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ANALYTICAL TOOLS

Module 023

WinDASI Exercise

NGAMO 3 - Economic Impacts of an Irrigation and Mechanization Project

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NGAMO 3 - Economic Impacts of an Irrigation and Mechanization Project

by

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for the

Food and Agriculture Organization of the United Nations, FAO

About EASYPol
EASYPol is a an on-line, interactive multilingual repository of downloadable resource materials for capacity development in policy making for food, agriculture and rural development. The EASYPol home page is available at: ***www.fao.org/tc/easypol***.
EASYPol has been developed and is maintained by the Agricultural Policy Support Service, FAO.

Acknowledgements

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1 SUMMARY

This module presents NGAMO 3, a practical step-by-step exercise in Cost Benefit Analysis (CBA) of investment projects, to be run with the WinDASI software. (The word NGAMO comes from the name of the zone of the original project that was located in Myanmar). The goal is to analyze the overall economic impact of the irrigation project, the so-called "economic analysis" of the project. To accomplish this task, the analyst is requested to calculate economic flows of costs and benefits by using economic prices, and calculate the relative project indicators (NPV, IRR, and Benefit/Cost Ratio). Moreover, some alternative project scenarios have to be explored in order to improve the viability of the project.

2 INTRODUCTION

Objectives

The main objective of this module is to allow the user to practice using the software by analyzing a real project (although simplified). In this exercise you are guided thorough a path, from the background of the exercise to its solution. Figure A below provides a synoptic view of the steps of the NGAMO3 exercise.

Target audience

This module targets current or future project analysts in the public administration or in Non-Governmental Organizations (NGOs), professional organizations, consulting firms willing to enhance their expertise in financial and economic analyses of agricultural investment projects.

Required background

In order to fully understand the content of this module the user must be familiar with:

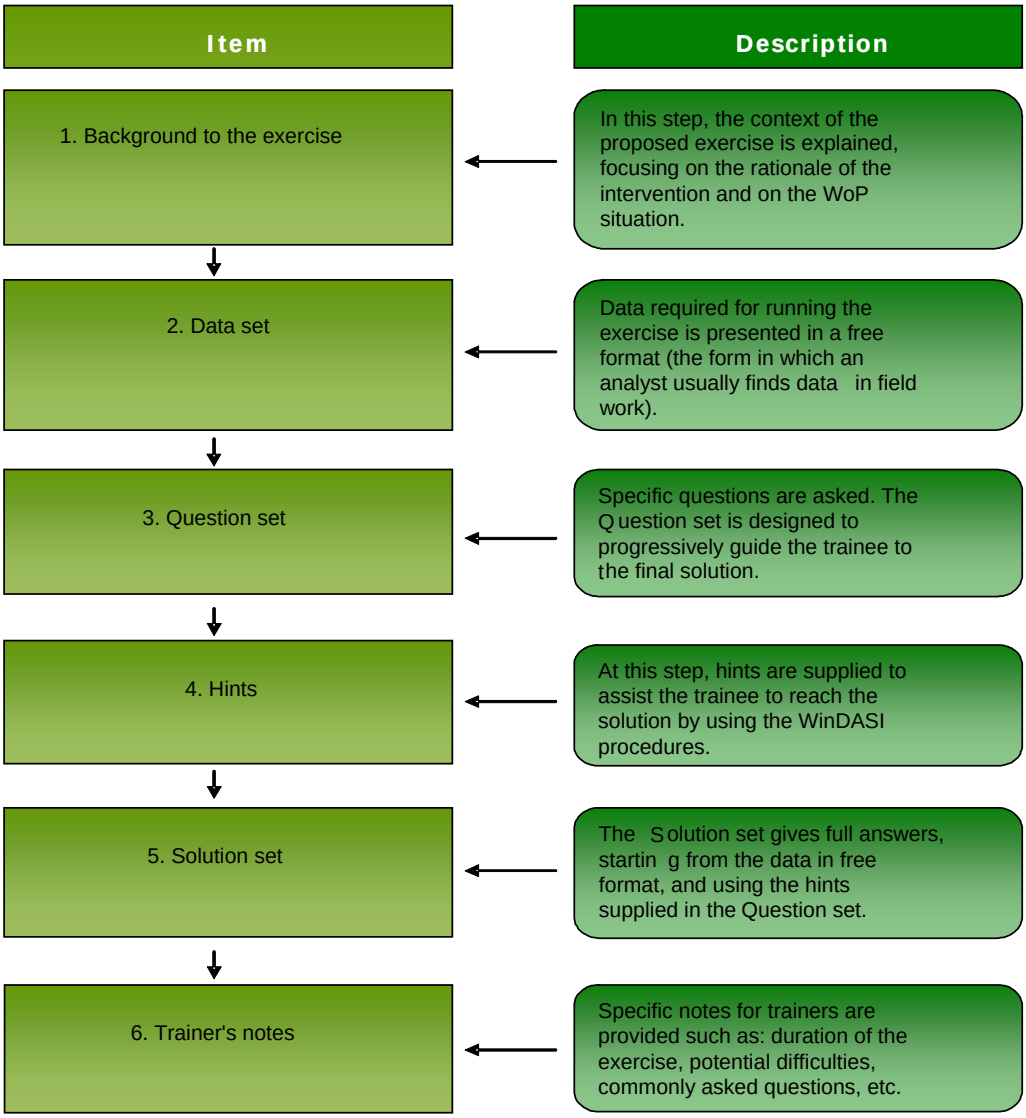
- concepts of project cycle management;
- concepts of project financial analysis;
- concepts of project economic analysis.

In addition, the user must have downloaded and installed the WinDASI software.

To find relevant material in the areas above, the reader can follow the links to other EASYPol modules included in the text or in the footnotes1. A set of linked EASYPol modules is reported in a section at the end of this document.

[1] EASYPol hyperlinks are shown in blue, as follows :
a) training paths are shown in **underlined bold**;
b) other EASYPol modules or complementary EASYPol materials are in ***bold underlined italics***;
c) links to the glossary are in **bold**; and
d) external links are in *italics*

Figure A: Structure of the NGAMO Exercises



3 BACKGROUND TO THE EXERCISE

In the previous exercises we have analyzed (i) the situation without the project of a typical farmer in the project area, (ii) the evolution of a typical farmer when the irrigation is introduced by the project (AN-FARM model) and (iii) the evolution of a typical farmer when irrigation and mechanization is introduced by the project (MEC-FARM model).

At this point, we need to assess the viability of the project, considered as a single entity, for the economy as a whole, and not just for a single farmer. This is the so-called "Economic analysis" of the project.

In the economic analysis, the inputs and the outputs of the project must be valued to reflect the costs and the benefits to the whole society, and the market price must be adjusted accordingly (i.e., the opportunity cost of using or not producing a given good or service by the project), by using the so called reference prices, also known as shadow prices or economic prices2.

In addition, when looking at the project from a global viewpoint one has to consider the number of farmers participating in the project and the investment required to implement the project (i.e., the costs of improving and developing the irrigation scheme).

4 DATA SET

To address the issues listed above in order to assess the economic viability of the project over a time span of 15 years, the formulation team collected the following data:

4.1 Data about the type and quantity of farms involved

The project is likely to involve one thousand farms. Due to the lack of bullocks in the region, already highlighted in NGAMO1 and NGAMO2, four hundred of the farms are going to mechanize (model MEC-FARM), while the rest would continue to use the animal traction (model AN-FARM). The analysts will model the zone of the project (code NGAMO3) using this data.

4.2 Data about the investment at project level: cost of rehabilitation and development of the irrigation scheme

The program for the rehabilitation and development of the irrigation scheme (code IRRIG) will last 3 years with the parameters as listed in Table 1.

[2] Techniques and methods on how to estimate economic prices can be found in "Economic Analysis of Agricultural Projects" by J Price Gittinger, 2nd Edition 1982, The John Hopkins Press, Baltimore & London, UK.

Table 1: Investment data

Description	Units
Project life span (duration in years)	30
Irrigation scheme cost (Francs)	12 million
Maintenance (% of cost)	5%
Lag for maintenance (years)	1
Residual value (% of cost)	20%
Contingency costs (% of cost)	1%

4.3 Data about economic prices

The prices of the different items produced and used by the project are reported in Table 2. Most of the economic prices are the same as the financial prices, since in the region no major market distortions are observed. However, land tax and irrigation tax are set to zero, since they are transfers and not costs to the economy as a whole. Finally, all the labour used in the project is costed as hired labour, since no problem of unemployment is observed in the project area. The hired labour price is therefore assumed to reflect the opportunity cost of labour3.

Table 2: Economic and financial prices of commodities

Item	Code	Financial price	Economic price
Seeds – HY paddy (kg)	S-PADDY	0.60	0.60
Seeds – Traditional paddy (kg)	S-PADDY	0.60	0.60
Seeds – Sunflower(kg)	S-SUNF	6.00	6.00
Seeds – Sesame (kg)	S-SESAME	10.40	10.40
Fertilizer – Urea (kg)	UREA	0.34	0.34
Fertilizer – TSP (kg)	TSP	1.14	1.14
Fertilizer – MOP (kg)	MOP	0.54	0.54
Fertilizer – manure (barrows)(kg)	MANURE	15.00	15.00
Pesticide (Francs)	PESTIC	1.00	1.00
Hired labour[3] (per person per day)	**HIR-LAB**	**7.00**	**–**
Workforce – Family (per person per day)	**LABOUR**	**–**	**7.00**
Draught animals (per day)	BULLOCKS	30.00	30.00
Power-tiller (per hour)	TRACTOR	2.00	2.00
Land Tax (Francs)	**LAND-TAX**	**1.00**	**–**
Irrigation Tax (Francs)	**IRR-TAX**	**1.00**	**–**

[3] Note that the price of the hired labour is set to zero to avoid double counting, once the family labour is computed.

[3] The economic price of hired labour is set to zero to avoid double counting with the LABOUR item. This computes the total labour requirement of the project and has a price of 7.00 per unit.

5 QUESTION SET

The analyst is expected to provide the decision-makers and the farmers with answers to the following questions concerning potential project outcomes:

5.1 Main question

(i) Is the project economically viable to the society as a whole, when considering an opportunity cost of capital of 12% per year over 15 years?

5.2 Additional questions

(ii) What change in the investment costs, other things equal, would lead the project to break even?

(iii) If the project shows to be uneconomically viable, which possible solutions would you suggest?

(iv) Are small changes in the economic prices chosen for some items likely to change the result of the economic analysis?

6 HINTS

(i) Introduce the data about the rehabilitation scheme as an additional investment item (IRRIG) using the investment component window.

(ii) Introduce the economic prices in the suitable commodity component window.

(iii) In order to be able to carry out the analysis at project level, a new "zone" item called, for instance, "NGAMO3" needs to be introduced using the "zone" component box, as explained in part 1 of the WinDASI manual. NGAMO3 will include two "plan" items, notably AN-FARM and MEC-FARM and the "investment" item IRRIG. The coefficients of the items AN-FARM and MEC-FARM will be the number of farms of each type joining the project, that is, 600 and 400 respectively. The coefficients for the investment item will be 1 for years 1, 2 and 3.

7 SOLUTION SET

7.1 Answer to question (i)

The economic viability of the overall irrigation project is appraised by:

(i) applying economic prices;
(ii) eliminating transfers;
(iii) including irrigation investment at the project level;
(iv) aggregating the farms according their specific farm models;
(v) discounting the economic flows of costs and benefits; and
(vi) calculating the summary project indicators.

Table 3 shows the flow of costs and benefits of production, inputs and investments. Note that both the irrigation tax and the land tax have zero values, being transfers from the farmers to the state that are assumed to reflect the consumption of no resource. The costs of running the irrigation scheme are assumed to be included in the investment component.

The total labour requirements both hired and of the household, are valued at their opportunity cost, assumed to be equal to the market price for labour.

Table 3a: Zone NGAMO3
Flows of costs and benefits of production and inputs (in thousands of Francs)

Item	WoP	Years						
		1	2	3	4	5	6	7-15
Pad-HY	6,112.3	6,112.3	6,112.3	6,535.6	6,619.4	7,408.8	7,501.4	7,501.4
Pad-TRA	2,184.6	2,184.6	2,184.6	2,330.2	2,257.4	2,184.6	2,111.8	2,111.8
Sesame	1,688.3	1,688.3	1,688.3	3,837.0	6,676.4	7,597.3	8,287.9	8,287.9
Sunflow	364.0	364.0	364.0	728.0	1,365.0	1,911.0	2,457.0	2,457.0
Total output	10,349.1	10,349.1	10,349.1	13,430.9	16,918.2	19,101.7	20,358.1	20,358.1
BULLOCKS	5,415.0	3,249.0	3,249.0	3,510.0	3,603.6	3,713.4	3,805.2	3,805.2
HIR-LAB	-	-	-	-	-	-	-	-
IRR-TAX	-	-	-	-	-	-	-	-
LABOUR	3,880.1	3,880.1	3,880.1	4,340.7	4,455.5	4,587.8	4,697.0	4,697.0
LAND-TAX	-	-	-	-	-	-	-	-
MANURE	82.5	82.5	82.5	82.5	82.5	82.5	82.5	82.5
MOP	59.7	59.7	59.7	62.0	63.5	65.8	68.0	68.0
OTHER	90.0	90.0	90.0	120.0	136.0	152.0	169.0	185.0
PESTIC	50.0	50.0	50.0	53.5	57.8	62.3	65.8	65.8
S-PADDY	207.2	207.2	207.2	208.0	208.7	209.4	210.1	210.1
S-SESAME	171.6	171.6	171.6	221.0	256.4	291.7	318.2	318.2
S-SUNF	6.6	6.6	6.6	13.2	16.5	23.1	29.7	29.7
TRACTOR		288.8	288.8	312.0	320.3	330.1	338.2	338.2
TSP	322.4	322.4	322.4	341.5	360.7	383.0	402.2	402.2
UREA	196.6	196.6	196.6	205.2	213.7	223.7	232.3	232.3
Total Inputs and factors	10,481.7	8,604.5	8,604.5	9,469.6	9,775.1	10,124.8	10,418.3	10,434.3

Note also that the cost of the land use does not explicitly appear in the table of costs and benefits. Indeed, the project does not use any more land than in the WoP situation. Therefore, no extra costs of land should be charged to the project.

Table 3b: Investment flows over the lifetime of the project

Item	WoP	Year						
		1	2	3	4	5	6	7
IRRIG-Total		12 120	12 720	13 320	1 800	1 800	1 800	1 800
TRAC-I-Total		8 400	800	800	800	800	800	800
Total investment outflow		20 520	13 520	14 120	2 600	2 600	2 600	2 600

Item	Year							
	8	9	10	11	12	13	14	15
IRRIG-Total	1 800	1 800	1 800	1 800	1 800	1 800	1 800	-21 720
TRAC-I-Total	800	7 600	800	800	800	800	800	-1 800
Total investment outflow	2 600	9 400	2 600	2 600	2 600	2 600	2 600	-23 520

Concerning the investment component, notice that the negative flow in year 15 is determined by the final value of the investment, i.e., by the fact that the investments at the end of the project are still economically viable. For the computation of the final value of the investment good, see part 2 of the WinDASI manual.

Table 4 reports the calculations of discounting the flow of costs and benefits.

The flows of **Net Benefits** are calculated as the flow of benefits minus the flow of input and factor costs, minus the flow of the investment component.

The **Net Incremental Benefits** are calculated year by year as the difference between the net with-project (WiP) benefits in each year and the net WoP benefits.

The **Net Incremental Discounted Benefits** are obtained by multiplying the net incremental benefits by the reported discount factor.

The **Net Incremental Discounted Cumulated Benefits** are obtained by summing, year by year, the Net Incremental Discounted Benefits from year 1 up to the specific year. The amount of the Net Incremental Discounted Cumulated Benefits in year 15 corresponds to the incremental Economic Net Present Value of the project (**ENPV**).

Table 4: Zone NGAMO3
Net Incremental Discounted Cumulated Benefits of the project

		Years						
Item	WoP	1	2	3	4	5	6	7
Total Benefits	10349.1	10349.1	10349.1	13430.9	16918.2	19101.7	20358.1	20358.1
Total Inputs and factors costs	10481.7	8604.5	8604.5	9469.6	9775.1	10124.8	10418.3	10434.3
Total Investment costs		20520.0	13520.0	14120.0	2600.0	2600.0	2600.0	2600.0
Net Benefits	-132.6	-18775.4	-11775.4	-10158.7	4543.1	6376.9	7339.8	7323.8
Net Incremental Benefits	0.0	-18642.8	-11642.8	-10026.1	4675.7	6509.5	7472.4	7456.4
Discount factor (@12%)		0.9	0.8	0.7	0.6	0.6	0.5	0.5
Nincremental discounted benefits (@12%)	0.0	-16645.4	-9281.6	-7136.4	2971.5	3693.7	3785.8	3372.9
Net incremental discounted cumulative benefits	0.0	-16645.4	-25926.9	-33063.3	-30091.8	-26398.2	-22612.4	-19239.5

Item	8	9	10	11	12	13	14	15
Total Benefits	20358.1	20358.1	20358.1	20358.1	20358.1	20358.1	20358.1	20358.1
Total Inputs and factors costs	10434.3	10434.3	10434.3	10434.3	10434.3	10434.3	10434.3	10434.3
Total Investment costs	2600.0	9400.0	2600.0	2600.0	2600.0	2600.0	2600.0	-23520.0
Net Benefits	7323.8	523.8	7323.8	7323.8	7323.8	7323.8	7323.8	33443.8
Net Incremental Benefits	7456.4	656.4	7456.4	7456.4	7456.4	7456.4	7456.4	33576.4
Discount factor (@12%)	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2
Net incremental discounted benefits (@12%)	3011.5	236.7	2400.8	2143.5	1913.9	1708.8	1525.7	6134.3
Net incremental discounted cumulative benefits	-16227.9	-15991.2	-13590.5	-11446.9	-9533.0	-7824.2	-6298.5	-164.2

Notice that the ENPV is slightly negative, signaling insufficient economic profitability of the irrigation project. This means that the additional Net Benefits obtainable at farm level with either plan AN-FARM or MEC-FARM, once aggregated and discounted, are not large enough to cover the costs of the irrigation scheme.

The lack of economic viability is also reflected by the Internal Rate of Return (IRR), reported in Table 5, which appears to be slightly lower than the discount rate used (12.00%) and by the Benefit/Cost Ratio (BCR), which is slightly less than the unity.

Table 5
Zone NGAMO3
Summary project indicators

Description	Coeff.	Discounted Incremental Value	SV (%)	CC
Benefits	+1	43 424.33	0.3781	43 589
Costs	-1	43 588.51	-0.3767	43 424
Incremental Net Present Value (NPV)		-164.18		
Internal Rate of Return (IRR)		11.93		
Benefit/Cost Ratio (BCR)		0.996		

7.2 Answer to question (ii)

The change in the irrigation investment, which would lead the project to break even, i.e., the Critical Change (CC), is reported in Table 6. If the irrigation investment were reduced by 0.48%, i.e., became Francs 33 918.3 thousand, the project would break even.

Table 6: Zone NGAMO3
Present Value by item and related Critical Changes

Description	Coeff.	Discounted Incr.Values	Switching Values %	Critical Changes
BENEFITS		**43,424.3**		
Pad-HY	1	5,813.1	2.82	5,977.0
Pad-TRA	1	-83.53	-196.55	80.6
SESAME	1	29,211.4	0.56	29,375.0
SUNF	1	8,483.4	1.94	8,648.0
COSTS & INVESTMENT		**43,588.5**		
BULLOCKS	-1	- 12,294.5	1.34	- 12,459.2
HIR-LAB	-1	-	N.A.	N.A.
IRR-TAX	-1	-	N.A.	N.A.
LABOUR	-1	3,714.1	-4.42	3,550.0
LAND-TAX	-1	-	N.A.	N.A.
FERTIL	-1	574.1	-28.6	409.9
OTHER	-1	382.2	-42.95	218.1
S-PADDY	-1	11.9	-1381.1	- 152.3
S-SESAME	-1	627.3	-26.17	463.2
S-SUNF	-1	94.4	-173.88	- 69.8
TRACTOR	-1	2,185.5	-7.51	2,021.3
IRRIG	-1	34,081.9	-0.48	33,918.3
TRAC-I	-1	14,211.5	-1.16	14,046.7
Increm. Net Present Value (NPV)		-164.18		
Internal Rate of Return (IRR)		11.93%		
Benefit / Cost Ratio (BCR)		0.996		

Note that the SV of the irrigation investments reported in Table 6 (-0.48%) is easily calculated by taking the ratio of the additional net present value (NPV additional) to the present value of the irrigation investment component, as shown:

$$SV_{irrigation\ investment} = \frac{\mathrm{NPV}_{additional.project}}{\mathrm{PV}_{irrig.investment}} = \frac{-164.2}{34081.9} = -0.0048 \quad (\text{i.e.} -0.48\%)$$

7.3 Answer to question (iii)

To improve the viability of the project, some alternative project scenarios have to be explored. It should be verified, for example, if it is possible to extend the benefits of the irrigation scheme to additional farms in order to better exploit the advantages of the fixed costs of the investment. It would indeed be enough to associate, say, ten

additional AN-FARM farms with no additional costs to increase the Net Benefits of the project by about Francs 340 thousand, i.e., ten times the ENPV of the plan AN-FARM, to obtain a positive ENPV, as reported in Table 7.

Table 7: Zone NGAMO3
Scenario with ten additional AN-FARM farms

Description	Coeff.	Discounted Incremental Value	SV %	CC
Benefits	+1	46 345.46	-5.9487	43 589
Costs	-1	43 588.51	6.3249	46 345
Incremental Net Present Value (NPV)		175.09		
Internal Rate of Return (IRR)		11.93		
Benefit/Cost Ratio (BCR)		1.004		

Note also that if there is some unemployment in the region, the choice of the market price of labour as its opportunity cost could lead to an overestimation of project costs. From Table 6 it is apparent that a reduction of about 5% in labour costs would result in the project breaking even.

7.4 Answer to question (iv)

Some slight changes in the economic prices of outputs could lead to different project results. For instance, if a sensitivity analysis on the price of sesame is run, simulating a price increase of 10%, the project would show the results reported in Table 8. Note that the project looks to be viable, even if not yet sufficiently robust.

Table 8: Zone NGAMO3
Sensitivity test: Sesame +10%

Description	Coeff.	Discounted incr.values	SV %	CC
Benefits	1	46345.46	-5.9487	43,589
Costs	-1	43588.51	6.3249	46,345
Increm. Net Present Value (NPV)		2756.95		
Internal Rate of Return (IRR)		13.2		
Benefit / Cost Ratio (BCR)		1.063		

A better judgement of project viability could come after a thorough review, covering technical choices, land use (rotation pattern), impact of irrigation, costs of the investment, and all the other major project components.

The inclusion in the analytical framework of the external effects of the project, such as positive and negative environmental externalities, could add further information on which to base sound decision making about the implementation of the project.

8 READERS' NOTES

The trainer should focus attention on the main question, i.e. Question (i) that is concerned with the economic viability of the project. Questions (ii) and (iii) could be left as an exercise for the trainees in case there is a lack of classroom time to go through them, or even to test the confidence level of trainees in building alternative project scenarios, thus checking both their ability to manipulate the software and their skills in economic thinking.

The natural extension of the NGAMO3 exercise would be the inclusion of some external effects, notably, environmental externalities of irrigation projects. On these grounds, some synergies could be found with the FAO ECOZONE software, which could help to identify the various impacts of a list of development projects.

Further discussion could be raised in the classroom bringing the attention of the trainees to the overall feasibility of the project considering the following aspects: availability of fertilizers in local markets, overall demand of hired labour induced by the project, logistics related to supply of tractors, impact of tractors on the existing road system, availability of fuel in the area, the actual possibility of selling additional outputs on the existing markets.

In addition, considerations on the income distribution impact of the project and its indirect effects could be presented, for example, by looking at the relationships between owners and non-owners of bullocks, or by looking at the impact of the availability of tractors in the area on the overall traditional transport system.

Alternatively, the trainer can follow up by going to the NGAMO4 exercise, where the focus is on project phasing.

8.1 Use of the files for the exercise NGAMO3

NGAMO3 exercise is supported by specific WinDASI files (files with a .WDS extension), available together with the WinDASI software4. The set of files available for NGAMO3 is reported in Table 9.

The first file of the set contains only a small fraction of the data and each subsequent file contains additional data until the data set is complete.

[4] WinDASI software and exercise files are available in the EASYPol Module 018: ***WinDASI: a Software for Cost-Benefit Analysis of Investment Projects. Installation Note***

The paced release of these files allows the trainer to control the data entry process as the exercise is carried out. Each consecutive file will be loaded as indicated by the trainer during the execution of the exercise, thus enabling the trainer to:

- keep all the trainees at the same level during the data entry process;
- recover partial data sets in case of computer/power failure;
- manage a step-by-step entry of the data;
- speed up the data entry process, if necessary, by skipping some steps;
- allow slow trainees in the data entry process to catch up with the rest of the class;
- run the calculations starting with a common database.

The set of files complementing NGAMO3 may be used step-by-step by the trainer as follows:

Step 1

NGAMO3 exercise starts with the full data-set file NGAMO2.WDS. In this file the economic prices and the investment IRRIG are inserted.

Step 2

The insertion of the economic prices and the investment IRRIG may be checked by loading the file NGAMO3a.WDS. Here the zone NGAMO3 has to be created using both the plans AN-FARM and MEC-FARM and the investment IRRIG.

Step 3

The correct creation of the zone NGAMO3 may be checked by means of the full data-set file NGAMO3.WDS. This file may be used to run all the calculations of the NGAMO3 exercise.

The above steps are summarized in Table 9.

Table 9: Files for the exercise NGAMO3

Step	File to be used	File content	Task to accomplish in the file
1	NGAMO2.WDS	Full data-set of the exercise NGAMO2.	Start NGAMO3 by inserting the economic prices and the Investment IRRIG
2	NGAMO3a.WDS	Economic prices, Investment IRRIG	Insert the zone NGAMO3
3	NGAMO3.WDS	Full data-set of the exercise NGAMO3.	Run the required calculations

8.2 EASYPol links

This module belongs to a set of EASYPol modules which illustrate how to use the WinDASI application for financial and economic Cost Benefit Analysis of investment projects.

The user can learn how to install and handle WinDASI for Cost-Benefit Analysis of investment projects by going through the following EASYPol modules:

- EASYPol Module 018: ***WinDASI: A Software for Cost-Benefit Analysis of Investment Projects: Installation Note***
- EASYPol Module 019: ***WinDASI - A Software for Cost-Benefit Analysis of Investment Projects: Inserting and Managing Data***
- EASYPol Module 020: ***WinDASI - A Software for Cost-Benefit Analysis of Investment Projects: Calculations Performed by the Software***

The modules:

- EASYPol Module 021: ***WinDASI Exercise: NGAMO1: An Irrigation Project: Impacts of Irrigation on Traditional Farms***
- EASYPol Module 022: ***WinDASI Exercise: NGAMO2: An Irrigation Project. Impacts of Irrigation and Mechanization on Traditional Farms***

are logically preceding the present module and it is recommended to go through them before using the present module.

The user can also follow up with NGAMO exercises using the following EASYPol module:

- EASYPol Module 024: ***WinDASI Exercise: NGAMO4: Starting a Coffee Plantation in a Phased Mode***

The main features of each NGAMO exercise, such as its objectives, the analysis of the WoP and WiP situations, the constraints of the context of the project, the improvements brought about by the proposed activities and other project items, are synoptically summarized in Table 11.

In addition, a case study presenting the use of WinDASI to analyze a real project is reported in the EASYPol module:

- EASYPol Module 039: ***WinDASI-A Software for Cost-Benefit Analysis of Investment Projects: Case Study – Crop Intensification and Coffee Plantation***

Module metadata

1. EASYPol module	023

2. Title in original language	
English	WinDASI Exercise
French	
Spanish	
Other language	

3. Subtitle in original language	
English	NGAMO 3 - Economic Impacts of an Irrigation and Mechanization Project
French	
Spanish	
Other language	

4. Summary

This module presents NGAMO 3, a practical step-by-step exercise in Cost Benefit Analysis (CBA) of investment projects, to be run with the WinDASI software. (The word NGAMO comes from the name of the zone of the original project that was located in Myanmar). The goal is to analyze the overall economic impact of the irrigation project, the so-called "economic analysis" of the project. To accomplish this task, the analyst is requested to calculate economic flows of costs and benefits by using economic prices, and calculate the relative project indicators (NPV, IRR, and Benefit/Cost Ratio). Moreover, some alternative project scenarios have to be explored in order to improve the viability of the project.

5. Date

November 2005

6. Author(s)

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7. Module type

- ☐ Thematic overview
- ☐ Conceptual and technical materials
- ☒ Analytical tools
- ☐ Applied materials
- ☐ Complementary resources

8. Topic covered by the module

- ☐ Agriculture in the macroeconomic context
- ☐ Agricultural and sub-sectoral policies
- ☐ Agro-industry and food chain policies
- ☐ Environment and sustainability
- ☐ Institutional and organizational development
- ☒ Investment planning and policies
- ☐ Poverty and food security
- ☐ Regional integration and international trade
- ☐ Rural Development

9. Subtopics covered by the module

10. Training path Investment planning for rural development

11. Keywords