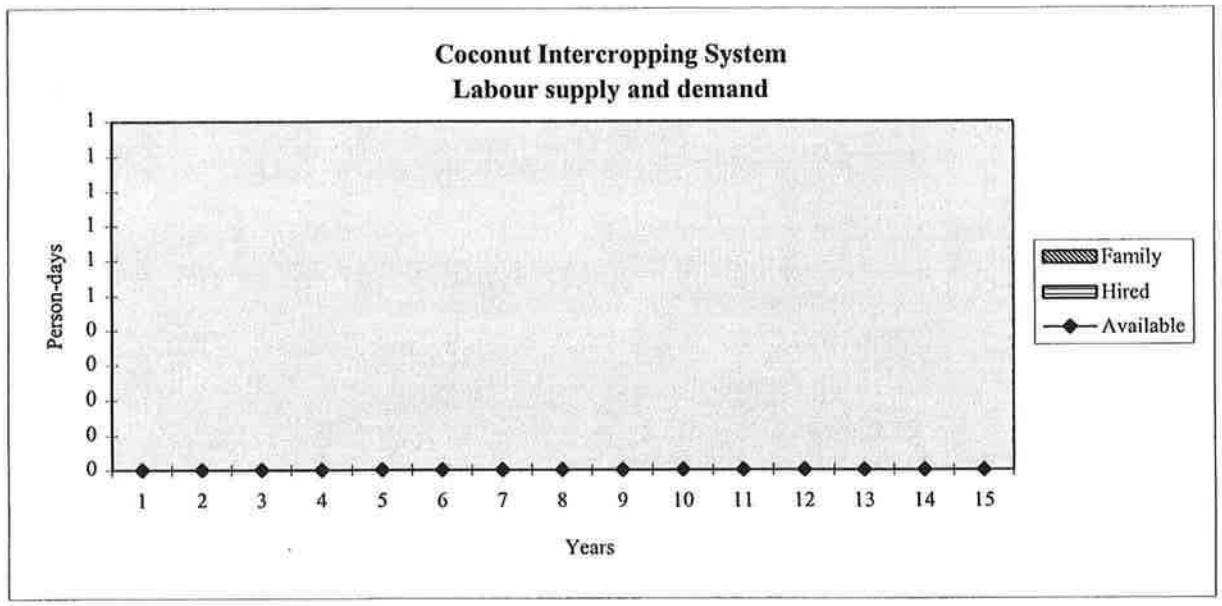
Year	Labour requirements Family	Hired	Farm labour Available
1	#DIV/0!	#DIV/0!	0
2	#DIV/0!	#DIV/0!	0
3	#DIV/0!	#DIV/0!	0
4	#DIV/0!	#DIV/0!	0
5	#DIV/0!	#DIV/0!	0
6	#DIV/0!	#DIV/0!	0
7	#DIV/0!	#DIV/0!	0
8	#DIV/0!	#DIV/0!	0
9	#DIV/0!	#DIV/0!	0
10	#DIV/0!	#DIV/0!	0
11	#DIV/0!	#DIV/0!	0
12	#DIV/0!	#DIV/0!	0
13	#DIV/0!	#DIV/0!	0
14	#DIV/0!	#DIV/0!	0
15	#DIV/0!	#DIV/0!	0

Gross Margin/Family Labour

GM per person-day of family labour

Standard situation Peso

Year	Mono-culture	Poly-culture
1	#DIV/0!	#DIV/0!
2	#DIV/0!	#DIV/0!
3	#DIV/0!	#DIV/0!
4	#DIV/0!	#DIV/0!
5	#DIV/0!	#DIV/0!
6	#DIV/0!	#DIV/0!
7	#DIV/0!	#DIV/0!
8	#DIV/0!	#DIV/0!
9	#DIV/0!	#DIV/0!
10	#DIV/0!	#DIV/0!
11	#DIV/0!	#DIV/0!
12	#DIV/0!	#DIV/0!
13	#DIV/0!	#DIV/0!
14	#DIV/0!	#DIV/0!
15	#DIV/0!	#DIV/0!



NB, Figures are for entire intercropping plot: 0 ha

Appendix 2

Sample Forms for Data Collection in the Field

DATA FORM **ECONOMIC MODEL OF COCONUT BASED FARMING SYSTEMS**

Annual crop: **Pre-harvest activities** **(per hectare)**

Months	Operations	Resources							Tools	Physical inputs		
		Family labour			Hired labour		Animal	Motorised	(descriptive)	Type	Quantity	Unit
		Men Hours	Women Hours	Children Hours	Men Hours	Women Hours	Power Hours	Machinery Hours				
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

DATA FORM **ECONOMIC MODEL OF COCONUT BASED FARMING SYSTEMS**

Annual crop: **Post-harvest activities** **(per tonne harvested)**

Months	Operations	Resources							Tools	Physical inputs		
		Family labour			Hired labour		Animal Power Hours	Motorised Machinery Hours	(descriptive)	Type	Quantity	Unit
		Men Hours	Women Hours	Children Hours	Men Hours	Women Hours						
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

DATA FORM **ECONOMIC MODEL OF COCONUT BASED FARMING SYSTEMS**

Coconut, Normal Year **Pre-harvest activities** **(per tree)**

Months	Operations	Resources							Tools	Physical inputs		
		Family labour			Hired labour		Animal	Motorised	(descriptive)	Type	Quantity	Unit
		Men Minutes	Women Minutes	Children Minutes	Men Minutes	Women Minutes	Power Minutes	Machinery Minutes				
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

DATA FORM **ECONOMIC MODEL OF COCONUT BASED FARMING SYSTEMS**

Coconut, Normal Year **Post-harvest activities** **(per 1000 nuts harvested)**

Months	Operations	Resources							Tools	Physical inputs		
		Family labour			Hired labour		Animal Power Hours	Motorised Machinery Hours	(descriptive)	Type	Quantity	Unit
		Men Hours	Women Hours	Children Hours	Men Hours	Women Hours						
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												