

Ministry of Water Resources

General Directorate for Water  
Resources Management



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Strategy for Water and Land Resources in Iraq

Guidance Note Series

## Preparing Farm Budgets

GN 10

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This document is one of a series of occasional guidance notes published by the Ministry of Water Resources addressing issues relevant to strategic planning for the sustainable use of the water and land resources of Iraq.

The guidance note describes procedures for the calculation of farm budgets for use in economic analyses.

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Preliminary

## 1 INTRODUCTION

### 1.1 The Place of Farm Budgets in Economic Analyses

1.1.1 This note presents a step by step approach to the preparation of farm budgets for both seasonal crops and livestock enterprises. The methodology is based on the following two documents.

- Cost-Benefit Analysis for Engineers and Planners, Snell M J, 1997, ISBN: 0 7277 2587 4
- Strategy for Water and Land Resources in Iraq, 'Guidance Note 09: Introduction to Cost-Benefit Analysis', August 2006

1.1.2 The document describes both financial and economic farm budgets and how to consider what is an appropriate future scenario for the farm enterprise.

### 1.2 Financial and Economic Analysis

1.2.1 Cost-benefit analysis (CBA) takes three forms according to the point of view being examined.

1.2.2 A farmer, a commercial organisation or a state organisation operating on quasi-commercial lines may be interested in the financial benefits compared with the financial cost – which comes from the budget they hold.

1.2.3 However, when deciding on national projects, the efficiency of resource use is more important than the financial impact on a particular organisation.

1.2.4 Where account is to be taken of achieving certain social goals, social CBA is employed. In this, some costs and/or benefits are given a weighting to increase or decrease their impact on the CBA calculations, in accordance with criteria established prior to the CBA. In summary:

Whose point of view	Type of analysis	Main criterion
Commercial organisation – here THE FARM	Financial analysis	Money
Whole economy	Economic analysis	Efficiency
Region		
Nation		
'society'	Social analysis	Equity
Whole human race		

- 1.2.5 In an economic CBA any cost borne by a member of the nation should be included even if there is no money payment made, as in the case of family labour, and also any benefit enjoyed for which nothing is paid. Since no money changes hands these items would not be included in a financial CBA.

### **1.3 With- and without-project situations**

- 1.3.1 The key to correct and complete identification of costs and benefits is the definition of the with- and without-project situations. These are projections into the future with all the usual difficulties and uncertainties of estimating and forecasting.
- 1.3.2 The without-project situation, sometimes equivalent to the do-nothing scenario, is not usually the same as a continuation of the present situation.
- 1.3.3 Part of the work of defining the with-project and without-project situation is to consider whether a project's outputs add to total production of the relevant goods, or substitute for (displace) goods that would have been produced or provided anyway. If the latter is true the effects on the other providers of the goods may need to be considered too.

### **1.4 Shadow pricing**

- 1.4.1 In an economic CBA there may be costs and benefits to include that have no market and thus there is no financial price, while others may have prices which, because of say market distortions, do not reflect their true value to the defined group of people on whose behalf the project is being analysed. Special valuation techniques must be used, referred to as shadow pricing.
- 1.4.2 The usual method is to start with financial prices and apply a factor which converts a value in financial prices into a value in economic prices. The factor being the shadow price factor (SPF). The SPF may give a higher economic price or a lower economic price than the financial price.
- 1.4.3 When goods or services appearing in a CBA as costs or benefits are traded in a relatively free market with few distortions, the market prices are a relatively good guide to willingness to pay and are usually used in an economic CBA unchanged (SPF=1). When they are not so traded, the economic price can either be estimated directly by finding out what people would be willing to pay if there were an effective market, or by taking the distorted real market price and adjusting it by shadow pricing.

1.4.4 The opportunity cost of something is what we have to forego or give up in order to obtain it. For example, in a rural area the use of unskilled labour on road-building is related to its seasonal use in agriculture. At harvest-time the opportunity cost to the nation of using an unskilled labourer for a day on the road is the value of the forgone work he might have been doing in the fields, quite a high value. However, the loss of his normal activity in the quiet season to spend a day working on the road might be of little or no value. The SPF could then be adjusted seasonally from say 1 at peak times like harvest down to 0.3 for slack times.

1.4.5

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## 2 REQUIREMENTS

### 2.1 Data Requirements - Arable

2.1.1 Before starting the calculations it is necessary to assemble the following data:

- Characteristics of the farm type
  - Size of farm (ha)
  - Scale of enterprise (family, small, medium, large)
  - Ownership (farmer owner, tenant farmer, cooperative, etc)
  - Type of enterprise (arable, livestock, mixed)
- Crops to be grown, including details of the seed variety
  - Area to be cultivated under each crop
  - Yield per hectare of main crop product (eg grain)
  - Yield per hectare of crop by-product (eg straw)
- Farming operations for each crop
  - Land preparation: labour and machinery required and when
  - Sowing: labour and machinery required
  - Fertilizer applications: labour and machinery required
  - Pesticide/herbicide applications: labour and machinery required
  - Harvest: labour and machinery required
  - Transport from field: labour and machinery required
  - Handling: labour and machinery required
  - Storage: labour and machinery required
- Unit rates for crop production inputs
  - Labour cost rate per day (hired labour: skilled, unskilled)
  - Seed cost
  - Fertilizer cost (for each type applied)
  - Pesticide/herbicide cost (for each type applied)
  - Machinery costs (tractor and more specialised equipment)
  - Transport costs (fuel etc)
  - Miscellaneous eg bags for grain
  - Storage costs
  - Rent if applicable
  - Water charges or costs for pumping
- Value of product in the local market
  - Price per standard unit of measure for main and by-products

- 2.1.2 Appendix A contains proforma for the collection of the necessary agronomic data from the Ministry of Agriculture.

## 2.2 Data Requirement – Livestock Enterprise

- 2.2.1 Before starting the calculations it is necessary to assemble the following data:

- Characteristics of the farm type
  - Size of farm (ha)
  - Scale of enterprise (family, small, medium, large)
  - Ownership (farmer owner, tenant farmer, cooperative, etc)
  - Type of enterprise (arable, livestock, mixed)
  - Primary product for livestock enterprise (eggs, dairy, meat, wool)
- Livestock to be kept, including details of the herd/flock composition
  - Herd/flock size and composition
  - Yield of main product
  - Yield of by-products
- Crops to be grown for feed, including details of the seed variety
  - Area to be cultivated under each crop
  - Yield per hectare of main crop product (eg grain)
  - Yield per hectare of crop by-product (eg straw)
- Crop operations and costs as in Section 2.1.
- Farming operations for each type of livestock and product
  - Milk production: labour and machinery required
  - Egg production: labour and machinery required
  - Wool production: labour and machinery required
  - Veterinary activities: labour and machinery required
  - Slaughter: labour and machinery required
  - Transport from farm: labour and machinery required
  - Handling: labour and machinery required
  - Storage: labour and machinery required
- Unit rates for production inputs
  - Labour cost rate per day (hired labour: skilled, unskilled)
  - Feed cost (if bought in rather than grown on the farm)
  - Veterinary costs (for each type applied)
  - Machinery costs (tractor and more specialised equipment)
  - Transport costs (fuel etc)
  - Miscellaneous eg bags, boxes, bottles etc

- Storage costs
- Rent if applicable
  - Value of product in the local market
- Price per standard unit of measure for main and by-products

2.2.2 Appendix A contains proforma for the collection of the necessary agronomic data from the Ministry of Agriculture.

## 2.3 Additional Information for Economic Analysis

2.3.1 Shadow price factors have to be estimated where necessary.

Table 1: Basic parameters and prices

All in Iraqi Dinars (ID) at 1986 constant prices, domestic pricing system				
Official exchange rate		x.xx ID/US\$		East Gharraf FS
Shadow exchange rate factor		1.15		
Shadow exchange rate		x.xx ID/US\$		
Discount rate		8%/year		
<i>Good</i>	<i>Unit</i>	<i>Financial price</i>	<i>Economic price</i>	<i>Shadow price factor</i>
<i>Investment inputs</i>				
Imported materials				1.10
other materials				1.00
Skilled labour				1.10
Unskilled labour				0.60
Machine use				1.20
<i>Agricultural inputs</i>				
<i>Seed</i>				
Maize	kg	0.35	0.35	
<i>Fertilizer</i>				
N	kg	0.06	0.12	
P	kg	0.12	0.24	
K	kg			
<i>Agro-chemicals</i>				
Seed treatments	ID	20	40	
Weedkiller		1.6	3.2	
Pesticide treatments		1.8	3.6	
<i>Machinery</i>				
tractor	hour	2	2	
combine	hour	16.5	16.5	
Animal power	ID			
Sacks etc	ID			
Hired labour	person-day			
Family labour	person-day	0	4	
<i>Agricultural outputs</i>				
Maize	t	80	75	

2.3.2 Information taken from World Bank commodity forecasts has been used to provide worked examples of the approach.

Table 2: Economic price of crop as import substitute

		<i>Currency X at 1986 prices</i>		
<i>Good</i>	<i>Unit</i>	<i>Financial price</i>	<i>Shadow price factor</i>	<i>Economic price</i>
<i>World price of maize in US\$</i>				
World Bank forecast for year xxxx				
US nr 2 maize fob US Gulf port	US\$	116		
Quality adjustment factor, project/US nr 2	factor	1.04		
Adjusted price for project maize	US\$	120.64		
Freight US Gulf port to Iraqi port	US\$	53		
Insurance etc to Iraqi port	US\$	8		
CIF price, imported maize, Iraqi port	US\$	181.64		
<i>Border equivalent price in local currency</i>				
	exchange rates	2.53		2.91
CIF price, imported maize, Iraqi port	ID	459.55		528.57
Import and other taxes	ID	89.25	0.00	0.00
Port handling costs	ID	10.20	1.05	10.71
Transport, port to Baghdad market	ID	22.00	0.80	17.60
Deduct: project to Baghdad market	ID	-16.00	0.80	-12.80
<b><i>Border equivalent farm gate price</i></b>	<b>ID</b>	<b>565.00</b>		<b>544.00</b>

### COMMODITY PRICE DATA

Commodity	Unit	Annual averages			Quarterly averages				Monthly averages			
		Jan-Dec 2003	Jan-Dec 2004	Jan-Oct 2005	Jul-Sep 2004	Oct-Dec 2004	Jan-Mar 2005	Apr-Jun 2005	Jul-Sep 2005	Aug 2005	Sep 2005	Oct 2005
<b>Energy</b>												
Coal, Australia	\$/mt	27.84	54.70	51.34	60.42	55.65	53.04	52.94	50.17	50.88	47.00	44.94
Coal, US	\$/mt	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Crude oil, avg, spot	a/ \$/bbl	28.90	37.73	52.92	40.52	42.68	46.24	50.79	59.98	61.89	61.69	58.19
Crude oil, Brent	a/ \$/bbl	28.85	38.30	54.09	41.59	44.17	47.64	51.61	61.55	64.09	62.98	58.52
Crude oil, Dubai	a/ \$/bbl	26.74	33.46	48.71	36.09	35.57	41.44	47.69	55.34	56.63	56.54	53.67
Crude oil, West Texas Int.	a/ \$/bbl	31.11	41.44	55.96	43.89	48.31	49.65	53.06	63.05	64.96	65.54	62.36
Natural gas, Europe	\$/mmbtu	3.91	4.28	6.10	4.34	4.93	5.49	5.89	6.52	6.56	6.58	7.28
Natural gas, US	\$/mmbtu	5.49	5.89	8.37	5.49	6.36	6.42	6.94	10.04	9.63	12.88	13.52
<b>Non Energy Commodities</b>												
<b>Agriculture</b>												
<b>Beverages</b>												
Cocoa	b/ c/kg	175.1	155.0	155.1	161.2	159.9	164.7	154.5	149.1	148.1	150.5	145.7
Coffee, Arabica	b/ c/kg	141.5	177.4	256.8	168.3	202.1	266.8	278.6	233.4	238.5	219.3	231.6
Coffee, robusta	b/ c/kg	81.5	79.3	110.0	76.6	74.3	93.9	122.6	115.2	114.6	103.3	104.8
Tea, auctions (3), average	c/kg	151.7	168.6	164.5	176.4	176.7	159.9	166.0	166.8	165.3	165.9	167.3
Tea, Colombo auctions	b/ c/kg	154.1	178.1	183.2	177.9	201.4	193.5	176.5	176.2	175.6	188.5	194.0
Tea, Kokata auctions	b/ c/kg	146.5	172.2	162.7	193.2	179.8	136.9	179.1	175.3	170.7	156.8	153.4
Tea, Mombasa auctions	b/ c/kg	154.4	155.4	147.6	158.1	149.1	149.3	142.3	149.0	149.6	152.3	154.5
<b>Food</b>												
<b>Fats and Oils</b>												
Coconut oil	b/ \$/mt	467.3	660.8	626.8	651.0	651.7	667.3	654.9	571.7	550.0	559.0	586.0
Copra	\$/mt	299.9	450.0	420.9	444.3	448.3	447.8	446.4	380.7	371.0	346.0	384.0
Groundnut oil	b/ \$/mt	1,243.2	1161.0	1081.9	1117.7	1130.3	1152.4	1101.3	1025.0	1023.0	1002.0	983.0
Palm oil	b/ \$/mt	443.3	471.3	419.2	432.3	429.0	413.3	421.7	415.0	407.0	421.0	442.0
Palmkernel oil	b/ \$/mt	458.8	648.1	631.9	629.0	653.0	662.3	655.6	582.3	558.0	577.0	618.0

[http://siteresources.worldbank.org/INTPROSPECTS/Resources/Pnk\\_1105.pdf](http://siteresources.worldbank.org/INTPROSPECTS/Resources/Pnk_1105.pdf)

	2004	2005	2006	2007	2010	2015
<b>A. Energy (nominal)</b>						
1. Energy index	164.9	236.0	244.8	227.3	174.8	153.0
2. Coal, Australia, \$/mt	54.7	50.0	45.0	42.0	35.0	37.5
3. Crude oil, average, \$/bbl	37.7	54.0	56.0	52.0	40.0	35.0
4. Natural gas, Europe, \$/mmbtu	4.3	6.3	7.2	6.8	5.3	4.8
5. Natural gas, US, \$/mmbtu	5.9	9.0	8.8	7.0	5.8	5.5
<b>B. Non-energy commodities (nominal)</b>						
1. Non-energy commodities index	107.5	120.9	116.8	109.1	99.5	104.1
<b>C. Agriculture (nominal)</b>						
1. Agriculture index	104.7	112.1	108.5	104.6	102.8	108.1
<b>D. Beverages (nominal)</b>						
1. Beverages index	94.0	118.3	115.2	111.2	99.7	106.0
2. Cocoa, c/kg	155.0	155.0	162.0	163.0	160.0	150.0
3. Coffee, arabica, c/kg	177.4	257.9	242.0	227.0	187.4	209.4
4. Coffee, robusta, c/kg	79.3	109.1	108.2	107.3	104.7	125.0
5. Tea, auctions(3) average, c/kg	168.6	166.0	166.0	165.0	165.0	170.0
<b>E. Food (nominal)</b>						
1. Food index	110.0	108.9	104.8	100.3	101.0	105.4
<b>F. Grains (nominal)</b>						
1. Grains index	100.2	102.8	99.6	95.2	94.5	99.7
2. Maize, \$/mt	111.8	100.0	98.0	95.0	105.0	110.0
3. Rice, Thailand, 5%, \$/mt	237.7	285.0	275.0	265.0	230.0	240.0
4. Sorghum, \$/mt	109.8	97.0	94.0	92.0	100.0	108.0
5. Wheat, US, HRW, \$/mt	156.9	150.0	145.0	135.0	145.0	155.0

World Bank commodity forecasts

### 3 CROP BUDGET

#### 3.1 Financial

3.1.1 With the agronomic information and the farm size and type a start can be made to prepare crop budgets for each of the crops that are grown on a typical farm of this type. The first stage is to prepare the financial crop budget

Table 3a: Financial crop budget per hectare

Crop		Maize			
Farm type		Small holder irrigation	East Gharraf FS		
Situation		Present			
Prices		Financial			
Currency		Iraqi dinars at 1985 constant prices?			
Item	Unit	Quantity	Price	Value	
<i>Gross return</i>					
Main product	t	5	80	400	
By-product	t			0	
Losses	t			0	
			Gross return	400	
<i>Production costs</i>					
Seed	kg	40	0.35	14	
Fertilizer					
N	kg	200	0.06	12	
P	kg	200	0.12	24	
K	kg			0	
Agro-chemicals	ID	34.4	1	34.4	
Machinery					
tractor	hour	14.5	2	29	
combine	hour	2.5	16.5	41.3	
Animal power	ID			0	
Sacks etc	ID			0	
Hired labour	person-day			0	
Family labour	person-day	18	0	0	
			Total Costs	154.7	
<i>Net financial return</i>	ID/hectare			245.3	
<i>Net return to family labour</i>	ID/person-day			13.6	

3.1.2 The analysis shown is for the PRESENT situation pre-project.

3.1.3 The future without- and future with- project budgets now need to be considered. For an individual crop there might be no difference but at the farm level improved water availability or better drainage (what ever the project is designed to improve) may lead to a change in the crops selected or to the use of improved varieties. Improved varieties often require more

inputs in order to achieve the best results (more fertilizer, more pesticides, etc).

## 3.2 Economic

3.2.1 The next step is to prepare the economic crop budget for each crop on the farm.

Table 5a: Economic crop budget per hectare

Crop	Maize			
Farm type	Small holder irrig?	East Gharraf FS		
Situation	Present			
Prices	Economic			
Currency	Iraqi dinars at 1985 constant prices?			
Item	Unit	Quantity	Price	Value
<i>Gross return</i>				
Main product	t	5	75	375
By-product	t			0
Losses	t			0
			Gross return	375
<i>Production costs</i>				
Seed	kg	40	0.35	14
Fertilizer				
N	kg	200	0.12	24
P	kg	200	0.24	48
K	kg			0
Agro-chemicals	ID	68.8	1	68.8
Machinery				
tractor	hour	14.5	2	29
combine	hour	2.5	16.5	41.3
Animal power	ID			0
Sacks etc	ID			0
Hired labour	person-day	0	0	0
Family labour	person-day	19.8	4	79.2
			Total Costs	304.3
<i>Net economic return</i>	ID/hectare			70.7

3.2.2 Note the cost of family labour is now included, and that the prices of some of the items are different to their values in the financial analysis – this is because the SPF for each of these items is not 1.0.

3.2.3 The analysis shown is for the PRESENT situation pre-project.

## 4 ARABLE FARM BUDGET

- 4.1.1 Once the analysis has been completed for every crop in the cropping pattern the whole annual farm budget can be prepared for both the financial and the economic case. The financial case is shown below for a fictitious farm and crops.

Table 4a: Financial arable farm budget

<i>Farm type</i>	Small holder irrigation				
<i>Situation</i>	Present				
<i>Prices</i>	Economic				
<i>Currency</i>	Iraqi dinars at 1985 constant prices?				
<i>Crop</i>	<i>Area for this crop</i>	<i>Net return, Iraqi dinars</i>		<i>Family labour</i>	
	<i>ha</i>	<i>per ha</i>	<i>per farm</i>	<i>per ha</i>	<i>per farm</i>
Maize	3	1392	4176	60	180
Cabbage	0.5	2270	1135	110	55
Tomatoes	0.5	2630	1315	125	62.5
Cowpeas	1	519	519	31	31
Totals	5		7145		328.5
Farm net return per hectare			1429		328.5
Farm net return per man-day of family labour					22

- 4.1.2 This applies to the present situation and needs to be repeated for the with-project situation.

## 5 LIVESTOCK ENTERPRISE BUDGET

### 5.1 Dairy Unit

5.1.1 Livestock enterprises are rather more complex to analyse than arable farms. In the case of a dairy unit there are a number of products and unlike the arable crop the livestock have a lifespan of several years so herd composition must be taken into account.

5.1.2 The table below is set out in the same format as the previous crop budgets and summarises the annual budget for a dairy enterprise. The prices are fictitious.

Table 5a: Economic dairy unit budget per 100 cows

Product	Milk			
<i>Farm type</i>	Dairy			
<i>Situation</i>	Present			
<i>Prices</i>	Economic			
<i>Currency</i>	Invented at 1985 constant prices?			
<i>Item</i>	<i>Unit</i>	<i>Quantity</i>	<i>Price</i>	<i>Value</i>
<i>Gross return</i>				
Main product	kg	304000	0.24	72960
By-product	t			
Old cows sold		13	255.42	3320.5
Bulls sold		35	316.08	11062.8
Heifers sold		22	306.5	6743
Manure (dry)	t	452	5	2260
Losses	t			0
			Gross return	96346.3
<i>Production costs</i>				
Feed				
Straw	t	252	5	1260
Green feed/silage	t	3949	1	3949
concentrates	t	320	150	48000
Veterinary	per head	330	6.79	2240.7
Machinery	per head	330	13.57	4478.1
Miscellaneous		17%		10372
Labour				
Hired labour				
Skilled	person-day	1	648	648
Unskilled/casual	person-day	20	216	4320
Family labour	person-day	0	0	0
			Total Costs	75267.8
<i>Net economic return</i>	ID/hectare			21078.5

5.1.3 Behind this table there are a number of preparatory calculations that are illustrated below.

Table X: Agronomic Information - Dairy Cattle

		Parametres
Number of cows		100
Calving rate		80%
Calving interval (months)		15.0
Calves born per year		80
Young stock mortality		12% * young stock mortality = 6% 0-1 years, 3% 1-2 years, 3% 2-3 years
Cow mortality		3%
No. lactations per cow		5
Milk	kg cow per lactation	3,800
	kg cow per year	3,040
Manure		
Casting age for cows (years)		8

**Herd Makeup and Feed Requirements**

	Cows	Bullocks		Heifers		Calves 0-1 yr	Herd Total
		2-3 yrs	1-2 yrs	2-3 yrs	1-2 yrs		
Baseline							
Number of animals	100	37	38	37	38	80	330
Feeding: kg/head/day							
staw	2	5	2	2	2	1	
green feed/silage	50	40	25	40	25	12	
concentrate	5.0	3.0	2.0	2.0	1.5	0.8	
Feeding: total tons/year							
staw	73	68	28	27	28	29	252
green feed/silage	1,825	540	347	540	347	350	3,949
concentrate	182	41	28	27	21	22	320
Total feed requirement for herd (tons/year)							4,522

5.1.4 The economic information to build up the budget are summarised below.

Table X2: Basic Economic Parameters - Dairy Cattle

Value of livestock	Cows	Bullocks		Heifers		Calves	
		2-3 yrs	1-2 yrs	2-3 yrs	1-2 yrs	0-1 yr	
value: soms/head	45,000	30,000	20,000	30,000	20,000	10,000	
Number of animals	100	37	38	37	38	80	330
total soms'000	4,500	1,110	760	1,110	760	800	9,040

Economic price of beef and milk as import substitute

World prices source information

Beef	import	Austral./New Zealand, frozen, boneless, cow forequarter, cif US East Coast
Butter	import	New Zealand, export price, average 1996-9
SMP	import	skim milk powder, New Zealand, export price, average 1996-9

Milk and meat

	\$/ton		
	Beef	Butter	SMP
green feed/silage	1729.18	1901.00	1818.00
quality adjustment	25%		
international freight etc.	300.00	300.00	150.00
Border price	2461.48	2201.00	1968.00
Local marketing	80.00	80.00	40.00
Value at wholesale	2541.48	2281.00	2008.00
Local processing etc.	-635.37		
Farm gate value	1906.11		

Conversion to fresh milk

Reconstitution of skim milk powder (SMP) and butter	
100 tons fresh milk =	9 tons SMP + 3 tons butter
= \$/ton	249.15
less transport from farm	5.00
Farm gate value	244.15

Conversion - beef to live cattle

	Weight (kg)			\$ per kg	\$ per animal
	live	carcass	boneless		
bull - 2/3 years old	450.00	247.50	165.83	1.91	316.08
cow - 8/9 years old	400.00	200.00	134.00	1.91	255.42

## 6 EXAMPLE OF WITH- AND WITHOUT-PROJECT ANALYSIS

Preliminary

## **Appendix A Data Compilation Proforma**

1. Crop data: variety, planting dates, harvest dates, operations and their timing
2. Overall cropping calendar
3. Local climate data

Preliminary