

GUIDELINE 6

ECONOMIC AND FINANCIAL ANALYSIS

GUIDELINE 6: ECONOMIC AND FINANCIAL ANALYSIS

0. INTRODUCTION

0.1 Significance of Project and Its Economic Analysis

Economic analysis of projects will support a decision making in investment of resources. When one must decide to execute a big investment in some activity toward the future, which connotes risks of damage predictable or unpredictable, the one must be scared of possibility of losing own properties. Economic analysis will offer information on the most effective and efficient investment alternative by comparing cost and benefit in a certain manner and on the assumed risks being calculated.

A national government is investing their limited resources to contribute to improving living standard of the people of the country. The resources of the government include taxes levied from the people and the government distributes them into activities or projects for the sake of the nation. The investments by the government, therefore, must be effective, efficient, valid and accountable to the nation. The economic analysis will help to bring about a better allocation of resources in terms of economic efficiency.

Here we are to deal with the economic analysis of irrigation projects, costs of which are partially borne by the government. Its necessity, validity, function etc. from the country's viewpoint should be discussed for clearer understanding of the significance of the project and its economic analysis.

Then, why is economic analysis necessary? There are two viewpoints to evaluate economic aspect of projects, which are "national economic point of view" and "private economic point of view". From the viewpoint of national economy, it has to be judged that the government investment should contribute to the development of the national economy and the investment is effectively and efficiently utilized. This is the necessity of economic analysis.

As for the viewpoint of private economy (farm economy), increase of farm income by the project will be the crucial interest. The degree of income increase has to be compared to the project cost borne by the farmer beneficiary. The analysis standing on the viewpoint of private entity is called financial analysis. Financial analysis is as important as economic analysis.

Analysis must include both aspects to justify the project, as a guideline of Asian Development Bank says, "For a project to be economically viable, it must be financially sustainable, as well as economically efficient. If a project is not financially sustainable, economic benefits will not be realized. Financial analysis and economic analysis are therefore two sides of the same coin and complementary" (ADB, 1997).

0.2 Contents of the Guideline

This guideline consists of basic discussions on benefits of irrigation projects (Chapter 1), estimation of project benefits (Chapter 2), decision criteria (Chapter 3), economic and financial analyses (Chapter 4). Application of economic analysis method is based on OECD Method.

To carry out the case study, data collection in relevant offices, market survey, and farm economy survey were carried out. Having learned from the process of data collection, the case study was arranged not only to demonstrate practical estimation of costs and benefits, but also to explain availability of existing useful data and where to obtain such necessary data.

Detail discussions about some topics and demonstrations of the formulae used in the text are noted as

boxed items.

1. BENEFITS OF IRRIGATION DEVELOPMENT PROJECT

1.1 Identifying Project Benefits

Benefit of a project is a comparison between without project and with project situations. The incremental benefit (net benefit with project – net benefit without project) stream in the flow during project life is defined to be the project benefit. Figure 8.1 shows the concept and samples of arising project benefits. For irrigation development projects, the stream of net incremental benefit would be pictured like the one top-left hand or even the one bottom-left hand of Figure 8.1.

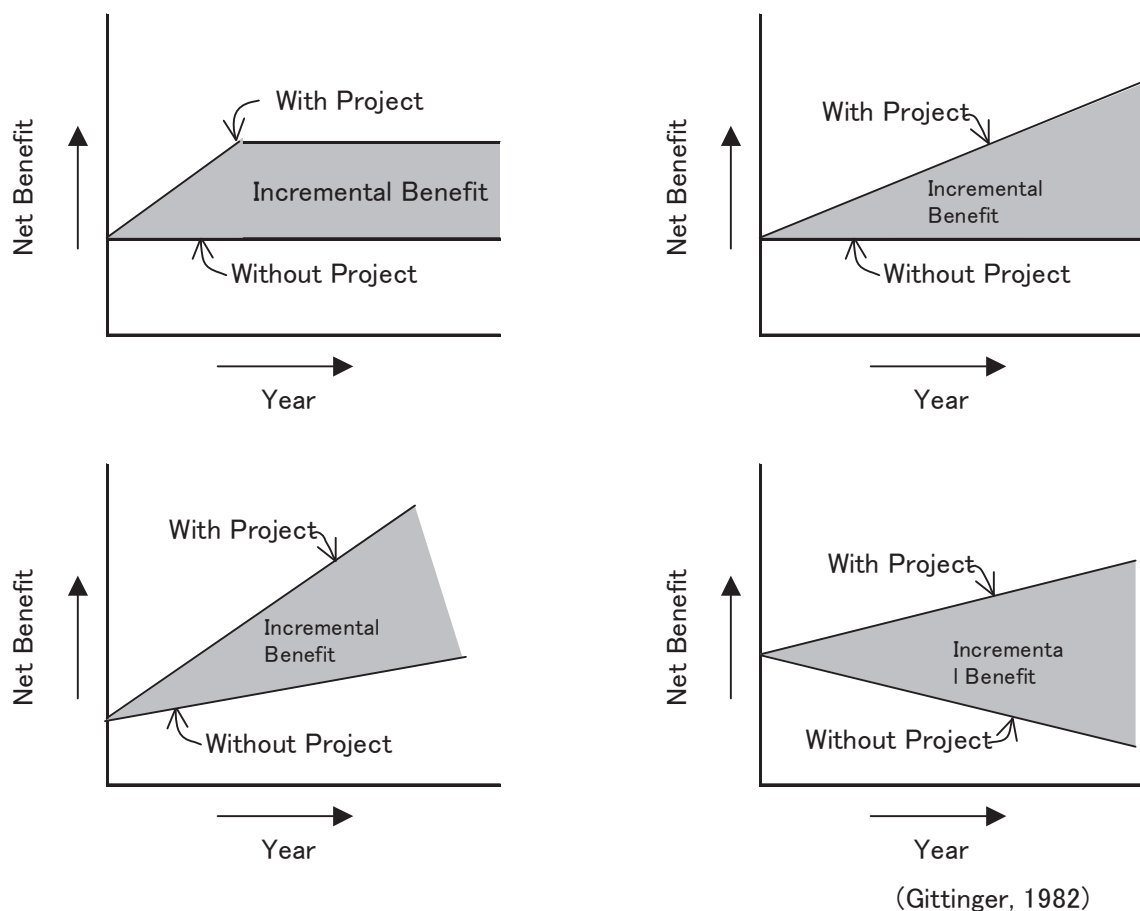


Figure 8.1 Sample of Incremental Benefit

1.2 Category of Benefits for Irrigation Development Projects

Major benefit of agricultural projects is normally an increase of crop production borne by unit yield increase and expansion of farmlands. Reduction of farming cost is another source of the benefit and other envisaged benefits are quality improvement, extension of time of sale by improving stores or other marketing facilities, avoiding loss of produce, etc.

In terms of valuation in cash, benefits of a project can be categorized as quantifiable or non-quantifiable, and the quantifiable benefits can be categorized into 'can be valued in cash' and 'cannot be valued in cash', and thirdly the benefits which can be valued in cash are further categorized into the benefit which can be income and cannot be income for the beneficiary (see Figure 8.2).

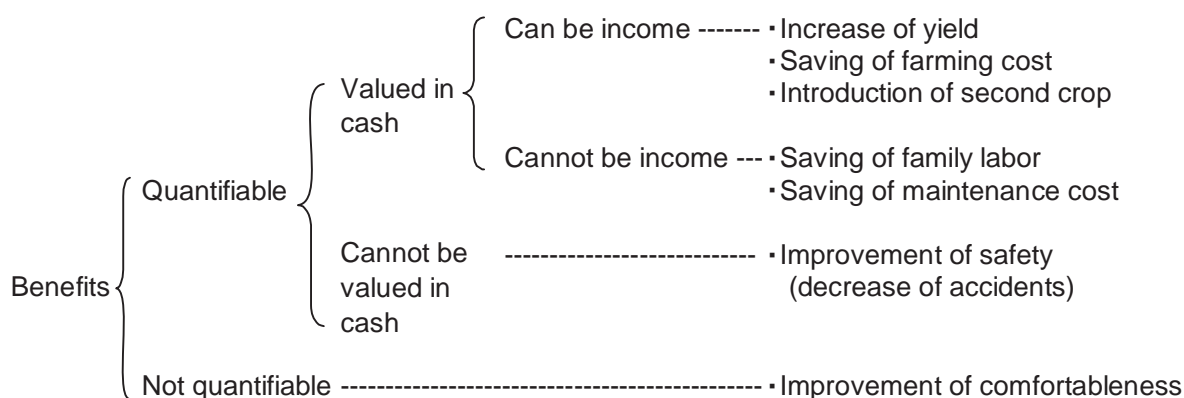


Figure 8.2 Category of Benefits (Sample: Irrigation Project)

Economic analysis normally deals with the benefits, which can be valued in cash only. This could sometimes underestimate the value of the project. Therefore, other benefits that cannot be valued in cash should be described and remarked in carrying out the economic analysis. Next sections introduce major benefits of irrigation development projects and some indirect benefits valuable in cash considered in Japan, and anticipated impacts of the project.

1.2.1 Increase of Crop Production

An irrigation development project enables efficient water management by separating irrigation canal and drainage leading to unit yield increase of crops. Also, improvement of soil conditions, such as from a damp field into a dry field by the project will bring unit yield increase in association with the prevention of crop damage caused by extra moisture to crops. Change of farmland into a dry one will also enable to introduce second crop after the harvest of the first crop.

1.2.2 Reduction of Farming Cost

High efficient machineries can be introduced to the farming system by implementing irrigation development projects. Change of farming system with the efficient machineries would reduce the production costs of crops by saving labor and machinery costs. Reduction of inputs can also be realized, for example, introduction of seeders will reduce the required amount of seeds per unit.

It can be said that the major purpose of irrigation projects is actually to introduce more efficient modernized farming system. However, the cost of the new system may become more expensive than without project situation, if the adopted farming system is not adequate. Also if labor saved by the project has no way to earn in another activities, the reduction of labor cost cannot be always said that it is a benefit. This issue will be discussed later.

Since the net benefit includes both increase of crop production and reduction of farming cost, both aspects are estimated at the same time when calculating the net benefit (gross output – production cost) of crop. Figure 8.3 shows the conceptual illustration of the category of “Increase of Crop Production” and “Reduction of Farming Cost”.

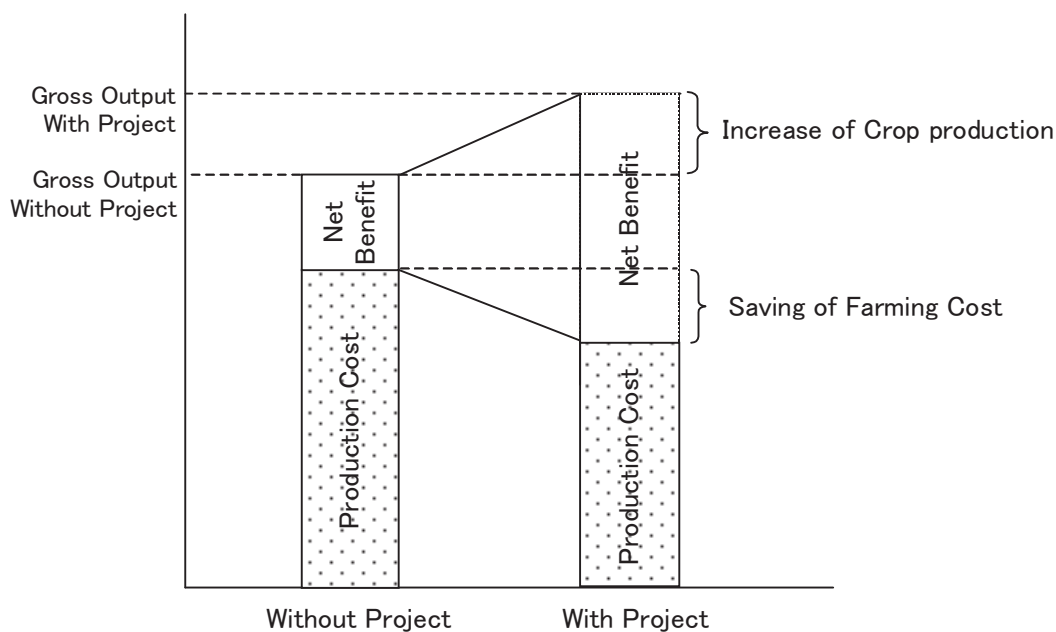


Figure 8.3 Illustration of Basic Benefit

1.2.3 Reduction of Maintenance Cost

Reduction of Maintenance cost is the benefit related to the maintenance work on the fields (this is not counted in production cost) such as clearing canal, road maintenance, etc. When an earth canal is concrete lined by the project, the burden for canal cleaning or grass cutting will be decreased. Or in case of new construction of drainage or extension of farm road will cause additional maintenance work. Hence sometimes the benefit relative to maintenance cost can be minus.

1.3 Indirect Benefits and Impacts of Project

1.3.1 Indirect Benefits

Increase of crop production and rationalization of farming system are considered to be the direct benefits of the project, since these benefits are in line with the project purpose. While it is considered that there are some benefits occurring by the implementation of the project, though they are not directly related to the project purpose. These benefits are called indirect benefits, which include tangible and intangible benefits.

1.3.2 Impacts

Project would cause positive and negative impacts with the implementation. Here some assumed impacts (some may be categorized to indirect benefits) are listed.

1) Saving of Foreign Currency

Increase of crop production will improve self-sufficiency ratio of the products, so that the import of the products will be decreased. By this, payment by foreign currency will be decreased and the government can save the cost for purchasing foreign currency.

2) Land Price Increase

Price of farmland will increase by irrigation development projects. If a government levies land tax according to the value of the land, government revenue will be improved by the rise of land price.

3) Employment

Project itself creates employment for the construction work and employment will extend to activation of regional economy. However, as pointed out above, the irrigation development project may reduce farm labor. If there are no labor markets to absorb the labor thrown out from farms, it can be said that the project has a negative impact on employment.

4) Reactivation of Rural Community

As defined in Introduction, the project planning and implementation require number of discussions and agreements among farmer beneficiaries. Through this process, rural communities will be activated.

There will be also some environmental impacts relative to the project though they may be intangible. Possible negative and positive impacts must be taken into account for project planning, designing and implementation.

2. ESTIMATION OF PROJECT BENEFITS

In this Chapter, a way of estimating the benefits with irrigation development projects is outlined. The basic procedure to estimate the benefits would be 1) identification of area benefited, 2) grasping present condition, 3) formulation of farming plan, and 4) pricing of benefits. Some useful formats, which have been used in the economic analysis of Land Improvement Project in Japan, can be utilized on the process of estimating the benefits. Detail procedure of the benefit estimation is presented in Chapter 5 Case Study.

2.1 Identification of Area Benefited

Category of land use changes by irrigation development projects. As shown Figure 8.4 below, some part of existing roads or canals will be converted to farmlands, or vice versa. It is convenient to summarize the category change of land use to identify actual area benefited by the project. Table 8.1 is a format to summarize the category change of land use.

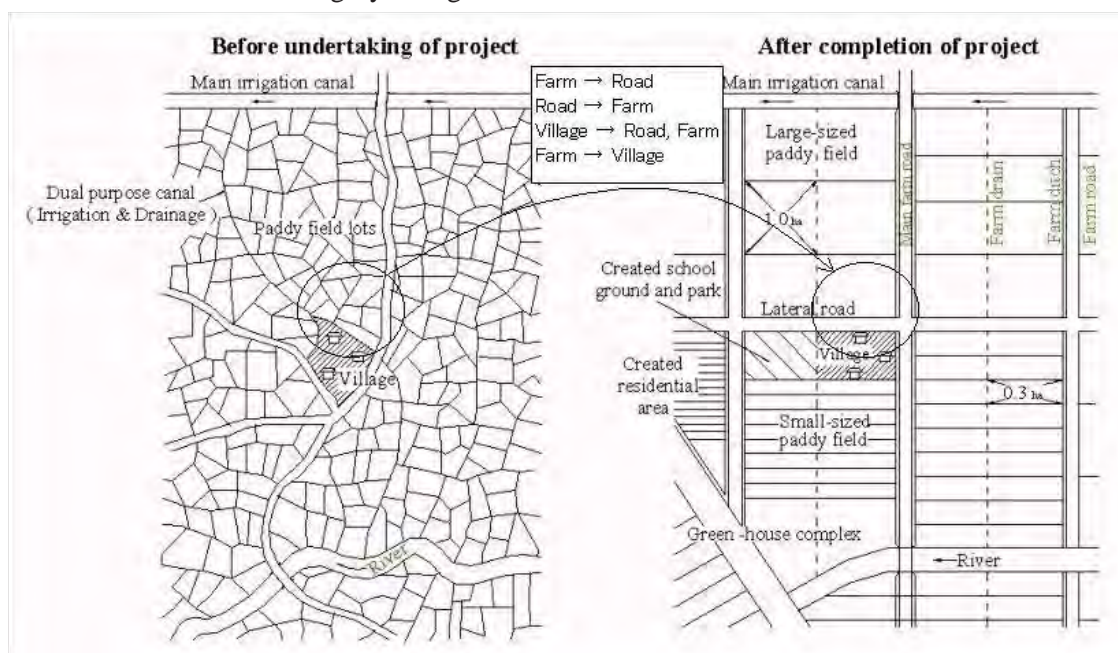


Figure 8.4 Change of Land Use with Land Consolidation Project

Table 8.1 Change of Land Use

		With Project		Farm Land (Paddy)					Other Land		Total (Without Project)
		Paddy	Non-paddy	Orchard	Pasture	Sub-total	Road, Canal	Others			
Without Project		(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	
Farm Land	Paddy	100.0	-	-	-	100.0	8.0	-	108.0		
	Non-paddy	15.0	-	8ha of paddy field without project changes to road and canal with project.		15.0	1.0	-	16.0		
	Orchard	-	-	-	-	-	-	-	-		
	Pasture	-	-	-	-	-	-	-	-		
	Sub-total	115.0	-	-	-	115.0	9.0	-	124.0		
Other Land	Forest/Bare land	-	2ha of road and canal without project changes to paddy field with project		-	-	-	-	-		
	Lakes and Marshes	-	-	-	-	-	-	-	-		
	Road, Canal	2	-	-	-	2.0	25.0	-	27.0		
	Others	-	-	-	-	-	-	-	-		
Total (With Project)		117.0	-	-	-	117.0	34.0	-	151.0		

What is indicated in Table 8.1:

Without Project		With Project	
	(ha)		(ha)
<u>Paddy total</u>	108		
Paddy	100	Paddy	100
Paddy	8	Road, canal	8
<u>Non-paddy total</u>	16		
Non-paddy	15	Paddy	15
Non-paddy	1	Road, canal	1
<u>Road, canal total</u>	27		
Road, canal	2	Paddy	2
Road, canal	25	Road, canal	25

From Table 8.1, total farmland areas with and without project situations are calculated as:

Without Project	=	124 ha (Paddy + Non-paddy field)
With Project	=	117 ha (Paddy field)

The difference of 7ha between with and without project situations is to be used for road or canal.

2.2 Grasping Present Condition: Farm Economy (Baseline) Survey

With reference to regional statistics, farm economy survey will be carried out to grasp the present condition of the project area. Items to survey are family member, assets, crops, yields, farm income and non-farm income, livestock, prices, production cost, family expenditure etc. When formulating a master plan, items to question will normally cover wider range with less detail.

While in case the project has already been targeted to implement, necessary items will be more focused, for instance in case of irrigation projects, number of family labor, assets of machinery and its use, unit yield, production cost etc. will be surveyed with much detail. The survey conducted before the implementation of the project is called baseline survey. The data collected by this survey will be the

criteria (baseline) to evaluate the effectiveness of the project after the implementation. Farm economy survey may be carried out to collect more information, which can be referred to for design change or even change of the plan.

The number of sample may depend on the budget or time though larger number is better. Or meeting with farmer beneficiaries in a manner of workshop is one way of collecting basic data. A sample form of farm economy survey is attached in Appendix A.4.

2.3 Formulation of Farming Plan

What kind of farming system will be applied with the irrigation development project? The project enables to introduce high efficiency farming system, but are the farmers able to afford such expensive farming system? Primary beneficiaries of the project are the farmers. Therefore, what they want to do is to come first. To estimate economic benefits, farming system with the project must be planned with comprehensive consideration.

What should be included in farming plan are kind of crops, cropping area, way of operation (by machine or man-power, individual work or cooperative work), procurement of inputs (individual or cooperative) etc. All these aspects can be outlined in a sample form of Table 8.2.

Table 8.2 Sample Form to Outline Farming Plan

Farming Type	Paddy	Project Type	Large Size Upper land	Machinery	Large size	Summary												Remark
Item	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec												Benefit Area by Crop					
Cropping Pattern													Paddy 30.0 ha Vegetable 8.5 ha					
	Operation	Rice Seeding (man-power, P-tiller(7.5ps)) Fertilization (man-power) Plowing (Tractor(50ps)) Puddling (Tractor(50ps)) Leveling (man-power) Transplant. planter (4lines) Weeding (man-power) Spraying (man-power, p-sprayer) Top-dressing (man-power) Irrigation (man-power) Harvsting Hauling Threshing (Combine (4lines)) Transport (man-power, tractor-track) Milling (Dryer, Rice-mill)	Vegetable Plowing (Tractor(50ps), Plow) Rotary (Tractor(50ps), Rotary) Fertilizer (man-power) Seeding (man-power) Transplant. (man-power) Pest Cont. (Handsprayer) Harvesting (man-power)															
Farming Group	Size of Group	Area	Machines			Organization of Machinery Operation												
		30.0 ha	Name	No.	Own/rent	Name	No.	Own/rent	Management	Operation								
No. of Farmers	26 households	Tractor (50ps)	2	Own	P-sprayer(100 liter)	1	Own	Village	Cooperation									
		Plow	2	Own	Combine(4lines)	1	Own											
		Rotary	2	Own														
		P-tiller(7.5ps)	1	Own														
		Planter(4lines)	1	Own														

Based on the area defined, farm economy survey and farming plan, cropping area by crop is summarized. Table 8.3 shows the summary of cropping area with and without project situations. The table will be the basis for estimating the total project benefit, which accrues from crop production.

Table 8.3 Cropping Area with / without Project

Condition		Without Project		With Project		Difference
Farm	Area (ha)	124.0ha		117.0ha		△7ha
Crop Season	Crop	Area	%	Area	%	Area
Summer Crop	Rice	108.0	87.1	117.0	100.0	9.0
	Vegetable	16.0	12.9	-	-	△16.0
			-		-	-
			-		-	-
			-		-	-
	Sub-total	124.0	100.0	117.0	100.0	△7.0
Winter Crop	Vegetable	-	-	50.0	42.7	50.0
		-	-	-	-	-
		-	-	-	-	-
		-	-	-	-	-
		-	-	-	-	-
	Sub-total	-	-	50.0	42.7	50.0
		124.0	100.0	167.0	142.7	43.0

2.4 Estimation of Net Incremental Benefit and Net Incremental Income

Net benefit is calculated by gross output minus production cost, which includes costs of seeds, fertilizers, pesticides, machinery costs, labor cost etc. Particular aspect in farming is family labor. Family labor can be priced as a part of production cost, although the farmers actually do not pay cash for themselves. Machinery costs include depreciation cost, which is a special arrangement in accounting the cost (see the box below). A format to summarize the production cost and output is shown in Table 8.4 below.

Machinery Cost

Machinery cost consists of fixed cost + operation cost and the fixed cost mainly consists of maintenance cost and depreciation cost (See detail explanation of fixed cost in Chapter 5). Depreciation is an accounting method to allocate the capital cost into annual cash flow all through the duration of capital. Basically depreciation is not applied when conducting cash flow analysis (see detail explanation of cash flow in Chapter 3). It is the normal procedure that when you buy a machine, the total purchasing price should be appropriated in the year of purchase. However, to estimate production cost per crop, machinery cost will be counted in the cost by applying depreciation.

Cash flow of machinery cost
basically applied

Year	Capital	O&M
1	100000	50
2		50
3		50
4		50
5		50

Cash flow with depreciation

Year	Capital	O&M
1	20000	50
2	20000	50
3	20000	50
4	20000	50
5	20000	50

When we investigate the productivity of capital, family labor should be included in the cost. On the other hand, from farmers' point of view, family labor is not a cash expense. Here we shall define the net benefit excluding family labor value as Net Income. This will be used for financial analysis and net benefit (including family labor value) is used for economic analysis. Financial and economic analyses are discussed in Chapter 4.

Costs for agriculture production further consists of another elements such as land rent and interest for capital, which can be also included in the production cost. In this guideline, if there are target farmer beneficiaries, who are renting land and borrowing considerable capital, the rent and interest actually paid will be included in the production cost (Details are explained in the box below). Definition of Production Cost

Production cost is defined as total economic value consumed to produce an output. Household farm management involves rather particular issues in estimating production cost like family labor or rent of one's own farmland. There are several ways of defining agricultural production cost as below.

(A): Production cost 1: Farm inputs + Labor

(Labor = family labor value + cost of hired labor)

(B): Production cost 2: Farm inputs + Labor + Rent + Interest of capital

(Rent = value of rent of own land + actually paid rent to landowner)

(Interest = value of own capital + actually paid interest to creditor)

(C): Production cost as an enterprise:

= Farm inputs + Hired labor + Paid rent + Paid interest

This guideline shall define net income and benefit as follows:

Net Income = Gross Output – (C)

Net Benefit = Gross Output – (A)

When considering farm household as a firm, net benefit can be defined as Gross Output – (B), so that the benefit accruing from activity of firm can be strictly calculated. However, this definition will not be applied in this guideline, since calculating value of rent of own land and interest of own capital are difficult and apt to be arbitrary (Valuing of family labor could be say so, but family labor is too important to ignore in farm household economy).

Table 8.4 Sample Form for Estimation of Net Benefit and Income

Crop: Rice (High Yield Variety: Neda)

(Unit: Rls/ha)

	Unit Price	Unit	Without Project		With Project		Incremental Case 1
			Quantity	Output/Cost	Quantity	Cost	
<i>I. Produce</i>							
Major Products (milled)	4,000	Rls/kg	4,160	16,640,000	4,160	16,640,000	-
By-products	325	Rls/kg	650	211,250	650	211,250	-
Total Output (a)				16,851,250		16,851,250	-
<i>II. Production Cost (M (Material))</i>							
1. Seed	3,500	Rls/kg	53	185,500	53	185,500	-
2. Fertilizer							
Manure	2,200	Rls/t	0.14	308	0.14	308	-
Phosphate	380	Rls/kg	208	79,040	208	79,040	-
Urea	320	Rls/kg	247	79,040	247	79,040	-
Potassium	500	Rls/kg	11	5,500	11	5,500	-
3. Pesticide							
Herbicide	30,000	Rls/lit.	3.3	99,000	3.3	99,000	-
Insecticide	8,000	Rls/kg	28.2	225,600	28.2	225,600	-
Fungicide	30,000	Rls/kg	0.2	6,000	0.2	6,000	-
4. Other Material							-
5. Irrigation Fee							-
6. Machinery Cost				1,904,160		1,645,157	-259,003
Tractor (Rent)	800,000	Rls/ha	1	800,000	1	800,000	-
Combine (Rent)	5	% of harvest		832,000		832,000	-
Pick up (0.6t) (Rent)	50,000	Rls/time	11	550,000	11	550,000	-
Sub-total				4,766,148		4,507,145	-259,003
<i>(Labor)</i>							
Family Labor	15,000	Rls/hr	393	5,895,000	352	5,280,000	-615,000
Hired Labor	15,000	Rls/hr	266	3,990,000	252	3,780,000	-210,000
Total Cost (Family Labor excluded) (b)				8,756,148		8,287,145	-469,003
Total Cost (Family labor included) (c)				14,651,148		13,567,145	-1,084,003
Net Income: a-b				8,095,102		8,564,105	469,003
Net Income Ratio: (a-b)/a (%)				48.0		50.8	
Net Benefit: a-c				2,200,102		3,284,105	1,084,003
Net Benefit Ratio: (a-c)/c (%)				13.1		19.5	

When gross outputs and production costs with and without project situations are estimated, the Net Incremental Benefit (Net Benefit with Project – Net Benefit without Project) and Income will be calculated and that will be the benefit of the project. The total benefit of crop production consists of both increase of crop production and reduction of farming cost. Detail calculation is carried out in Chapter 5 Case Study.

We should also consider if the yield increase could achieve at maximum level in a year. Very often it is assumed that yield increase with project may take 3 to 5 years. The sample flow of net benefit is shown in Table 8.5. Or for example, if crop production in the future can be reliably predicted to decrease without project due to deterioration of existing agricultural facilities, the net benefit without project should also be calculated according to year. Figure 8.5 is the samples of several types of project benefit as it has been discussed.

Table 8.5 Sample of Crop Production Model for Estimation of Net Benefit and Income

Input-Output		(Sample in Egypt)						
Crop Name: Rice								
Item	Unit	Unit Price L.E	W/O Yield & Input per Fed.	W/O.P Sit. Value/fed	With Project Situation			
					Yr.1 L.E	Yr.2 L.E	Yr.3 L.E	Full benefit L.E
A-INCOME:			Yield Increase	Achivement	30%	60%	80%	100%
Main product(Grain)	ton	397.00	3.20	1270.40	1377.59	1484.78	1556.24	1627.70
Second product	caml/load	4.40	8.00	35.20	38.19	41.14	43.12	45.10
Green fodder	per fed.	0.00	0.00	0.00				
TOTAL GROSS INCOME				1305.60	1415.78	1525.92	1599.36	1672.8
B-COSTS OF PRODUCTION:								
1-Non Yield Dependent Costs								
Machinery:								
Soil Prep.(Tractor)	hour	38.00	2.00	76.00	76.00	76.00	76.00	76.00
Pumpset(Irrigation)	hour	3.33	70.00	233.10	0.00	0.00	0.00	0.00
Seed	kg	0.88	65.00	57.20	57.20	57.20	57.20	57.20
Fertilizer:								
N	kg	1.67	60.00	100.20	100.20	100.20	100.20	100.20
P205	kg	1.51	20.00	30.20	30.20	30.20	30.20	30.20
K	kg	1.16	0.00	0.00	0.00	0.00	0.00	0.00
Other								
Manure:	m3	2.11	5.00	10.55	10.55	10.55	10.55	10.55
Insecticides	liter	30.80	1.00	30.80	30.80	30.80	30.80	30.80
Fungicides	liter	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Herbicides	liter	19.36	2.00	38.72	38.72	38.72	38.72	38.72
Sprayer	hour	2.81	6.00	16.86	16.86	16.86	16.86	16.86
Animal work:								
Cultivation	cow/hour	1.23	10.00	12.30	12.30	12.30	12.30	12.30
Manure transportarion	donk/hour	0.62	12.50	7.75	7.75	7.75	7.75	7.75
Labor cost:								
Family labor	man/hour	0.79	120.00	94.80	99.60	99.60	99.60	99.60
Hired labor	man/hour	0.79	52.00	41.08	43.16	43.16	43.16	43.16
Sub-Total		0.83	0.00	749.56	523.34	523.34	523.34	523.34
2-Yield Deventent Costs:								
Labor for harvesting, threshing, winnowing etc.:								
Family labor	man/hour	0.79	63.00	49.77	56.70	61.11	64.06	67.00
Hired labor	man/hour	0.79	27.00	21.33	24.30	26.19	27.45	28.71
Machine threshing	hour	13.00	2.00	26.00	28.19	30.39	31.85	33.31
Machine winnowing	hour	11.00	2.00	22.00	23.86	25.71	26.95	28.19
Animal transportation	donk/hour	0.62	23.00	14.26	15.46	16.67	17.47	18.27
Sub-Total				133.36	148.51	160.07	167.78	175.48
Other material	10%			88.00	90.50	91.65	92.42	93.19
3-Grand Total Costs				970.92	762.35	775.06	783.54	792.01
				(826.35)	(606.05)	(614.35)	(619.88)	(625.41)
C-NET BENEFIT(L.E per Fed.)				334.68	653.43	750.86	815.82	880.79
D-NET BENEFIT RATIO(%)				25.6	46.2	49.2	51.0	52.7
E-INCREMENTAL DIFFERENCE(L.E per Fed.)					318.75	416.18	481.14	546.11
F-NET INCOME(L.E per Fed.)				479.25	809.73	911.57	979.48	1047.39

Note: () = production cost without family labor cost

L.E. = Egyptian currency

Feddan = 1 acre (about 0.4ha)

2.5 Reduction of Maintenance Cost

Reduction of Maintenance cost with irrigation development projects is accounted for clearing canal, canal maintenance etc. The benefit may become minus due to added new facilities. Detail calculation is carried out in Chapter 5

3. DECISION CRITERIA AND THEIR CALCULATIONS

To justify if an investment is economically feasible, or which project should be put in the first priority, generally three decision criteria, Net Present Value (NPV), Cost-Benefit Ratio (B/C) and Internal Rate of Return (IRR) are used. To introduce these criteria, it is necessary to understand basic concepts such as time value of money and opportunity cost. Discussion in this chapter commences with descriptions of such concepts.

3.1 Basic Concept and Utility

3.1.1 Time Value of Money

Is today's value of 1,000SSP same after one year? Or is the value of 1,000SSP one year after same as today? When we deposit money in a bank, the bank will pay you interest. Suppose interest rate of the bank deposit is 10% and you deposit 1,000SSP today, you will receive 1,100SSP after one year. When we deposit money in a bank or lend somebody, we normally expect interest.

Interest can be considered that it is a reward for your surrender of spending money at this time instead of lending somebody. In another way, when you lend money to somebody or deposit in a bank, they may invest the money to some activities like commerce, or agriculture etc. and they may earn profit. It means that you sacrificed an opportunity to invest your own money and gave the opportunity to somebody. Interest is considered as the reward of giving your opportunity to somebody. When the interest of the bank deposit is 10%, present value of 1,000SSP will increase as the below Table 8.6:

Table 8.6 Adding Interest to the Future

<u>Year</u>	<u>Beginning of year</u>		<u>Interest</u>		<u>End of year</u>	<u>Compound</u>
			<u>rate</u>			<u>Interest Rate</u>
Present					1,000.0	
1 st year	1,000.0	×	1.10	=	1,100.0	1.1000
2 nd year	1,100.0	×	1.10	=	1,210.0	1.2100
3 rd year	1,210.0	×	1.10	=	1,331.0	1.3310
4 th year	1,331.0	×	1.10	=	1,464.1	1.4641
5 th year	1,464.1	×	1.10	=	1,610.5	1.6105

Table 8.6 shows that the value of 1,100SSP in 1st year (end of year) is equivalent to the present value of 1,000SSP. Likewise the value of 1,210SSP in 2nd year, 1,331SSP in 3rd year,...., are equivalent to the present value of 1,000SSP. The same implication above can be expressed as following Table 8.7. The value of 1,000SSP in 2nd year, 3rd year,...., can be converted to the present value dividing by compound interest rate in each year.

Table 8.7 Present Value of Each Year

<u>Year</u>	<u>End of year</u>		<u>Compound</u> <u>Interest rate</u>		<u>Present Value</u>
Present					1,000.0
1 st year	1,000.0	÷	1.1000	=	909.1
		(×)	(0.9091)		
2 nd year	1,000.0	÷	1.2100	=	826.4
		(×)	(0.8264)		
3 rd year	1,000.0	÷	1.3310	=	751.3
		(×)	(0.7513)		
4 th year	1,000.0	÷	1.4641	=	683.0
		(×)	(0.6830)		
5 th year	1,000.0	÷	1.6105	=	620.9
		(×)	(0.6209)		

Table 8.7 above shows that the value of 1,000SSP in 1st year is equivalent to the present value of 909.1SSP. Likewise the value of 1,000SSP in 2nd year is equivalent to the present value of 826.4SSP, the value of 1,000SSP in 3rd year is equivalent to the present value of 751.3SSP,... This may more clearly indicate the implication that the future value of money is less than present. The value of money at present is higher than that of future, because you can invest the money at present in some activities and receive some benefit, but not with the money in the future right now.

The process of finding the present value of future price as above is called “discounting”. The interest rate assumed for discounting is, therefore, called “discount rate”. The difference of the term between interest rate and discount rate is only the point of view. The term “interest rate” is used when standing on a viewpoint from present to the future, whereas “discount rate” is used on the viewpoint from future to the present. A discount rate is, therefore, the reciprocal of an interest rate and its application allows future costs and benefits to be expressed in terms of present value. The calculation of future value to the present value is expressed in a formula below.

$$P = \frac{A_n}{(1 + i)^n}$$

P: Present Value

A_n: Value in the year n

i: Discount Rate

n: Year

Present = P

End of 1st year: A₁ = (1 + i)P

End of 2nd year: A₂ = (1 + i)A₁ = (1 + i)(1 + i)P = (1 + i)²P

$$\begin{aligned} \text{End of 3}^{\text{rd}} \text{ year: } A_3 &= (1+i)A_2 = (1+i)(1+i)^2P = (1+i)^3P \\ &\vdots \\ \text{End of year } n: A_n &= (1+i)A_{n-1} = (1+i)(1+i)^{n-1}P = (1+i)^nP \\ \text{Therefore, } P &= \frac{A_n}{(1+i)^n} \end{aligned}$$

In the formula, $1/(1+i)^n$ is called “Present Value Factor” at discount rate of i . List of the present value factor by different discount rates is summarized in Appendix A.5 Conversion Tables. To discount future price into the present value, using the conversion table is convenient.

3.1.2 Opportunity Cost

In economic analysis, all costs and benefits should be valued at their opportunity cost of the country in which the project will be located. Opportunity cost is defined as “the maximum alternative benefit forgone (sacrificed) (UNIDO, 1992)”. For example, you will buy fertilizer for 1,000SSP and use the fertilizer for increasing paddy production. Suppose you get benefit of 1,300SSP from the investment of the fertilizer in paddy crop. Also suppose that instead of paddy, you invest the fertilizer in wheat crop or potato crop and get the benefit of 1,200SSP and 1,100SSP respectively. Normally the cost for increasing paddy production is counted for 1,000SSP, which is the price of the fertilizer and it is called “nominal cost”. However, in terms of “opportunity cost”, the cost is estimated as “the maximum alternative benefit forgone”, namely in this case, the benefit of wheat crop using the fertilizer, 1,200SSP, is counted for the opportunity cost. Figure 8.5 shows the concept of opportunity cost.

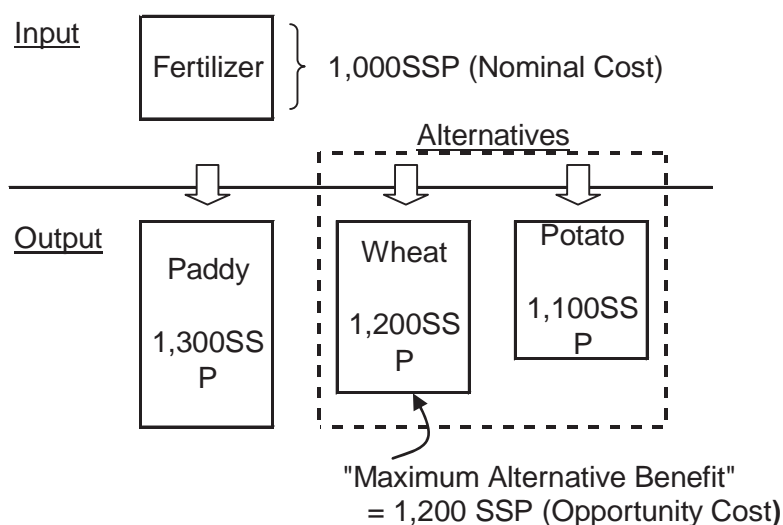


Figure 8.5 Concept of Opportunity Cost

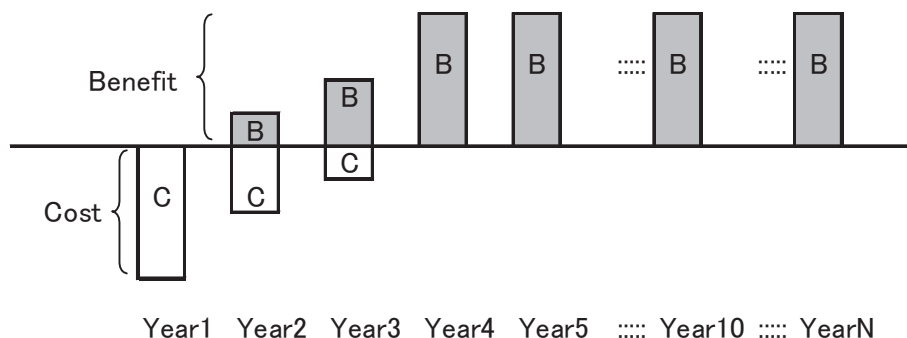
3.1.3 Cash Flow Sheet

Cash flow sheet is a basis for calculating NPV, B/C ratio and IRR. Project cost is normally invested for the first few years and the benefit will occur accordingly and the benefit is expected to last until the end of the project life. There are also cases that replacement cost will be invested after some years of project commencement and/or operation and maintenance (O&M) cost will be spent every year. To express the flow of these cost and benefit streams, cash flow sheet is prepared.

For example of land consolidation projects, the project cost would be spent for the first three years and yield increase would occur from the second year and achieve the full-expected yield increase in 3 years. Irrigation using shallow well would need oil and repair costs every year and also replacement of

pump every ten years. These situations are described as Figure 8.6:

Sample1: Land Consolidation Project



Sample2: Shallow Well Irrigation Project

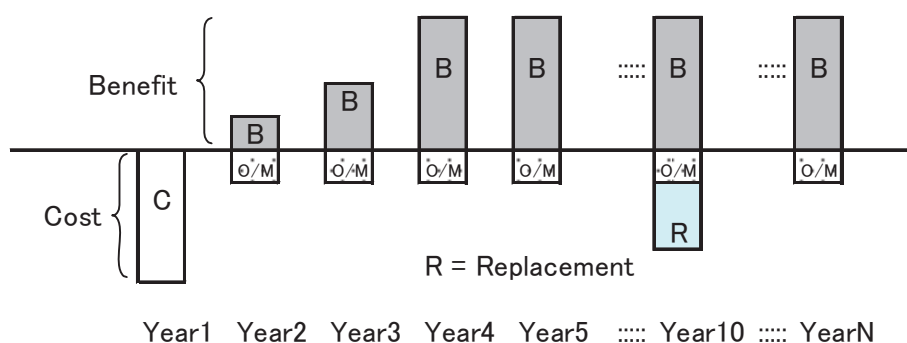


Figure 8.6 Cash Flow of Cost and Benefit

With the cash flow sheet, total cost and benefit can be easily counted. Yet, as discussed above, value of future price should be expressed at present value. Therefore, the benefits and costs in the future have to be discounted to the present value. Cash flow is basically prepared up to the end of project life. The sample of cash flow sheet is shown below. Totaling each cost and benefit of the present value in 40 years is the present value of the cost and benefit.

Table 8.8 Cash Flow Sheet (Discount Rate = 10%, Project life 40 years)

Year	Cost	Benefit	Present Value Factor	Present Value	
				Cost	Benefit
1	100,000		0.9091	90,910	
2	5,000	4,000	0.8264	4,132	3,306
3	2,000	8,000	0.7513	1,503	6,010
4		12,000	0.6830		8,196
5		12,000	0.6209		7,451
::	
40		12,000	0.0221		265
Total	107,000	456,000		96,545	96,819

3.2 Decision Criteria

In this section, the definitions, formulae, and characteristics of three decision criteria, namely Net Present Value (NPV), Cost-Benefit Ratio (B/C), and Internal Rate of Return (IRR) are discussed.

3.2.1 Net Present Value (NPV)

Net Present Value (NPV) is defined as the present value of net incremental benefit, namely total

benefit minus total cost at present value is defined as NPV. If NPV of a project is more than zero, the project is economically feasible. Following is the formula to calculate NPV.

$$NPV = \sum_{t=1}^n \frac{B_t}{(1+i)^t} - \sum_{t=1}^n \frac{C_t}{(1+i)^t}$$

If $(NPV) > 0$, project is feasible.

For the cash flow sheet above, NPV is calculated as:

$$NPV = 96,819 - 96,545 = 274$$

3.2.2 Cost – Benefit Ratio (B/C Ratio)

Benefit-Cost Ratio (B/C Ratio) is the ratio obtained when the present value of benefit is divided by the present value of cost. If B/C ratio of a project is more than 1, the project is economically feasible. The formula is as follows:

$$B/C \text{ Ratio} = \frac{\sum_{t=1}^n \frac{B_t}{(1+i)^t}}{\sum_{t=1}^n \frac{C_t}{(1+i)^t}}$$

If $(B/C) > 1$, project is feasible.

For the cash flow sheet above, B/C Ratio is calculated as:

$$B/C \text{ Ratio} = 96,819 / 96,545 = 1.003$$

3.2.3 Internal Rate of Return (IRR)

Prior to the calculation of NPV and B/C Ratio, it is necessary to decide the discount rate in calculating these criteria and the results of calculation differ by applied discount rate. For the case above, 10% of discount rate was applied to calculate NPV and B/C Ratio, but for example, if 5% and 15% of discount rates are applied for the same cash flow sheet, the results of NPV and B/C ratio change as summarized in Table 8.9 (also see Tables 8.10 and 8.11):

Table 8.9 Summary of NPV and B/C Ratio by Different Discount Rates

Discount rate	5%	10%	15%
NPV	82,263	274	-31,470
B/C ratio	1.81	1.003	0.66

Table 8.10 Cash Flow Sheet (Discount Rate = 5%, Project life 40 years)

Year	Cost	Benefit	Present Value Factor	Present Value	
				Cost	Benefit
1	100,000		0.9524	95,240	0
2	5,000	4,000	0.9070	4,535	3,628
3	2,000	8,000	0.8638	1,728	6,910
4		12,000	0.8227		9,872
5		12,000	0.7835		9,402

::		::::	::::		::::
40		12,000	0.1420		1,704
Total	107,000	456,000		101,503	183,766

Table 8.11 Cash Flow Sheet (Discount Rate = 15%, Project life 40 years)

Year	Cost	Benefit	Present Value Factor	Present Value	
				Cost	Benefit
1	100,000		0.8696	86,960	0
2	5,000	4,000	0.7561	3,781	3,024
3	2,000	8,000	0.6575	1,315	5,260
4		12,000	0.5718		6,862
5		12,000	0.4972		5,966
::		::::	::::		::::
40		12,000	0.0037		44
Total	107,000	456,000		92,056	60,585

Setting discount rate is a crucial issue since it strongly affects the result of evaluation as above. As for Internal Rate of Return (IRR), it is defined as the ratio to make the present value of total benefit equal to the present value of total cost. In another word, IRR is the discount rate to make NPV = 0 or B/C Ratio =1. Following is the formula and Figure 8.7 shows the concept of IRR.

$$\text{When, } \sum_{t=1}^n \frac{B_t}{(1+i)^t} = \sum_{t=1}^n \frac{C_t}{(1+i)^t} \quad i = \text{IRR}$$

$$\text{Or, } \sum_{t=1}^n \frac{B_t}{(1+i)^t} - \sum_{t=1}^n \frac{C_t}{(1+i)^t} = 0 \quad i = \text{IRR}$$

If (IRR) > Long term interest (for financial analysis) / Opportunity cost of capital (for economic analysis)*, project is feasible. (* Opportunity cost of capital is discussed in 3.2.4 and financial and economic analyses are discussed in Chapter 4)

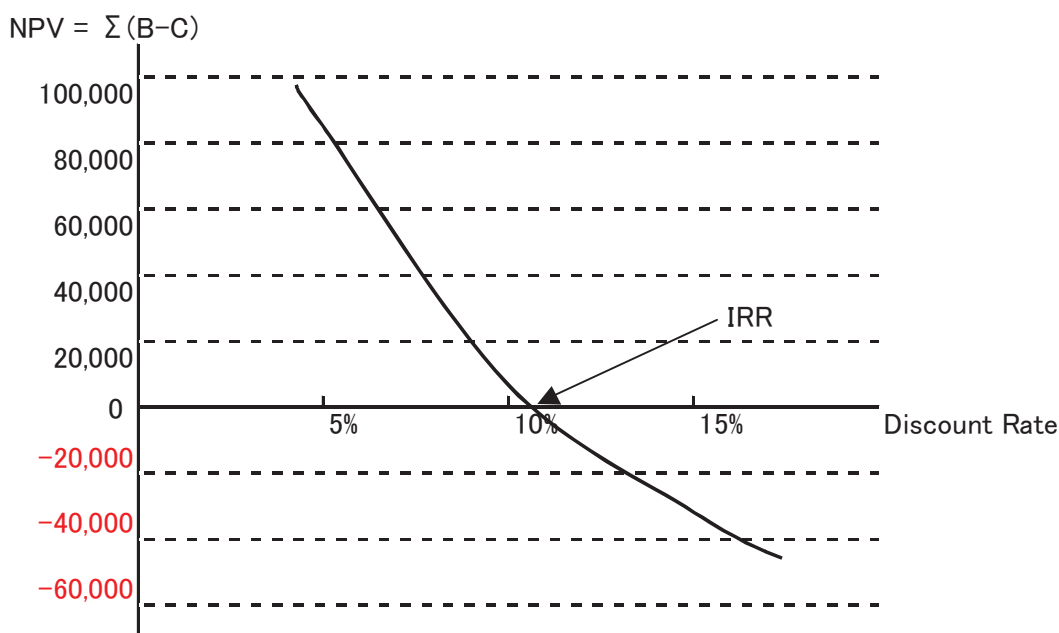


Figure 8.7 Concept of Internal Rate Of Return (IRR)

Procedure of calculating IRR is a trial and error process. Firstly decide a discount rate randomly and

calculate NPV. If NPV is more than 0, apply higher discount rate and calculate NPV again and if NPV is minus, apply lower discount rate. By repeating this process, IRR will be found out. If it is a big amount of investment, NPV is not necessarily exactly 0 but approximate. Table 8.12 shows the process of calculating IRR.

Table 8.12 Calculation Process of IRR

Year	Cost	Benefit	Present Value		Present Value		Present Value		Present Value	
			Discount rate	5%	Discount rate	10%	Discount rate	11%	Discount rate	10.03%
1	100,000		95,238	0	90,909	0	90,090	0	90,885	0
2	5,000	4,000	4,535	3,628	4,132	3,306	4,058	3,246	4,130	3,304
3	2,000	8,000	1,728	6,911	1,503	6,011	1,462	5,850	1,501	6,006
4		12,000	0	9,872	0	8,196	0	7,905	0	8,187
5		12,000	0	9,402	0	7,451	0	7,121	0	7,441
6		12,000	0	8,955	0	6,774	0	6,416	0	6,763
7		12,000	0	8,528	0	6,158	0	5,780	0	6,146
8		12,000	0	8,122	0	5,598	0	5,207	0	5,586
9		12,000	0	7,735	0	5,089	0	4,691	0	5,077
10		12,000	0	7,367	0	4,627	0	4,226	0	4,614
11		12,000	0	7,016	0	4,206	0	3,807	0	4,194
12		12,000	0	6,682	0	3,824	0	3,430	0	3,811
13		12,000	0	6,364	0	3,476	0	3,090	0	3,464
14		12,000	0	6,061	0	3,160	0	2,784	0	3,148
15		12,000	0	5,772	0	2,873	0	2,508	0	2,861
16		12,000	0	5,497	0	2,612	0	2,260	0	2,600
17		12,000	0	5,236	0	2,374	0	2,036	0	2,363
18		12,000	0	4,986	0	2,158	0	1,834	0	2,148
19		12,000	0	4,749	0	1,962	0	1,652	0	1,952
20		12,000	0	4,523	0	1,784	0	1,488	0	1,774
21		12,000	0	4,307	0	1,622	0	1,341	0	1,613
22		12,000	0	4,102	0	1,474	0	1,208	0	1,466
23		12,000	0	3,907	0	1,340	0	1,088	0	1,332
24		12,000	0	3,721	0	1,218	0	980	0	1,211
25		12,000	0	3,544	0	1,108	0	883	0	1,100
26		12,000	0	3,375	0	1,007	0	796	0	1,000
27		12,000	0	3,214	0	915	0	717	0	909
28		12,000	0	3,061	0	832	0	646	0	826
29		12,000	0	2,915	0	756	0	582	0	751
30		12,000	0	2,777	0	688	0	524	0	682
31		12,000	0	2,644	0	625	0	472	0	620
32		12,000	0	2,518	0	568	0	425	0	564
33		12,000	0	2,398	0	517	0	383	0	512
34		12,000	0	2,284	0	470	0	345	0	465
35		12,000	0	2,175	0	427	0	311	0	423
36		12,000	0	2,072	0	388	0	280	0	384
37		12,000	0	1,973	0	353	0	252	0	349
38		12,000	0	1,879	0	321	0	227	0	318
39		12,000	0	1,790	0	292	0	205	0	289
40		12,000	0	1,705	0	265	0	185	0	262
Total	107,000	456,000	101,501	183,767	96,544	96,825	95,610	87,181	96,516	96,515
			NPV =	82,266	NPV =	281	NPV =	-8,429	NPV =	-1

To approximate IRR, following formula is applied.

$$\text{Approximate IRR} = i_1 + (i_2 - i_1) \times \frac{[P_1]}{[P_1] + [P_2]}$$

P: NPV
i: discount rate

[] : Absolute value of NPV at discount rate of i_t

Applying this formula, IRR above Table 8.12 is calculated as follows:

$$\text{IRR} = 10 + (11 - 10) \times \frac{281}{281 + 8,429} = 10.03\%$$

If the distance between i_1 and i_2 is far, accuracy of calculation becomes less (Distance between True IRR and Approximate IRR becomes far: see Figure 8.8).

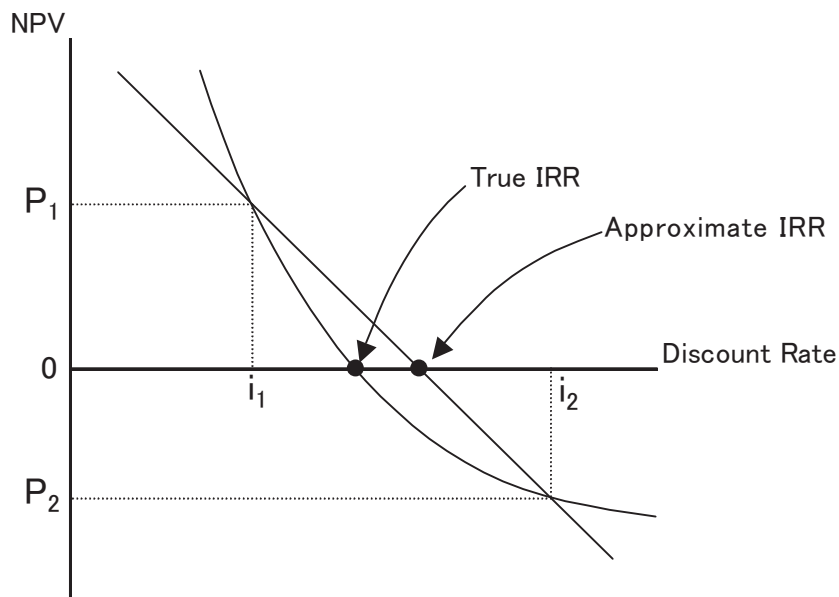
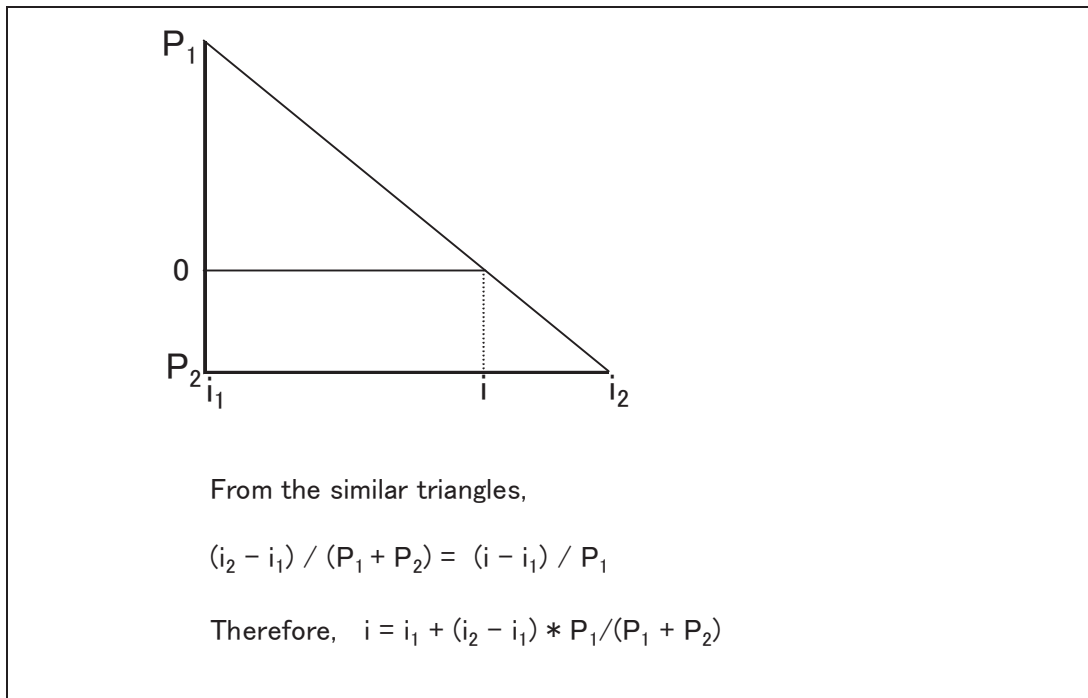


Figure 8.8 Approximating IRR

For the calculation of IRR, “Microsoft Excel” has the function to calculate IRR. Figure 8.9 below shows the sample use of IRR function in Excel.

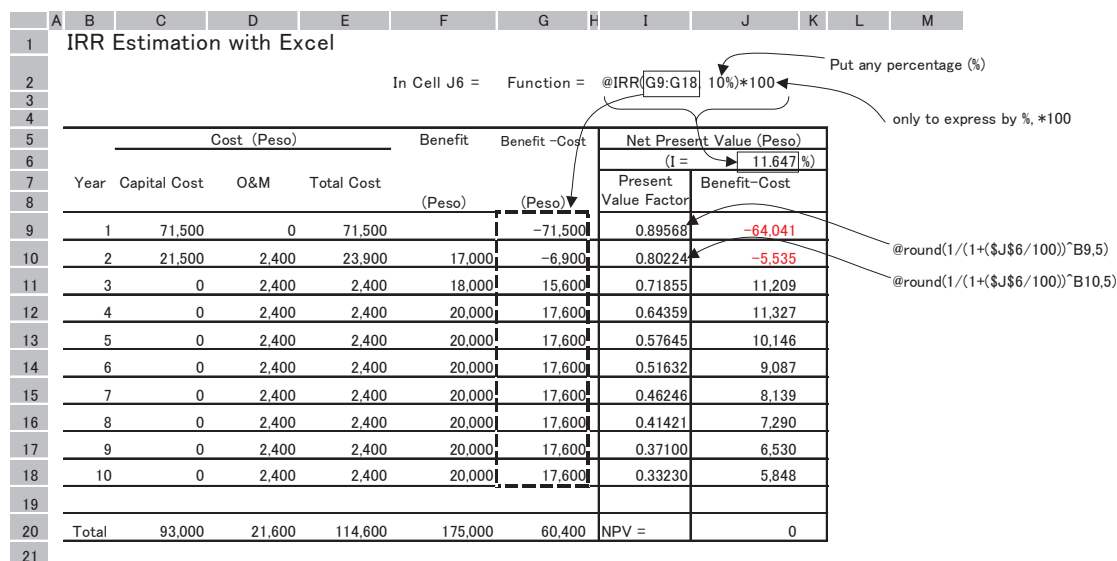


Figure 8.9 Sample Use of IRR Function in Excel

3.2.4 Opportunity Cost of Capital

When IRR is used for economic evaluation, IRR is compared with the opportunity cost of capital in the country. This section explains the definition of opportunity cost of capital.

As it has been explained that opportunity cost is “the maximum alternative benefit forgone”, the opportunity cost of capital is accordingly defined as “the maximum alternative benefit of the project among the ones forgone (that will not be implemented)”.

Suppose you invest your capital in a project under limited budget condition. Instead of investing the capital in the project, you may give up to implement some other projects due to limited budget. The maximum benefit of the project among the ones you gave up is, therefore, the opportunity cost of capital. In another word, the opportunity cost of capital is the marginal profitability of capital in allocating a limited resource of a country.

Amount of opportunity cost of capital is usually expressed by percentage, since the benefit that accrues from capital is focused as the ratio of benefit to the capital. For example, benefit of loan, which is the benefit of capital, is expressed as interest rate. IRR is the benefit of the project expressed by percentage.

Suppose that a government has the capital (budget) of 1,000 to invest in projects and there are 6 planned projects (From Project A to Project F) with IRR from 20% to 10% (see Figure 8.10 below). Projects are prioritized in order of higher IRR. Now with the limited budget of the government, project D with IRR of 13% is lastly selected to utilize the government’s capital most efficiently and Project E and F will be given up. The opportunity of capital in the country is therefore considered 12%, which is the maximum opportunity cost of capital among the given up projects.

Government's Budget = 1,000

	Cost	IRR	Acc. Cost	
Project A	250	20%	250	
Project B	250	18%	500	
Project C	250	15%	750	
Project D	250	13%	1,000	Government can afford by Project D
Project E	250	12%	1,250	
Project F	250	10%	1,500	

Opportunity Cost of Capital

Figure 8.10 Opportunity Cost of Capital

Calculating opportunity cost of capital is actually very difficult, since all the possible projects have to be picked up with their IRR in the country. Also the opportunity cost of capital will be considered by sector as well. As reference, Overseas Development Administration (ODA) in England presumed the opportunity cost of capital in some countries as follows:

India (Industry)	10 ~ 12%
Pakistan (Agr. Ind.)	10%
Bangladesh (Industry)	15%
Nepal (Transport, Agr.)	8%
Egypt (Industry)	8%
Zambia (Transport)	10%

For financial analysis, the discount rate, for which the analysis is being done, is usually the marginal cost of money to the farm or firm. This will be often the rate at which the enterprise is able to borrow money. Discount rate to use for economic analysis should be, yet, the opportunity cost of capital.

3.2.5 Characteristics of Each Decision Criterion

Hereunder describes the characteristics of the decision criteria:

1) NPV :

Discount rate must be decided prior to calculate NPV. Decision of what kind of discount rate to apply is one of the most bothering issues for economic analysis. Generally if it is a case of private firm investment, actual capital market rate will be applied, and in case the project is implemented by borrowed money, the interest rate for the borrowed money will be applied and if it is analyzed in terms of national economy, opportunity cost of capital will be the discount rate.

2) B/C Ratio :

Same as NPV, discount rate has to be decided prior to the calculation. Another point with B/C Ratio is the fact that categorization of benefit and cost will give different results in B/C ratio and it does not happen for NPV (see Table 8.13 below).

3) IRR:

Unlike NPV and B/C ratio, finding out the fixed discount rate itself is the target for IRR calculation. IRR is a good method to prioritize projects, since the value will not change by such a way of applying different discount rates. Also IRR indicates the productivity of capital. However, IRR will not be a unique number in case minus value occurs somewhere in the middle of the cash flow sheet (Case that there is a big investment somewhere in the middle of the project life). Table 8.14 shows the case that

there are two IRRs which make NPV = 0. Both IRRs are true.

Table 8.13 Calculation of B/C ratio with Gross Benefit and Net Benefit

(1/2) B/C Ratio Calculation on Gross Benefit Basis

Yr	Cost					Benefit			
	Investment	O&M	Production Cost	Total	Discount Rate (15%)	Present Value	Sales	Discount Rate (15%)	Present Value
1	20			20	0.870	17.40		0.870	0.00
2	30			30	0.756	22.68		0.756	0.00
3		4	70	74	0.658	48.69	100	0.658	65.80
4		4	70	74	0.572	42.33	100	0.572	57.20
5		4	70	74	0.497	36.78	100	0.497	49.70
6		4	70	74	0.432	31.97	100	0.432	43.20
Total						199.85			215.90

$$\text{B/C Ratio} = 215.90/199.85 = 1.08$$

$$\text{NPV} = 215.90 - 199.85 = 16.05$$

(2/2) B/C Ratio Calculation on Net Benefit Basis

Yr	Cost					Benefit				
	Investment	O&M	Total	Discount Rate (15%)	Present Value	Sales	Production Cost	Net Benefit	Discount Rate (15%)	Present Value
1	20		20	0.870	17.40				0.870	0.00
2	30		30	0.756	22.68				0.756	0.00
3		4	4	0.658	2.63	100	70	30	0.658	19.74
4		4	4	0.572	2.29	100	70	30	0.572	17.16
5		4	4	0.497	1.99	100	70	30	0.497	14.91
6		4	4	0.432	1.73	100	70	30	0.432	12.96
Total					48.72					64.77

$$\text{B/C Ratio} = 64.77/48.72 = 1.33$$

$$\text{NPV} = 64.77 - 48.72 = 16.05$$

Table 8.14 A Case: Two IRRs are calculated

Yr	Net Benefit	i = 100%	Present Value	i = 200%	Present Value
1	100	0.50000	50	0.333333	33.3333
2	-500	0.25000	-125	0.111111	-55.5556
3	600	0.12500	75	0.037037	22.2222
Total			0		0.0000

$$\text{IRR} = 100\% \text{ or } 200\%$$

Another issue is that IRR does not indicate the magnitude of present value of projects. For example, as Figure 8.11 below, Project B has higher IRR than Project A, but if the opportunity cost of capital in the country is 7%, the net present value of Project A at discount rate of 7% is higher than that of Project B, indicating bigger magnitude of benefits to the country by Project A.

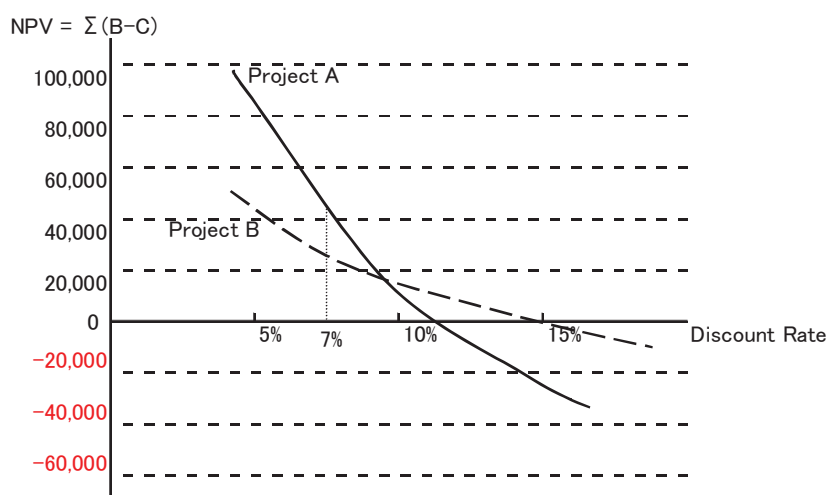


Figure 8.11 Small-scale with higher IRR and Large-scale with lower IRR

Following are the lists of countries or international organization according to their recommendation in economic evaluation method. Here for the irrigation development projects, it is recommended to apply IRR for decision criteria and also combine NPV in prioritizing numbers of projects or project areas.

Recommending or using frequently

NPV: UNIDO, ODA, USAID

IRR: World Bank, ADB

B/C Ratio: Ministry of Agriculture in Japan

< Reason for using NPV by UNIDO >

"In choosing projects we may follow the rule that all projects with an internal rate of return higher than the market rate of interest should be chosen. Alternatively, we may recommend that all projects with a positive present value should be selected. Does it make any difference which of the two rules we follow? The answer is No", not at all", so long as the present value always goes down as the discount rate is raised. Conflict arises in the point that the present value gives a measure of total gains, which the internal rate of return does not." (UNIDO, 1992)

< Reason for using NPV by ODA in England >

"IRR is often used as an alternative to the NPV criterion. The IRR is simply the discount rate which results in an NPV of zero and its use requires comparison with some minimum rate considered to be acceptable. Theoretical objections to its use are the assumption contained in the calculation of the IRR that net flows are reinvested, as they occur, at exactly the IRR, and the possibility that the IRR will not be a unique number. NPV is therefore preferable criterion on theoretical grounds and it also has the practical advantage that the trade-off between economic and other aspects of a project can be more readily approached

through the NPV. For these reasons this guide recommends the use of the NPV as the decision criterion in economic appraisal.” (ODA, 1997)

4. ECONOMIC AND FINANCIAL ANALYSES

4.1 Definitions of Economic and Financial Analyses

The most interesting issue for private firm will be how much they will get the profits with the project comparing to the situation without the project. But for the national economic view, the issue will be the effective and efficient use of limited national resources. Market price under perfect competition will give the most appropriate value (opportunity cost) of the goods and services, so that the price at the market will become a signal to the government to allocate their limited resources most effectively and efficiently, in another word, optimally.

However, it is the understanding that in actual situation, there is a distortion in the actual market, hence actual market price cannot be a good signal (If the price of a goods at the market is higher than its real value and there is no way to discount, it means you are spending extra money to buy the goods. You could have bought another goods with that extra expense. Here allocation of your resource (your money) is not optimal). Government policy also distorts market by subsidy, tax allocation, setting minimum wage rate, controlling foreign exchange rate etc.

For these reasons, it is thought in economic analysis of projects that the price at the actual market should be converted into somehow appropriate value for the sake of national economy. Price converted from market price (it is also called “Financial Price”) is called “Economic Price”(also called accounting price), which will be the price to express the value of the goods and services under perfect competition market leading to optimal and efficient use of limited resources (Definition of perfect competition is shown in box in 4.2.2).

Private firm will follow the actual prices in the market no matter how much the prices are distorted. Private firm will (or must) try to maximize their profits under actual market situation. Here we call the analysis from viewpoint of private sector “Financial Analysis” using market price (financial price) and the analysis from national economic viewpoint “Economic Analysis” using economic price.

The items to consider in economic analysis are as follows:

- Transfer payments
- Production Goods (Traded Goods and Non-traded Goods)
- Labor
- Land etc.

In practice, traded goods at international market are considered to be more rational and reflect the true price of goods than non-traded goods that are only traded in internal market, because the international market is considered most competitive among the existing markets in the world (most close to the market under perfect competition).

The international market price (It is called border price as the price is expressed at the border of the countries) is a better measure of opportunity cost than domestic price. For many countries, international trade is of great significance, and many investment projects have a high content of imports and exports. Several factors make domestic price unsuitable as an indicator of relative opportunity cost without a lot of adjustment. Import tariffs, indirect taxes, overvalued exchange rates, subsidies, overstated labor costs, monopoly prices and other forms of administrative intervention affect the (internal) market price of very many products and services.

4.2 Calculation of Economic Price

4.2.1 Elimination of Transfer Payments etc.

When calculating economic cost, only resources inputted in the project will be accounted as cost, in another word, transfer payments are eliminated in calculating economic cost. Transfer payments are “command over resources from one party to another without reducing or increasing the amount resources available as a whole” (ADB, 1997). Taxes, duties, subsidies are considered to be transfer payments. These are the command of the government for transferring the resources from one to another. In another word, economic analysis is carried out in such a world without governments. Government is the distortion factor for the market. Following are explanations.

1) Taxes

In economic analysis, taxes are transfer payments within a society, not the payment for resources used for project. Hence, tax is eliminated from cost. For private firm, taxes are obviously actual expenditures, hence it is considered as costs. However, from a viewpoint of national economy, taxes are just transfer of cost from firm to government (among the members of the society).

2) Subsidies

If government subsidizes a project implemented by a private firm, this subsidy is accounted as a benefit for the private firm. However, from the viewpoint of national economy, subsidies are also transfer of cost among the members of the country. Therefore, subsidies are also eliminated from the cost or benefit.

3) Interest

Investing capital in a project will consume resources such as raw material, equipment, labor etc. On the other hand, interest of the capital, which is defined as a benefit of capital invested in any activities, is not the cost used for consuming resources for the project but a kind of accounting operation like depreciation cost. Also Interest is a transfer of value among the members of the country (from borrower to lender). Therefore, interest is eliminated from project cost.

Discussion on Interest

There have been discussions about if the case of interest be included in project cost, that are:

- If a country borrows money from other country or international agencies, the interest will not be a matter of transfer within the country but international transfer. From viewpoint of national economy, such interest should be included in the project cost or not?
- Because interest accrued during construction period should include in the cost since it is different from the interest after construction (capital interest)

<Inflation>

Another item is inflation, though it is not a transfer item. Inflation is a general increase in market price

level, which occurs with time. In economic analysis, inflation is not considered because inflation especially caused by demand increase of currency will disturb the valuation of resources invested to a project, since it is a change of measurement itself. For estimating project cost in a country in which the inflation ratio is high, usually inflation is considered and included in the project cost as price escalation contingency. This price escalation contingency is considered in financial analysis but eliminated in economic analysis.

4.2.2 Concept of Shadow Price

As discussed above, it is considered that the market price in a country is distorted by several factors. Therefore, market price cannot be used for economic analysis. Instead of that, shadow price will be used for economic analysis. Shadow price is the equilibrium price, with which supply and demand meet under perfect competition market (considered to be the most appropriate price). Equilibrium price under perfect competition is the price thereby the optimal allocation of resources is realized. In reality, the perfect competition market does not exist on the earth and therefore, the price determined at considerably competitive market is used as approximate shadow price (sometimes it is called accounting price or efficiency price).

In this world, international market is considered to be very competitive one. Therefore, price in the international market (border price of country) is used as approximate shadow price in practice. Internal market price will be converted into the value of international market. In this sense, goods are categorized to traded goods and non-traded goods. Traded goods refer to the international market price directly and for non-traded goods, their prices are referred to internal markets. The word, approximate shadow price is equivalent to economic price. In this text, the term economic price is used primarily.

Perfect Competition

A market condition of a goods, such as 1) numerous suppliers and demanders, 2) Influence of each supplier and demander to market is so little that they receive the market price as a precondition of their decision making, 3) Suppliers and demanders have perfect information of the market and goods, 4) the goods traded in the market is uniform in quality and 5) anyone is free to enter into the market. Under such conditions the equilibrium price at the market realizes the optimal allocation of resources (no residual or shortage in supply and demand)

4.2.3 Valuing Goods as Economic Price

As discussed above, the prices of traded goods are obtained from the international market that is considered more ideal and price of non-traded goods are obtained from the internal market. To adjust the level of prices obtained from different markets, some converting factors are applied. When converting the price of international market into that of internal market, **Shadow Exchange Rate (SER)** (UNIDO method) is used. Unit of currency in this case is the one in the country. When converting the price of internal market into that of international market, **Conversion Factor (CF)** (Little and Mirrlees method or OECD method) is used. In this case usually an international currency, namely, US\$ will be the unit of currency (however, in convenience, US\$ is converted to local currency by official foreign exchange rate in the analysis.). Here we will apply OECD method using Conversion

Factor for economic analysis.

4.2.4 Traded (tradable) Goods

Traded goods (or tradable goods) are valued on the basis of their marginal international (border) price, CIF (Cost Insurance and Freight) for imports and FOB (Free on Board) for exports.

<Example>

Border Price of Imported Goods (CIF)

Importing Tractor:

Cost of production	= US\$ 20,000
Cost of loading for shipment	= US\$ 2,000
Freight charge	= US\$ 2,500
<u>Insurance</u>	<u>= US\$ 1,000</u>
Border Price (CIF)	= US\$ 25,500

Exporting Rice

Farm-gate price	= SSP 1,000
Handling charge	= SSP 10
Transport to port	= SSP 100
<u>Warehousing</u>	<u>= SSP 20</u>
Border Price (FOB)	= SSP 1,130

4.2.5 Non-traded goods

Non-traded goods, which has only internal market price, is converted into the level of international market price by applying Standard Conversion Factor (SCF). SCF has a function to eliminate the factors of distorting internal market price on border of the country, namely import and export tariffs, and export subsidies. The formula is shown below:

$$SCF = \frac{M + X}{(M + T_M) + (X - T_X + S_X)} = \frac{\text{<Border Price>}}{\text{<Internal Market Price>}}$$

M: Import Price (CIF)

X: Export Price (FOB)

T_M: Import tax

T_X: Export tax

S_X: Export subsidy

If a government imposes 100% of import tax to a foreign car which costs 1,000US\$, people in the country have to buy the car at the internal market with double price compared to international market. Like this way, import tax has an effect to raise internal market price. If we calculate the conversion factor of car in this case, it is calculated as $1,000/(1,000 + 1,000) = 0.5$. If a car at internal market is 2,000US\$ (financial price), economic price of the car is $2,000US\$ \times 0.5 = 1,000US\$$.

On the other hand, if there is an export tax for a goods, the goods sold outside the country will be shipped with the tax added price and if this tax added price is competitive in the international market,

it can be said that the goods sold at the internal market at the price probably (or surely?) excluding the export tax is valued less than international market price. Export tax is, therefore, considered to have an effect to lower the value of goods in the internal market, as long as the price of exported goods including the export tax is competitive in the international market.

For example, silk product is exported in a country and the government imposes 20% of an export tax to the silk exporting. Silk sold with 1,000US\$ in the internal market is, therefore, exported with 1,200US\$ and the price of 1,200US\$ is accepted in the international market (traders in the international market are satisfied with the price or in another word, traders have willingness to pay such amount of money for the silk). This means the 1,000US\$ of silk in the internal market is valued less. Conversion Factor for the silk will be $1,200/(1,200 - 200) = 1.2$. Economic price of silk in this country is, therefore, $1,000US\$ \times 1.2 = 1,200US\$$.

As for export subsidies, if a government gives export subsidy to beans, for example, beans can be sold with cheaper price thanks to the subsidy and if the subsidized price of the beans is appropriate in the international market (same quality beans from other countries can be sold with the same price at competent), it can be considered that the beans' internal market price without export subsidy in the country is overvalued. Suppose that the price of beans is 100US\$ in the internal market and the government gives 10% of export subsidy to beans trader. With the export subsidy, traders can sell the beans to the international market with 90US\$. Conversion factor of the beans is calculated as $90/(90+10) = 0.9$.

Table 8.15 Estimation of Standard Conversion Factor

Item	Year					Average
	1375	1376	1377	1378	1379	
	(1996/97)	(1997/98)	(1997/98)	(1998/99)	(1999/00)	
Export Value (Oil & gas) (Mil. US\$)	19,271	15,471	9,933	17,089	24,280	-
Export Value (Other) (Mil. US\$)	3,120	2,910	3,185	3,941	4,181	-
Oil National Rate*	(1751.72)	(1752.5)	(1752.5)	(1752.5)	(1752.5)	-
Non oil Export Rate*	(3007.5)	(3007.5)	(5395.42)	(7906.88)	(8181.4)	-
① Export Value (billion Rls.)	43,141	35,865	34,592	61,109	76,757	50,293
② Import Value (FOB, billion Rls.)	23,938	24,354	24,893	22,202	25,179	24,113
Import Value (FOB, Mil. US\$)	14,989	14,123	14,286	13,433	15,086	-
③ Export Duties (billion Rls.)	0	0	0	0	0	0
④ Import Taxes (billion Rls.)	3,110	4,477	5,078	6,592	8,488	5,549
⑤ = ① + ②	67,079	60,219	59,485	83,311	101,936	74,406
⑥ = ⑤ - ③ + ④	70,189	64,696	64,563	89,903	110,424	79,955
⑦ SCF = ⑤ / ⑥	0.96	0.93	0.92	0.93	0.92	0.93

Source: "Iran Statistical Year Book 1380 (Mar. 2001 - Mar. 2002)", Statistical Center of Iran.

"Economic Trends No. 16-1st Otr, 1378", "No. 21-2nd Otr. 1379", Central Bank of Iran

Note: Export Value are converted from US\$ to Rials with applying oil national exchange rate and non oil export rate.

Import taxes comprise customs duties, commercial profit tax, and others.

Standard Conversion Factor (SCF) is, therefore, overall calculation of all the goods of the country, which are traded in the international market. If possible, Conversion Factor by category of goods should be calculated, for example, Construction Conversion Factor (CCF) (conversion factor for construction materials), Consumption Goods Conversion Factor (CGCF). By selecting relevant kinds

of goods for import and export, these conversion factors are calculated. Also international agencies like the World Bank have prepared conversion factors for some countries. In such case, these conversion factors should be utilized. SCF is calculated by using national statistics (it is better that data should have at least recent five years). Calculation of SCF in Iran is shown in Table below. SCF in Iran is considered to be 0.93.

Issues on SCF

Although SCF has function to adjust governmental policy on border, policy in internal market is not reflected. Therefore, adjustment within the internal market should be done separately if any.

When converting foreign currency unit into the unit of local currency with official exchange rate, distortion of exchange rate (over valuation or under valuation) itself is not considered. (from Ueno, 2001)

Shadow Exchange Rate (SER) and Standard Conversion Factor (SCF)

Suppose Official Exchange Rate (OER) is distorted by some factors such as tariffs, following formula is expressed for a traded goods:

$$P = P' \times \text{SER} \quad (1)$$

P: Internal price of a traded goods

P': International price

While the definition of SCF is:

$$\text{SCF} = \frac{P'}{P} \times \text{OER} \quad (2)$$

With (1) and (2)

$$\text{SCF} = \frac{1}{\text{SER}} \times \text{OER}$$

4.2.6 Labor

Labor is categorized with skilled labor and unskilled labor. It is considered that the supply of skilled labor is usually scarce, and therefore, the wage of skilled labor meets at its demand (market price can be used as its shadow price). As for unskilled labor, it is usually considered in over supply situation. Under such situation, unskilled labor wage in the market could be more than its opportunity cost.

For example, a farmer with his 3 children is working in his limited farm plot. When his children work together with him, they could not increase the production as much as his father, since they are unskilled (the younger, the more unskilled) and also the labor supply to the farm plot becomes over the adequate quantity.

As the sample below shows, first children can increase only 15,000 of product (this is the maximum increase by the first sun. This is called marginal production. Opportunity cost is the maximum alternative benefit (marginal production) forgone). This is less 10,000 less than his father can produce. Accordingly what the third sun can add (his marginal productivity) is 5,000 only.

	Total Production	Marginal Production
Only father works	25,000	25,000
Father + first child work	40,000	15,000
Father + first +second child	50,000	10,000
F + first + second + third	55,000	5,000

If the third child is hired by a project, the value of his labor forgone in their farming (opportunity cost) is his marginal production = 5,000. If the project may pay 10,000 for him according to the wage of labor market, unskilled labor wage of the third child is over his opportunity cost.

To covert unskilled labor wage into economic one, Labor Conversion Factor (LCF) (or it is also called Shadow Wage Rate (SWR)) is estimated. Estimation of LCF is one of the most difficult procedures in economic analysis. Hereunder is the example of estimating LCF.

Case 1: to survey supply and demand situation of day laborer in the project area

Survey item: Days hired, average wage, type of work, percentage of day laborer etc.

If day laborer is, on average in the area, hired for 200 days per year for construction work and they work on domestic job (family labor) for the remaining days. Daily wage for construction is 1,000SSP and in domestic job assumingly they produce 300SSP. His marginal productivity is

$$(1,000SSP \times 200days + 300SSP \times 165days) / 365days = 684SSP/day$$

The ratio of marginal cost to the domestic wage = 684 / 1,000 = 0.68

Also the wage should be converted into the level of border price, since the wage is measured in the internal market. SCF can be used as a conversion factor, or CGCF can be applied because consumption goods (food, clothes etc.) are mostly related to labor. The estimation formula is same as calculating SCF, but the consumption goods are only selected in the calculation.

$$CGCF = \frac{M' + X'}{(M' + T'M) + (X' - T'x + S'x)} = \frac{\langle \text{Border Price} \rangle}{\langle \text{Internal Market Price} \rangle}$$

M': Import Price of Consumption Goods (CIF)

X': Export Price of Consumption Goods (FOB)

T'M: Import tax of Consumption Goods

T'X: Export tax of Consumption Goods

S'X: Export subsidy of Consumption Goods

In case of applying SCF, LCF will be $SCF \times 0.68 = 0.94 \times 0.68 = 0.64$

Case 2: Day labor of land less farmer

Compare to necessary agricultural labor and actual working labor is estimated according to farm economy survey as follows:

Number of family labor = 150. Labor per month is $150 \times 30 \text{ days} = 4,500 \text{ man} \cdot \text{day}$.

Number of farm laborer (Land less farmer) = 100. Labor per month is $100 \times 30 \text{ days} = 3,000 \text{ man} \cdot \text{day}$.

As Table 8.16 below shows, population of farm laborer is excess over the necessary labor in the farm. In this area, actual hired labor is necessary for four months per year and total necessary man·day by hired labor is estimated at 9,800man·day per year. However, according to the survey, actual hired labor was 14,900man·day. Hence the LCF will be calculated as follows.

Table 8.16 Necessary labor and Actual Hired Labor in the Area by month

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Necessary Labor	3200	2500	2500	7400	6000	4000	4300	7200	7200	4000	3000	2000
Family Labor	3200	2500	2500	4500	4500	4000	4300	4500	4500	4000	3000	2000
Necessary Hired Labor	0	0	0	2900	1500	0	0	2700	2700	0	0	0
Actual Hired Labor	100	150	150	3000	3000	1000	1000	3000	3000	500	0	0

$$\frac{\text{Necessary Hired Labor}}{\text{Actual Hired Labor}} = \frac{9800}{14900} = 0.66$$

$$\text{LCF} = \text{CGCF or SCF} \times 0.66 = 0.94 \times 0.66 = \underline{0.62} \quad (\text{SCF is applied})$$

4.2.7 Land

Market price of land implies several aspects. At first, the price of land (rent of land) implies the productivity of the land, e.g. rent of farmland is based on the crop yield of the land. If the land is used for housing, price of land will follow the supply and demand situation. Another aspect is that market price of land may include speculative factor. Social prestige on land ownership may also increase the market price.

If it is clear that market price of land is competitive, not distorted by speculation or social custom, the market price can be the economic price. Otherwise, price of land must be measured by its opportunity cost in economic analysis. Land is a non-traded goods, but using SCF is not appropriate, since land has no possibility at all for international trade. Price of land as opportunity cost (or marginal productivity) is calculated below:

$$\text{Economic Price of Land: } R = \sum_{n=1}^{\infty} \frac{X}{(1+a)^n} \doteq \frac{X}{a}$$

X: Marginal Production (rent)

a: Discount rate

$$R_n = \frac{X}{1+a} + \frac{X}{(1+a)^2} + \frac{X}{(1+a)^3} + \cdots + \frac{X}{(1+a)^n}$$

$$\frac{R_n}{(1+a)} = \frac{X}{(1+a)^2} + \frac{X}{(1+a)^3} + \frac{X}{(1+a)^4} + \cdots + \frac{X}{(1+a)^{n+1}}$$

$$R_n - \frac{R_n}{(1+a)} = \frac{X}{1+a} - \frac{X}{(1+a)^{n+1}}$$

$$\frac{a R_n}{(1+a)} = X \left[\frac{1}{1+a} - \frac{1}{(1+a)^{n+1}} \right]$$

$$R_n = \frac{X}{a} \left[1 - \frac{1}{(1+a)^n} \right]$$

$$n \rightarrow \infty, \rightarrow \frac{1}{(1+a)^n} \doteq 0 \quad (a > 0)$$

Therefore, $R \doteq \frac{X}{A}$

For example, suppose that a person buys a land with 15,000 SSP to build a hotel, and the expected profit from the hotel is estimated at 1,000SSP per year. If the discount rate (opportunity cost of capital) is 10%, the economic price of land is estimated as $1,000 \div 0.1 = 10,000$ SSP. Although the person paid 15,000SSP to buy the land, economic price of the land is valued at 10,000SSP.

Also if the land required by a project has no other potential use (productivity zero) unless otherwise the project utilizes it, the land must be measured at zero cost in economic analysis.

In practice calculation of economic price of land and labor is very difficult. The estimation method can be more valid according to required accuracy.

4.3 Procedure of Calculating Economic Price

4.3.1 Calculation of Economic Cost

Conversion of financial price into economic price shall be explained by sides of cost and of benefit. Here begin with economic cost. Economic cost is estimated by following procedure:

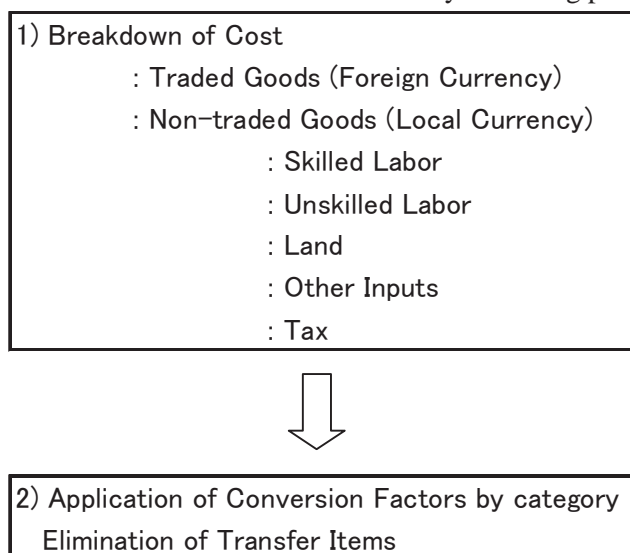


Figure 8.12 Procedure of Estimating Economic Cost

1) Breakdown of Project Cost

First step is to disaggregate (break down) the cost into traded goods, non-traded goods and transfer payments. Traded goods are called foreign currency portion (F/C), and non-traded goods as local currency portion (L/C). L/C portion (non-traded goods) is disaggregated to skilled labor, unskilled labor, land, other inputs and transfer payments such as tax. The other inputs in L/C portion are further disaggregated as Table 8.17 below. Breakdown of cost will be repeated to make the portion of

non-traded goods as little as possible (so that the goods can be valued with border price). In practice, first or second round breakdown will be enough.

Table 8.17 Breakdown of Cost (Example Rice Mill)

First Round Breakdown	Second Round Breakdown	Third Round Breakdown	Total Cost Disaggregation					
			F/C	Skilled Labor	Unskilled Labor	Tax	Other Input	Land
Machinery and equipment 200	F/C(traded goods) 140 Skilled Labor 20 Unskilled Labor 0 Tax 20 Other Inputs 20	F/C(traded goods) 8 Skilled Labor 4 Unskilled Labor 0 Tax 3 Other Inputs 5	148	24	0	23	5	
Feeder road 100	F/C(traded goods) 35 Skilled Labor 5 Unskilled Labor 15 Tax 15 Other Inputs 30	F/C(traded goods) 5 Skilled Labor 2 Unskilled Labor 6 Tax 3 Other Inputs 14	40	7	21	18	14	
Building 350	F/C(traded goods) 175 Skilled Labor 20 Unskilled Labor 50 Tax 35 Other Inputs 70	F/C(traded goods) 14 Skilled Labor 2 Unskilled Labor 8 Tax 7 Other Inputs 39	189	22	58	42	39	
Land 100								100
		Sub-total	377	53	79	83	58	100
Total 750								Total 750

2) Application of Conversion Factors

Applying conversion factors defined, according to the portion categorized above Table 8.17, aggregate conversion factor of the construction work and the economic cost are calculated as following Table 8.18:

Table 8.18 Application of Conversion Factors and Calculation of Economic Cost

Item	Cost	Propotion (%) ①	CF	F/C 1.00 ②	L/C			Tax 0.00 ⑥	Conversion Factor ⑦ Sum(②~⑥)	① × ⑦
					Skilled Labor 0.94 ③	Unskilled Labor 0.62 ④	Others (SCF) 0.94 ⑤			
Machinery and equipment	200	30.8%	CF × %	74.0 0.740	12.0 0.113	0.0 0.000	2.5 0.024	11.5 0.000	100.0 0.877	0.270
Feeder road	100	15.4%	CF × %	40.0 0.400	7.0 0.066	21.0 0.130	14.0 0.132	18.0 0.000	100.0 0.728	0.112
Building	350	53.8%	CF × %	54.0 0.540	6.3 0.059	16.6 0.103	11.1 0.104	12.0 0.000	100.0 0.806	0.434
Total	650	100.0								0.816

Note: For conversion of Skilled labor cost, SCF is applied.
Proportion of F/C and L/C by item is calculated from Table 4.3.

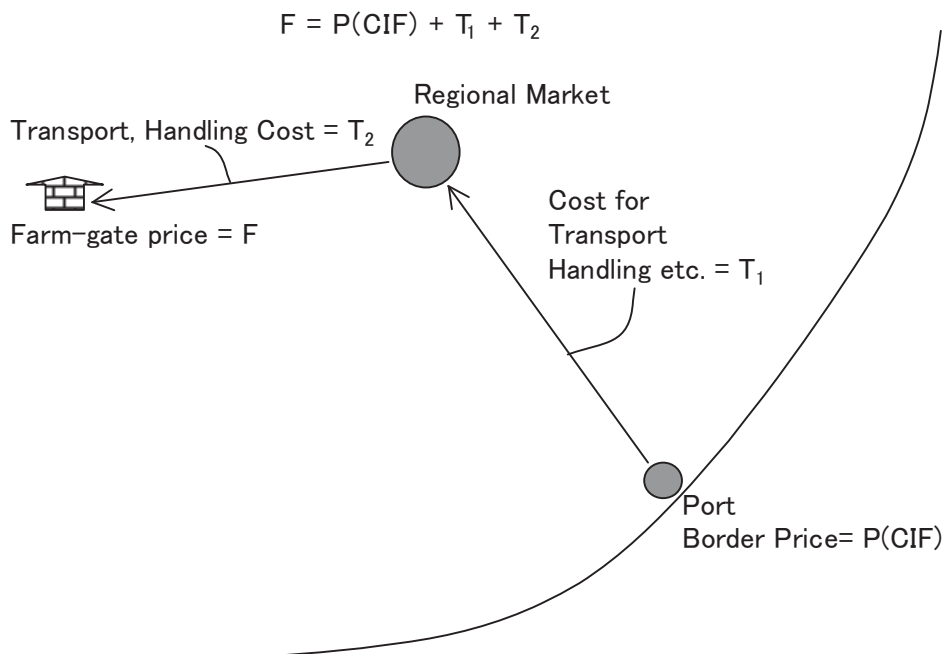
	Financial Cost	CF	Economic Cost
Construction	650	0.82	533
Land	100	0.66	66
Total	750		599

* CF of land 0.66 is an example (taken from above section)

4.3.2 Calculation of Economic Benefit

For the items used in calculating benefits, traded goods will be referred to border price and non-traded goods will be converted by applying Standard Conversion Factor (SCF). For agricultural project, the goods, which are traded, are some crops like rice, wheat, or inputs like fertilizers. Because the benefits are estimated at farm-gate price, farm-gate prices of traded goods need to be estimated based on the border price.

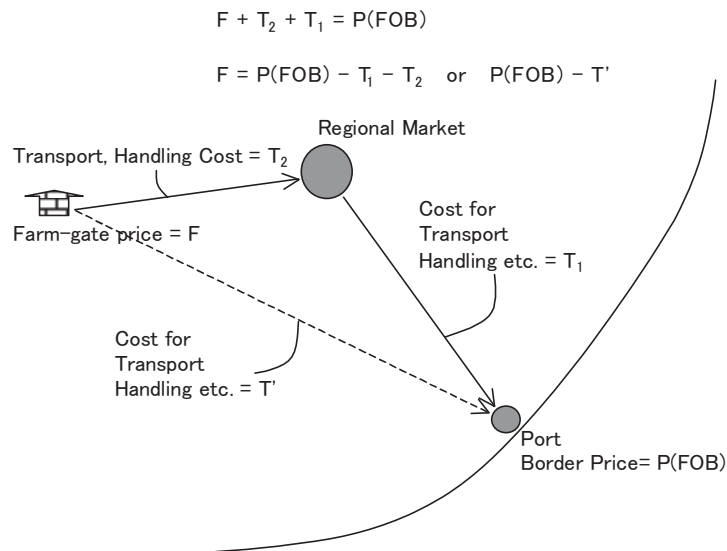
Calculating a farm-gate price will depend on if the goods is imported or exported or sold in the internal market as an import substitute. Calculation of farm-gate price in each case is illustrated Figure 8.13 below and examples of farm-gate price calculation are shown in Tables 8.19.



Case 1

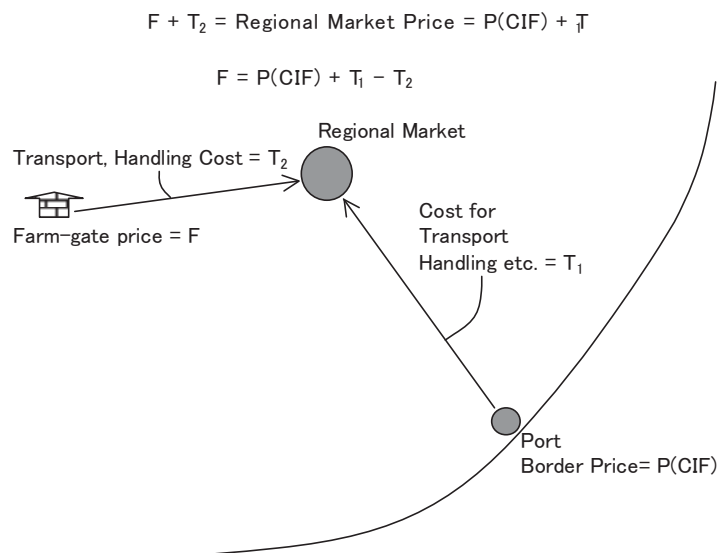
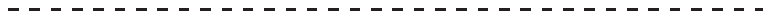
Goods imported and also farmers buy the goods
(Fertilizer)





Case 2

Goods produced by farmer for export



Case 3

Goods imported but also farmers supply to domestic market (Import Substitute)
(Rice, Wheat)

** $P(\text{FOB}) + \text{Freight and Insurance} = P(\text{CIF})$

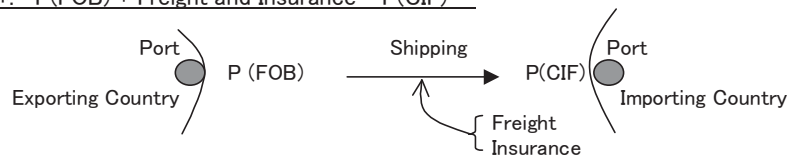


Figure 8.13 Calculation of Farm-gate Price (Case 1 to 3)

Table 8.19 Price structure of Rice (Ad of 2001: The Case using FOB Price)

Price Structure	Unit	Financial Price Present	Conversion Factor	Economic Price Present
Trade status			Imported	
FOB price at Thai *	US\$/metric ton			278
Fright and Insurance	US\$/metric ton			50
CIF price at ports of Bandar-e-Abbas	US\$/metric ton			328
Import taxes	US\$/metric ton			0
Equivalent to Rials for economic analysis (US\$1=RIs. 4,900)**	RIs/metric ton			1,607,200
Transport/ handing constns from port to regional market through marketing agents (1,020 km)	RIs/metric ton	204,000	0.94	191,800
Other marketing margen	RIs/metric ton	320,100	0.94	300,900
Market price at regional market	RIs/metric ton			2,099,900
Transport/ handing constns from regional market to farm gate (Project Area: average 100km)	RIs/metric ton	20,000	0.94	18,800
Farmgate prices (milled rice) ***	RIs/metric ton			2,081,100
	RIs/kg			2,081

Note: * FOB price is quoted from "Global Commodity Market"(GCM) , June 2000. (attached in Appendix Price of Rice, Thai, : 2010 projectiton price is 255.4US\$/mt in Constant 1990 US\$. To adjust the 1990 constant price into 2001 price, MUV index of 108.80 (1990 = 100) attached with the GCM is used: $255.3\text{US}\$/\text{mt} \times 108.80/100 = 278\text{US}\$/\text{mt}$

** Average exchange rate is used.

*** Milling cost is included in the production cost. Therefore the farm-gate price of rice is milled one.

To identify the border price of these goods, a journal called "Global Commodity Market (GCM)" is generally used. This journal is periodically published by the World Bank and it can be downloaded from the homepage of the World Bank. FOB price of major traded goods can be obtained from GCM. GCM has been, however, suspended to publish. Therefore, other documents to obtain international market price will be needed.

Here summarizes application of conversion factors and comparison of applying SER method in Table 8.20.

Table 8.20 Summary of Calculating Economic Price

Item	Calculation of Economic Price	
	OECD Method (Using Conversion Factor)	UNIDO Method (Using Shadow Exchange Rate)
Traded Goods		
Imported Goods	CIF Price	CIF * SER
Exported Goods	FOB Price	FOB * SER
Non-traded Goods		
Goods & Srvices	Market price * SCF	Market Price
Skilled Labor	Market price * CGCF or SCF	Market Price
Unskilled Labor	Market price * LCF (Shadow wage)	Shadow wage
Land	Productivity/Opportunity cost of Capital	Productivity/Opportunity cost of Capital
Transfer Item (tax, subsidy)	eliminated	eliminated

* Internal Market is supposed to be uncompetitive.

4.4 Calculation of Decision Criteria

4.4.1 NPV, B/C Ratio and EIRR

Internal Rate of Return using Economic Price is called “Economic Internal Rate of Return (EIRR)”. This is simply calculated by applying the cost and benefit expressed at economic price. Whereas, IRR calculated at financial price (market price) is called “Financial Internal Rate of Return (FIRR)”. For the national economic point of view, EIRR is the primary decision criterion, which can be compared to the opportunity cost of capital. Therefore, if EIRR is higher than the opportunity cost of capital in the country, the project is considered to be feasible.

In calculating IRR, cash flow sheet will be enough with 30 to 50 years since as the year goes, the present value factor becomes so small (closer to zero) that the present value of after 30 years are negligible.

4.4.2 Sensitivity Analysis

Sensitivity analysis is required to carry out for the analysis to examine what factor will affect the feasibility of the project. Normally IRRs in cases of 10% increase of cost, 10% decrease of benefit and the combination of the former 2 cases are examined. As for agricultural project, more detail sensitivity analysis like 10% decrease of yield, 10% decrease of market price, 10% increase of input material etc. will be carried out to examine what factors will affect more on project feasibility. Also several cases of cost disbursement can be analyzed by the cash flow sheet. It is to examine which disbursement schedule can be most effective and efficient. That is the usefulness of the cash flow sheet. An example of sensitivity analysis is conducted in Chapter 5 Case Study.

4.5 Financial Analysis (FIRR, Farmer’s Capacity to Pay and Farm Budget)

4.5.1 FIRR

FIRR is calculated before the economic analysis when the cost and benefit cash flow sheet at financial price is prepared. FIRR can be used to compare with a market interest rate or the interest rate of agricultural loan, which the farmer beneficiaries will borrow to pay their share of the project cost. If FIRR is higher than these interest rates, the project can be acceptable from private sector’s view.

4.5.2 Farmers’ Capacity to Pay

Comparing net incremental income by the project (net income with project – net income without project) and repayment (the project cost borne by farmer beneficiaries), farmers’ capacity to pay is measured. In Land Improvement Project in Japan, if the ratio of repayment to the net incremental income is less than 40%, it is considered that farmer beneficiaries will have capacity to pay their share. Appropriate ratio to apply for the analysis should be studied in the context of RSS.

Annual repayment cost including its compound interest is calculated by the following formula.

$$C_r = C_t \times \frac{i(1+i)^n}{i(1+i)^n - 1} \quad \text{: (Cost Recovery Factor)}$$

C_r : Annual Repayment
 C_t : Total Debt (including interest)

$$C_t = \frac{C_r}{(1+i)} + \frac{C_r}{(1+i)^2} + \dots + \frac{C_r}{(1+i)^n} \quad \dots(1)$$

Provide $a = \frac{C_r}{(1+i)}$, $p = \frac{1}{(1+i)}$ Formula (1) will be:

$$C_t = a + ap + ap^2 + \dots + ap^{n-1} \quad \dots(2)$$

$$pC_t = ap + ap^2 + ap^3 + \dots + ap^{n-1} + ap^n \quad \dots(3)$$

$$(2) - (3) = C_t - pC_t = a - ap^n \quad \text{Therefore, } C_t = \frac{a(1-p^n)}{1-p} \quad \dots(4)$$

Substitute a and p for (4)

$$C_t = \frac{\frac{C_r}{(1+i)^n}}{\frac{i(1+i)^n}{i(1+i)^n - 1}} \quad \text{therefore, } C_r = C_t \times \frac{i(1+i)^n}{i(1+i)^n - 1} \quad \text{: (Cost Recovery Factor)}$$

4.5.3 Farm Budget

As a financial analysis of agricultural project, farm budget analysis is conducted. For farm budget analysis, net income is primarily used. Net income does not include the value of family labor and self-reliant fertilizer such as manure. From the Table 8.4 in Chapter 2, the profitability of the project per ha basis is estimated. For further analysis taking into consideration of the situations of project areas, it is suggested examining the profitability of the project according to different scale of farm

management, or a case of tenant farmers (land rent will be counted as a cost for tenant farmers).

4.6 Project Evaluation

4.6.1 Use of Term

Economic analysis and financial analysis of project are parts of project evaluation (or it is also said project justification). Project evaluation must be carried out with comprehensive analyses including technical aspects, social aspects, environmental aspects and economic and financial aspects. In this text, however, the term of project evaluation is used to indicate economic and financial analyses.

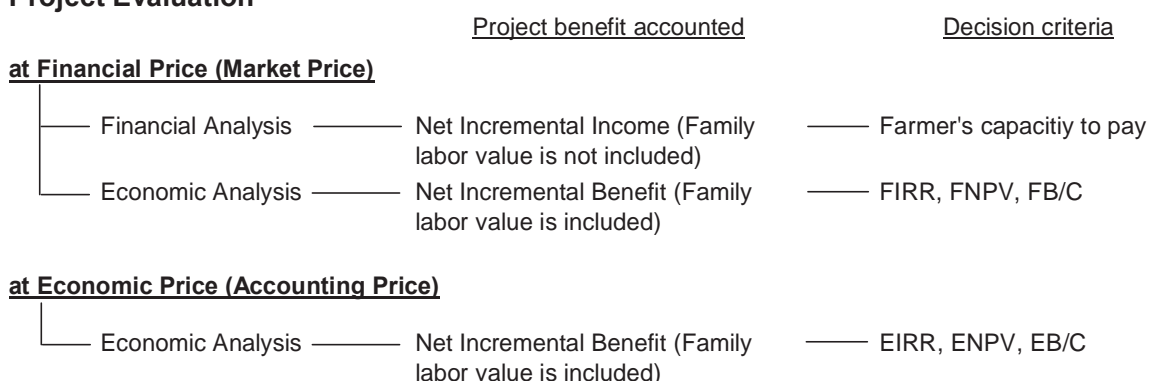
As discussed above, here we are calling economic analysis when using economic price, and financial analysis when using financial price. But, there is also a discussion on what benefit should be included in economic and financial analyses. As discussed in chapter 1, economic analysis normally deals with the benefit, which can be valued in cash. But for financial analysis, there may be 2 cases: One is to count only the benefit, which can be cash income for the private entity, and other is to include the benefit that can be valued in cash, though it cannot be actual cash income.

Strictly speaking, the former will be applied for financial analysis, but in the case of farm economy, it will bring the issue of family labor. From the farmer's point of view, saving of family labor does not directly give cash income to farmers (if they can work for another job by the spared time from saving farming work, they will get cash income indirectly). But if you consider the farm household as a private firm, the profitability of the firm should count all the inputs as cost.

Considering this point, it is suggested to categorize the analysis as Figure 8.14 below. It is suggested that we use the term of project evaluation as first principle and categorize it into project evaluation at financial price and project analysis at economic price. Project analysis at financial price is further divided into financial analysis and economic analysis. Financial analysis only deals with the benefit, which can be cash income, namely family labor value is excluded from the analysis. While, economic analysis includes the value of family labor. In this use of the term, economic analysis both at financial price and economic price includes the benefit, which can be valued in cash.

In this text, term of economic analysis is used primarily in the case of analysis at economic price, as it has been so far described. But sometimes the term economic analysis can be used in the context of project evaluation at financial price.

Project Evaluation



Note:

For saving of maintenance cost, if the work is done by family labor, the value is accounted in economic analysis. If the work is done by hired labor, the value is accounted in both financial and economic analysis.

Figure 8.14 Categorization of Project Evaluation

4.6.2 Step of Project Evaluation

Hereunder summarizes the flow chart of economic analysis of the project. As shown in the chart of Figure 8.15, the results of project evaluation at financial price will come up first as a sequence of calculation. Here the implementation agency (e.g. government) can make decision and if the results do not show the feasibility of the project, the original plan should be reviewed again.

To examine the feasibility from the viewpoint of national economy, the analysis is proceeded to project evaluation at economic price (economic analysis) converting financial price into economic one. This step will be necessary especially if the government intends to get loan from foreign countries or international agencies.

But if the government itself sponsors the project, there could be another point to argue. Project evaluation at economic price will remove the effects of subsidies, taxes etc. to extract the efficiency of investment under the competitive market. However, these setting of subsidies and taxes are the policies the government itself intended to lead the country to a certain direction. It might be said that making decision by EIRR denies the policy of the government, if there are significant subsidies etc.

If the government wishes to retain the effects of its policy, project evaluation at financial price may be enough for government's making decision. Comparison between the results of economic price and financial price can indicate the distortion of the market giving the government some idea of reviewing its policy. Therefore, it is said that project evaluation at economic price is still useful even for the government-sponsored project.

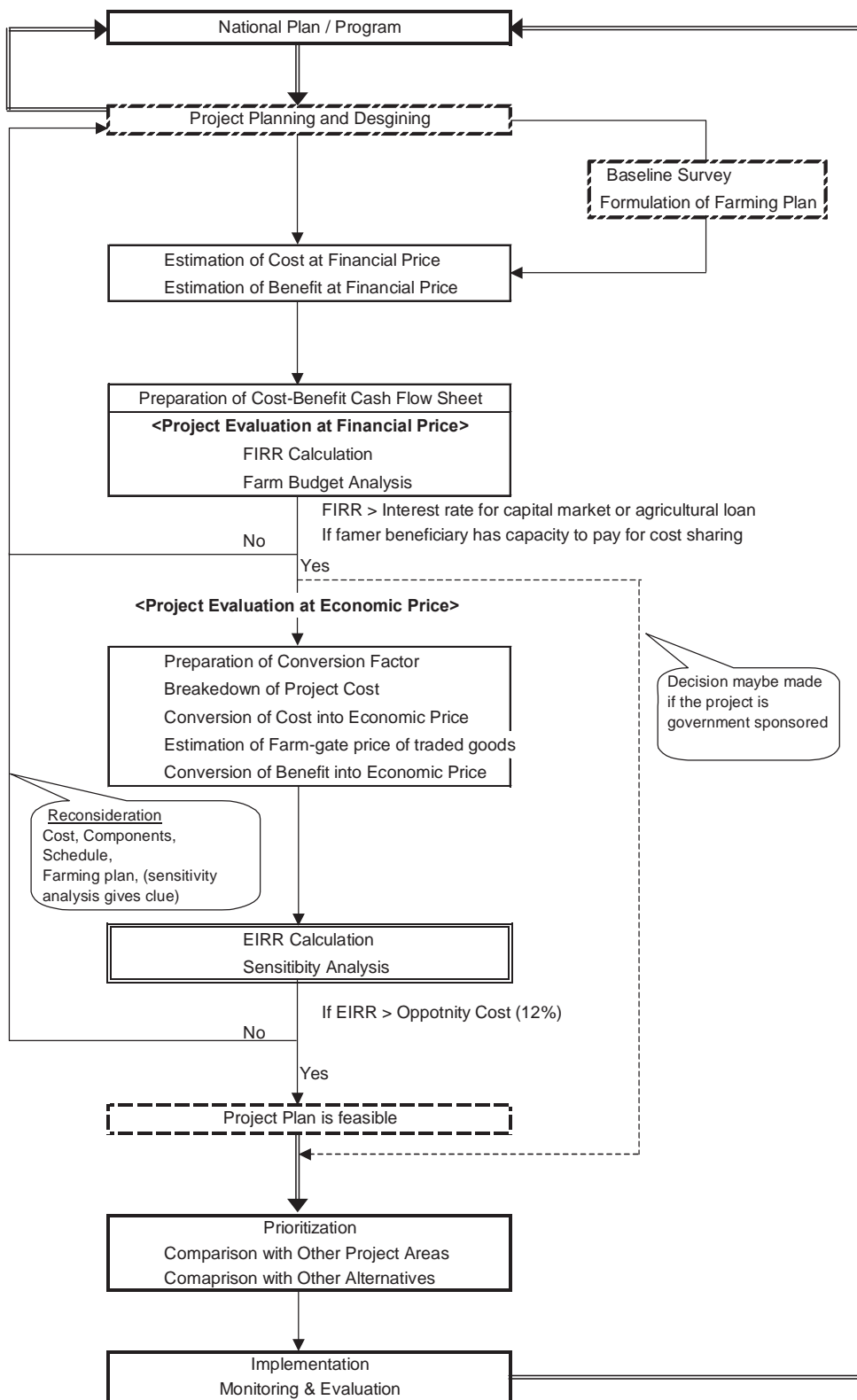


Figure 8.15 Flow Chart of Project Evaluation

References

1. Gittinger, J. P. Economic Analysis of Agricultural Projects, Second Edition. Baltimore, Johns Hopkins University Press, 1982.
2. Little, I. M. D. and J. A. Mirrlees. Project Appraisal and Planning for Developing Countries. London, Heinemann Educational Books, 1974.
3. Overseas Development Administration (ODA: UK organization). Appraisal of Projects in Developing Countries: A Guide for Economists. London, The Stationary Office, 1997.
4. United Nations Industrial Development Organization (UNIDO). Guidelines for Project Evaluation. Vienna, 1992.
5. United Nations Industrial Development Organization (UNIDO). Guide to Practical Project Appraisal: Social Benefit – Cost Analysis in Developing Countries. Vienna, 1986
6. Ward W. A. and Deren B. J. with D'Silva E. H. The Economics of Project Analysis A Practitioner's Guide, Economic Development Institute of The World Bank, 1991
7. Asian Development Bank (ADB). Guidelines for the Economic Analysis of Projects, 1997
8. Yagihashi M. Economic Evaluation of Land Consolidation Project: Estimation of Economic Effect for Land Consolidation Project (Draft). Project of Haraz Agricultural Human Resources Development Center, 2000.
9. Ministry of Agriculture, Forestry and Fishery, Japan. Economic Effects of Land Improvement Project (Japanese Book: Kaisetsu totikairyō no keizaikōka). Taisei Publishing Co. (Taisei syuppan sya), 1988.
10. Ministry of Agriculture, Forestry and Fishery, Japan. Economic Effects of Land Improvement Project, New Edition (Japanese Book: Kaitei kaisetsu totikairyō no keizaikōka). Taisei Publishing Co. (Taisei syuppan sya), 1997
11. Toriyama M. Theory and Practice for Feasibility Study, New Edition (Japanese Book: Shin F/S no riron to jissen). Japan Development Service (Nippon Kaihatsu Service), 1991.
12. Japan International Cooperation Agency (JICA). Study on Economic Evaluation in Development Study (Japanese Report: Kaihatsu tyōsa ni okeru keizaihyōka syūho no kennkyū). JICA, 2002
13. Japan International Cooperation Agency (JICA). Study on Economic Analysis and Evaluation of Projects (Japanese Report: Project no keizaibunseki, hyōka no chōsa kenkyū hōkokushyō). JICA, 1977.
14. Japan International Cooperation Service Center (JICSC). Study on Economic Analysis and Evaluation of Projects Volume II (Japanese Report: Project no keizaibunseki, hyōka no chōsa kenkyū Volume II). JICSC, 1979.
15. Ueno H. Theory of Project Appraisal and Issues to Study (Japanese Study Paper: Project hyōka no riron oyobi kōgō no kadai). Journal of Development Study, Volume 10, No.2, 2001.
16. Nagasu M. What is Opportunity Cost of Capital? (Japanese Study Paper: Shihon no kikaihyō towa nanika). Kikin tyōsa kiho, No.47, 1984.

APPENDIX-1: QUESTIONNAIRE OF AGRICULTURE AND SOSCO-ECONOMIC SURVEY

**SOCIO-ECONOMIC SURVEY FOR
THE PROJECT FOR IRRIGATION DEVELOPMENT MASTER
PLAN
(IDMP) IN RSS**

Sample No.:
Date:
Name of enumerator:

Q-1 Background of Household

* Family is a unit of livelihood. Family members live in a place together, sharing a family budget.

- 1.1 Name of Interviewee: _____ Sex: _____
- 1.2 Address County: _____ Payam: _____ Boma: _____ Village: _____
- 1.3 **【Above 15 years old】**Family size, Education, Occupation (Except for families living outside)(✓ on a figure)

No.	(1) Family Member		(2) Sex	(3) Age	(4) Education			(5) Occupation					
	Relationship to the head				None	Primary	Secondary & More	Farmer	Employee/Gov. Staff	Business	Labor	Other work	No work
			<i>(✓ in a box)</i>		1	2	3	1	2	3	4	5	6
(1)	Head		M	F									
(2)			M	F									
(3)			M	F									
(4)			M	F									
(5)			M	F									
(6)			M	F									
(7)			M	F									
(8)			M	F									
(9)			M	F									
(10)			M	F									

【The number of children (under 14 years old)】

Boys: _____ Girls: _____

1.4 Would you answer following questions by feddan or hectare?

fed	ha
-----	----

If you will answer them by hectare, please replace "fed" in the questions t 1 fed = 0.42 ha
2.4 fed = 1 ha

1.5 If you have any problem that caused by the conflict in this time, would you describe it?

* In this interview, please answer normal situation excluding the effect of t

Q-2 Land Tenure and Livestock

2.1 Land holding and land tenure

(1) Total holding land area. (including all cultivated and non cultivated fields, grass land, homestead, lands leased or borrowed, etc.)

	(fed)
--	-------

(2) Breakdown of total holding area

Land Category	Total holding area (fed)	Of total holding area, how many feddan leased to others ? (fed)	Of total holding area, how many feddan borrowed from others ? (fed)
(a) Field-irrigated			
(b) Field-non irrigated			
(c) Homestead			
(d) Others ()			
(e) Total			

(3) Land rent (rental charge of land)

Land Category	Lease Charge								
	In cash			In kind					
	price (SSP)	per area (fed)	per duration (month)	name of kind	amount number	unit	conversion* (kg)	per area (fed)	per duration (month)
(a) Field-irrigated									
(b) Field-non irrigated									
(c) Homestead									
(d) Others (

Land Category	Borrow Charge								
	In cash			In kind					
	price (SSP)	per area (fed)	per duration (month)	name of kind	amount number	unit	conversion* (kg)	per area (fed)	per duration (month)
(a) Field-irrigated									
(b) Field-non irrigated									
(c) Homestead									
(d) Others (

*conversion: Please ask the interviewee to convert the amount into kilogram.

(4) What is the reason to borrow a land? (✓ in a box)

- 1 To meet shortage of the self consumption 3 Both 1 and 2
 2 To sell the production 4 Other ()

(5) Do you have Land Rights Registration Certificate (Card)?

Yes No (✓ in box)

(6) What is Land Tenure type of your major land? Please choose one from below. (✓ in a box)

- 1 Public 3 Private
 2 Community 4 Other ()

(7) If you chose "Community" in (6), who decides for selling the land? (✓ in a box)

- 1 Land holder 3 Other ()
 2 Community Chief

(8) If you chose "Community" in (6), who decides for changing the land use type? (✓ in a box)

- 1 Land holder 3 Other ()
 2 Community Chief

2.2 Livestock Raising (owned)

*The number is including young.

	No.		No.		No.
(a) Cow		(e) Sheep		(i) Ducks	
(b) Bull / Ox		(f) Goats		(j) Others ()	
(c) Donkeys		(g) Pigs		(k) Others ()	
(d) Horses		(h) Chicken		(l) Others ()	

Q-3 Inventory of Farm Machinery and Hiring Cost of Farm Power

3.1 Inventory of Farm Machinery/ Tools (owned)

Farm Machinery	No.	Farm Machinery	No.	Farm Machinery	No.
(a) 4-wheel tractor		(h) Shovel		(o) Agro well	
(b) Hand tractor		(i) Manual thresher		(p) Mobile phone	
(c) Hand sprayer		(j) Engine thresher		(q) Others ()	
(d) Engine sprayer		(k) Oxen-drawn plow		(r) Others ()	
(e) Weeder		(l) Water pump (Oil)		(s) Others ()	
(f) Seeder/()		(m) Water pump (Electric)		(t) Others ()	
(g) Hoe		(n) Milling machine		(u) Others ()	

3.2 Do you possess a tractor? (✓ in a box)

Yes → **1 Working**

- What is the brand and output power?
 Brand name: _____
 Output Power: _____ kw or HP (*Circle kw/ HP)
- Who own the tractor?
 Individual Farming group Others _____
- How do you get the tractor?
 From Government Others _____
 Purchase (Price: SSP _____)
- How many days do you use the tractor? _____ days/year
- How many feddan do you cultivate by the tractor? _____ fed/day
- How much is the cost of fuel? _____ lit/day SSP /lit
- How much is the cost of maintenance? _____ SSP /year

→ **2 Out of order**

- What is the brand and output power?
 Brand name: _____ Output power: _____ kw or HP
- How many years did you use the tractor? _____ years

No → **3 Hire**

- From whom do you borrow the tractor?
 Government Farming group Relatives
 NGO Neighbor Others(_____)
- How much is the rental fee? SSP /day or SSP /fed
- How many days does it take to cultivate one fed? _____ days/fed
- How many days do you use the tractor? _____ days/year
- How many feddan do you cultivate by the tractor? _____ fed/day
- How much is the cost of fuel? _____ lit/day SSP /lit
- How much is the cost of maintenance? _____ SSP /year

→ **4 No use**

- Do you want to use a tractor?
 Yes, want to hire. Yes, want to purchase.
 No need.
 → Why you don't need a tractor? (_____)

3.3 **[This question is for a farmer who borrows draft animals / agricultural equipment.]**

(1) How much is the cost to borrow a draft animal / agricultural equipment?

(One head/ unit)	Borrow from 1)Gov./ 2)NGO/ 3)Neighbors/ (select the number)	Unit rental price		How long do you use a year?		Total
		SSP	/period	numbe	unit	SSP/year
(Example)	3	50	month	3	months	150
(a) Draft animal						
(b) Water pump						
(c) Weeder						
(d) Sprayer						
(e) Thresher						
(f) Others ()						
(g) Others ()						
(h) Others ()						

(2) How much is the cost of feed/ fuel?

(One head/ unit)	use the "equipment" in a year? (days/year)	lit/kg of the "fuel"? (lit(kg)/day)	Total amount of (lit(kg)/year)	Unit cost of the "fuel" (SSP/lit(kg))	"Fuel" cost per year (SSP/year)
(Example)	90	3	270	10	2,700
(a) Draft animal					
(b) Water pump					
(c) Weeder					
(d) Sprayer					
(e) Thresher					
(f) Others ()					
(g) Others ()					
(h) Others ()					

Q-4 Crop Production and Farming Practices

* Questions only for crops grown in field in one year. Crops in home garden are asked in Q-5.

4.1 Farming operation in a year

* If you cultivate a crop more than one time in a year, please describe all cultivation.

Legends **L**: Land preparation **T**: Transplanting/ seedling **W**: Weeding
 S: Seeding **F**: Fertilizing **H**: Harvesting

Crop name	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainy season												
Example			L L	S S F	W F	W	H H	S S F	W F	W	H H	
Maize												
Sorghum												
Cassava												
Millet												
Common Bean												
Ground nut												
Sesame												

Farming Practice in A Year

* If you cultivate a crop more than one time in a year, please describe a major cultivation.

4.2 Name of crop cultivated

* Please write down all varieties if you cultivated some varieties in a year.

1	
Crop	Maize
Variety ()	

2	
Crop	Sorghum
Variety ()	

4.3 Crop production

- (1) Cultivated Extent
- (2) Season
- (3) Water supply

(fed)	
1 Rain	2 Dry
1 Irrigated by pump	2 Irrigated by bucket
3 Irrigated by gravity	4 Rain fed

(fed)	
1 Rain	2 Dry
1 Irrigated by pump	2 Irrigated by bucket
3 Irrigated by gravity	4 Rain fed

kg or other units	
(1 unit: kg)	
Quantity	
	kg
	kg
	kg
	kg
	kg
	kg
	kg
	kg
	kg

kg or other units	
(1 unit: kg)	
Quantity	
	kg
	kg
	kg
	kg
	kg
	kg
	kg
	kg
	kg

(4) Total production

(Circle the unit)

- (5) How did you use the produce?
 - (a) Stock for home consumption
 - (b) Stock for seed
 - (c) Loan repayment
 - (d) Land tenant fee
 - (e) Loss/ damaged after harvest
 - (f) Others (Gift and so on)

: Sub total

(g) If you sold to

- Trader/ Collector
- Cooperative
- Sold at market
- Sold at market
- NGO
- Company
- Farmers/ Others

: Sub total

: Total selling amount

Grand total amount ((a)~(g))

Quantity		Price	
	kg		SSP/kg
	kg		SSP/kg
	kg		SSP/kg
(Market name:)			
	kg		SSP/kg
(Market name:)			
	kg		SSP/kg
	kg		SSP/kg
	kg		SSP/kg
	kg		SSP/kg
	kg		SSP/kg
	kg		SSP/kg
	kg		SSP
			kg

Quantity		Price	
	kg		SSP/kg
	kg		SSP/kg
	kg		SSP/kg
(Market name:)			
	kg		SSP/kg
(Market name:)			
	kg		SSP/kg
	kg		SSP/kg
	kg		SSP/kg
	kg		SSP/kg
	kg		SSP
			kg

Please check

4.4 Total quantity and unit prices of fertilizer used.

*The price of organic fertilizer made by themselves is estimated.

*Unit should be same between 'Unit price' and 'Quantity'.

Name	Unit price	Quantity	(unit)	Quantity	(unit)
Example	10 SSP/kg	500	kg	400	kg
(a) DAP(Diammonium phosphate)	SSP/kg		kg		kg
(b) NPK(Nitrogen,Phosphorus,Potassium)	SSP/kg		kg		kg
(c) CAN(Calcium Ammonium Nitrate)	SSP/kg		kg		kg
(d) Urea	SSP/kg		kg		kg
(e) Liquid fertilizer	SSP/lit		lit		lit
(f) Organic fertilizers	SSP/kg		kg		kg
(g) Others ()	SSP/kg		kg		kg

4.5 Total quantity and unit prices of agro-chemicals sprayed

*Unit should be same between 'unit price' and 'quantity'.

Name	Unit price	Quantity	(unit)	Quantity	(unit)
(a) Weedicide					
()	SSP/lit		lit		lit
(b) Insecticide					
()	SSP/lit		lit		lit
(c) Pesticide (Anti-disease)					
()	SSP/lit		lit		lit

4.6 Total quantity and unit price of seeds/seedlings used

(a) Quantity sowed	(kg)	(kg)
(b) Unit price of seed	(SSP\$/kg)	(SSP\$/kg)
(c) Percentage of seed transplanted	(%)	(%)

4.7 Requirements of labor, animal and equipment

*If farmers carried out following activities several times, please sum up each man*days/unit*days/head*days.

	(man*days)	Family		Hired		Family		Hired	
		Men	Women	Men	Women	Men	Women	Men	Women
(a) Land preparation (plough, puddling, leveling)									
(b) (Nursery preparation)									
(c) Seeding/Broadcasting									
(d) Planting/Transplanting									
(e) Fertilizing									
(f) Application of agro-chemical**									
(g) Weeding									
(h) Irrigating									
(i) Harvesting									
(j) Post-harvest processing/ bagging									
(k) Transportation and storing									
(2) <u>Tractor</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Land preparation									
(b) Transportation									
(3) <u>Draft animal</u>	(head*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Land preparation									
(b) Transportation									
(4) <u>Sprayer</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Application of agro-chemical									
(5) <u>Weeder</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Weeding									
(6) <u>Water pump</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Irrigating									
(7) <u>Thresher</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Threshing									
(8) <u>Other Costs</u>		<u>Amount</u>		<u>Unit price</u>		<u>Amount</u>		<u>Unit price</u>	
(a) Purchasing cost for bags		(pieces)		(SSP/piece)		(pieces)		(SSP/piece)	
(b) Other transportation cost		(times)		(SSP/time)		(times)		(SSP/time)	
(c) Sales charge		(times)		(SSP/time)		(times)		(SSP/time)	
(d) Land tenant fee		(months)		(SSP/month)		(months)		(SSP/month)	
(e) Others ()		(times)		(SSP/time)		(times)		(SSP/time)	
(f) Others ()		(times)		(SSP/time)		(times)		(SSP/time)	
(g) Others ()		(times)		(SSP/time)		(times)		(SSP/time)	

**Agro-chemical: weedicide, insecticide, pesticide

Farming Practice in A Year

* If you cultivate a crop more than one time in a year, please describe a major cultivation.

4.2 Name of crop cultivated

* Please write down all varieties if you cultivated some varieties in a year.

3	
Crop	Cassava
Variety ()	()

4	
Crop	Millet
Variety ()	()

4.3 Crop production

- (1) Cultivated Extent
- (2) Season
- (3) Water supply

(fed)	
1 Rain	2 Dry
1 Irrigated by pump	2 Irrigated by bucket
3 Irrigated by gravity	4 Rain fed
kg or other units	
(1 unit: kg)	
Quantity	
	kg
	kg
	kg
	kg
	kg
	kg
	kg
	kg
	kg
: Sub total	
	kg

(fed)	
1 Rain	2 Dry
1 Irrigated by pump	2 Irrigated by bucket
3 Irrigated by gravity	4 Rain fed
kg or other units	
(1 unit: kg)	
Quantity	
	kg
	kg
	kg
	kg
	kg
	kg
	kg
	kg
	kg
: Sub total	
	kg

(4) Total production

(Circle the unit)

(5) How did you use the produce?

- (a) Stock for home consumption
- (b) Stock for seed
- (c) Loan repayment
- (d) Land tenant fee
- (e) Loss / damaged after harvest
- (f) Others (Gift and so on)

: Sub total

(g) If you sold to

In case of cereals, such as sorghum and maize, please fill in the amount of the grain

In case of G-nuts, fill in the production that's without shell.

- Trader / Collector
- Cooperative
- Sold at market
- Sold at market
- NGO
- Company
- Farmers/ Others

: Sub total

: Total selling amount

Grand total amount ((a)~(g))

Quantity (Paddy)	Price
kg	SSP/kg
kg	SSP/kg
kg	SSP/kg
(Market name:)	
kg	SSP/kg
(Market name:)	
kg	SSP/kg
kg	SSP/kg
kg	SSP/kg
kg	SSP/kg
kg	SSP/kg
: Sub total	
kg	SSP
: Total selling amount	
kg	SSP
: Grand total amount	
kg	SSP

Quantity (Paddy)	Price
kg	SSP/kg
kg	SSP/kg
kg	SSP/kg
(Market name:)	
kg	SSP/kg
(Market name:)	
kg	SSP/kg
kg	SSP/kg
kg	SSP/kg
kg	SSP/kg
kg	SSP/kg
: Sub total	
kg	SSP
: Total selling amount	
kg	SSP
: Grand total amount	
kg	SSP

Please check

4.4 Total quantity and unit prices of fertilizer used.

*The price of organic fertilizer made by themselves is estimated.

*Unit should be same between 'unit price' and 'quantity'.

Name	Unit price	Quantity	(unit)	Quantity	(unit)
Example	10 SSP/kg	500	kg	400	kg
(a) DAP	SSP/kg		kg		kg
(b) NPK	SSP/kg		kg		kg
(c) CAN	SSP/kg		kg		kg
(d) Urea	SSP/kg		kg		kg
(e) Liquid fertilizer	SSP/lit		lit		lit
(d) Organic fertilizers	SSP/kg		kg		kg
(e) Others ()	SSP/kg		kg		kg

4.5 Total quantity and unit prices of agro-chemicals sprayed

*Unit should be same between 'unit price' and 'quantity'.

Name	Unit price	Quantity	(unit)	Quantity
(a) Weedicide				
()	SSP/lit		lit	
(b) Insecticide				
()	SSP/lit		lit	
(c) Pesticide				
()	SSP/lit		lit	

4.6 Total quantity and unit price of seeds/seedling used

(a) Quantity sowed	(kg)	(kg)
(b) Unit price of seed	(SSP\$/kg)	(SSP\$/kg)
(c) Percentage of seed transplanted	(%)	(%)

4.7 Labor, mechanical and animal requirement

*If farmers carried out following activities in few times, please sum the man-days of the labors.

	(man*days)	Family		Hired		Family		Hired	
		Men	Women	Men	Women	Men	Women	Men	Women
(a) Land preparation (plough, puddling, leveling)									
(b) (Nursery preparation)									
(c) Seeding/Broadcasting									
(d) Planting/Transplanting									
(e) Fertilizing									
(f) Application of agro-chemical**									
(g) Weeding									
(h) Irrigating									
(i) Harvesting									
(j) Post-harvest processing/ bagging									
(k) Transportation and storing									
(2) <u>Tractor</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Land preparation									
(b) Transportation									
(3) <u>Draft animal</u>	(head*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Land preparation									
(b) Transportation									
(4) <u>Sprayer</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Application of agro-chemical									
(5) <u>Weeder</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Weeding									
(6) <u>Water pump</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Irrigating									
(7) <u>Thresher</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Threshing									
(8) <u>Other Costs</u>		<u>Amount</u>		<u>Unit price</u>		<u>Amount</u>		<u>Unit price</u>	
(a) Purchasing cost for bags		(pieces)		(SSP/piece)		(pieces)		(SSP/piece)	
(b) Other transportation cost		(times)		(SSP/time)		(times)		(SSP/time)	
(c) Sales charge		(times)		(SSP/time)		(times)		(SSP/time)	
(d) Land tenant fee		(months)		(SSP/month)		(months)		(SSP/month)	
(e) Others ()		(times)		(SSP/time)		(times)		(SSP/time)	
(f) Others ()		(times)		(SSP/time)		(times)		(SSP/time)	
(g) Others ()		(times)		(SSP/time)		(times)		(SSP/time)	

**Agro-chemical: weedicide, insecticide, pesticide

Farming Practice in A Year

* If you cultivate a crop more than one time in a year, please describe a major cultivation.

4.2 Name of crop cultivated

* Please write down all varieties if you cultivated some varieties in a year.

5	
Crop	Common Bean
Variety ()	()

6	
Crop	Ground nut
Variety ()	()

4.3 Crop production

- (1) Cultivated Extent
- (2) Season
- (3) Water supply

(fed)	
1 Rain	2 Dry
1 Irrigated by pump	2 Irrigated by bucket
3 Irrigated by gravity	4 Rain fed

(fed)	
1 Rain	2 Dry
1 Irrigated by pump	2 Irrigated by bucket
3 Irrigated by gravity	4 Rain fed

- (4) Total production (Circle the unit)

kg or other units	
(1unit: kg)	

kg or other units	
(1unit: kg)	

- (5) How did you use the produce?
 - (a) Stock for home consumption
 - (b) Stock for seed
 - (c) Loan repayment
 - (d) Land tenant fee
 - (e) Loss/ damaged after harvest
 - (f) Others (Gift and so on)

Quantity	
kg	kg
kg	kg
kg	kg
kg	kg
kg	kg
kg	kg
kg	kg

Quantity	
kg	kg
kg	kg
kg	kg
kg	kg
kg	kg
kg	kg
kg	kg

: Sub total

- (g) If you sold to

Quantity (Paddy)	Price
kg	SSP/kg
kg	SSP/kg
kg	SSP/kg
(Market name:)	
kg	SSP/kg
(Market name:)	
kg	SSP/kg
kg	SSP/kg
kg	SSP/kg
kg	SSP/kg
kg	SSP
kg	kg

Quantity (Paddy)	Price
kg	SSP/kg
kg	SSP/kg
kg	SSP/kg
(Market name:)	
kg	SSP/kg
(Market name:)	
kg	SSP/kg
kg	SSP/kg
kg	SSP/kg
kg	SSP
kg	kg

Please check

In case of cereals, such as sorghum and maize, please fill in the amount of the grain

In case of G-nuts, fill in the production that's without shell.

- Trader / Collector
 - Cooperative
 - Sold at market
 - Sold at market
 - NGO
 - Company
 - Farmers/ Others
- : Sub total
- : Total selling amount

Grand total amount ((a)~(g))

4.4 Total quantity and unit prices of fertilizer used.

*The price of organic fertilizer made by themselves is estimated.

*Unit should be same between 'unit price' and 'quantity'.

Name	Unit price	Quantity	(unit)	Quantity	(unit)
Example	10 SSP/kg	500	kg	400	kg
(a) DAP	SSP/kg		kg		kg
(b) NPK	SSP/kg		kg		kg
(c) CAN	SSP/kg		kg		kg
(d) Urea	SSP/kg		kg		kg
(e) Liquid fertilizer	SSP/lit		lit		lit
(d) Organic fertilizers	SSP/kg		kg		kg
(e) Others ()	SSP/kg		kg		kg

4.5 Total quantity and unit prices of agro-chemicals sprayed

*Unit should be same between 'unit price' and 'quantity'.

Name	Unit price	Quantity	Quantity
(a) Weedicide ()	SSP/lit	lit	lit
(b) Insecticide ()	SSP/lit	lit	lit
(c) Pesticide ()	SSP/lit	lit	lit

4.6 Total quantity and unit price of seeds/seedling used

(a) Quantity sowed	(kg)	(kg)
(b) Unit price of seed	(SSP\$/kg)	(SSP\$/kg)
(c) Percentage of seed transplanted	(%)	(%)

4.7 Labor, mechanical and animal requirement

*If farmers carried out following activities in few times, please sum the man-days of the labors.

(1) <u>Labor</u>	(man*days)	<u>Family</u>		<u>Hired</u>			<u>Family</u>		<u>Hired</u>	
		<u>Men</u>	<u>Women</u>	<u>Men</u>	<u>Women</u>		<u>Men</u>	<u>Women</u>	<u>Men</u>	<u>Women</u>
(a) Land preparation (plough, puddling, leveling)										
(b) (Nursery preparation)										
(c) Seeding/Broadcasting										
(d) Planting/Transplanting										
(e) Fertilizing										
(f) Application of agro-chemical**										
(g) Weeding										
(h) Irrigating										
(i) Harvesting										
(j) Post-harvest processing/ bagging										
(k) Transportation and storing										
(2) <u>Tractor</u>	(unit*days)	<u>Own</u>		<u>Hired</u>			<u>Own</u>		<u>Hired</u>	
(a) Land preparation										
(b) Transportation										
(3) <u>Draft animal</u>	(head*days)	<u>Own</u>		<u>Hired</u>			<u>Own</u>		<u>Hired</u>	
(a) Land preparation										
(b) Transportation										
(4) <u>Sprayer</u>	(unit*days)	<u>Own</u>		<u>Hired</u>			<u>Own</u>		<u>Hired</u>	
(a) Application of agro-chemical										
(5) <u>Weeder</u>	(unit*days)	<u>Own</u>		<u>Hired</u>			<u>Own</u>		<u>Hired</u>	
(a) Weeding										
(6) <u>Water pump</u>	(unit*days)	<u>Own</u>		<u>Hired</u>			<u>Own</u>		<u>Hired</u>	
(a) Irrigating										
(7) <u>Thresher</u>	(unit*days)	<u>Own</u>		<u>Hired</u>			<u>Own</u>		<u>Hired</u>	
(a) Threshing										
(8) <u>Other Costs</u>		<u>Amount</u>		<u>Unit price</u>			<u>Amount</u>		<u>Unit price</u>	
(a) Purchasing cost for bags			(pieces)		(SSP/piece)			(pieces)		(SSP/piece)
(b) Other transportation cost			(times)		(SSP/time)			(times)		(SSP/time)
(c) Sales charge			(times)		(SSP/time)			(times)		(SSP/time)
(d) Land tenant fee			(months)		(SSP/month)			(months)		(SSP/month)
(e) Others ()			(times)		(SSP/time)			(times)		(SSP/time)
(f) Others ()			(times)		(SSP/time)			(times)		(SSP/time)
(g) Others ()			(times)		(SSP/time)			(times)		(SSP/time)

**Agro-chemical: weedicide, insecticide, pesticide

4.6 Total quantity and unit price of seeds/seedling used

(a) Quantity sowed	(kg)	(kg)
(b) Unit price of seed	(SSP\$/kg)	(SSP\$/kg)
(c) Percentage of seed transplanted	(%)	(%)

4.7 Labor, mechanical and animal requirement

*If farmers carried out following activities in few times, please sum the man-days of the labors.

(1) <u>Labor</u>	(person*day)	<u>Family</u>		<u>Hired</u>		<u>Family</u>		<u>Hired</u>	
		<u>Men</u>	<u>Women</u>	<u>Men</u>	<u>Women</u>	<u>Men</u>	<u>Women</u>	<u>Men</u>	<u>Women</u>
(a) Land preparation (plough, puddling, leveling)									
(b) (Nursery preparation)									
(c) Seeding/Broadcasting									
(d) Planting/Transplanting									
(e) Fertilizing									
(f) Application of agro-chemical**									
(g) Weeding									
(h) Irrigating									
(i) Harvesting									
(j) Post-harvest processing/ bagging									
(k) Transportation and storing									
(2) <u>Tractor</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Land preparation									
(b) Transportation									
(3) <u>Draft animal</u>	(head*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Land preparation									
(b) Transportation									
(4) <u>Sprayer</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Application of agro-chemical									
(5) <u>Weeder</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Weeding									
(6) <u>Water pump</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Irrigating									
(7) <u>Thresher</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Threshing									
(8) <u>Other Costs</u>		<u>Amount</u>		<u>Unit price</u>		<u>Amount</u>		<u>Unit price</u>	
(a) Purchasing cost for bags			(pieces)		(SSP/piece)		(pieces)		(SSP/piece)
(b) Other transportation cost			(times)		(SSP/time)		(times)		(SSP/time)
(c) Sales charge			(times)		(SSP/time)		(times)		(SSP/time)
(d) Land tenant fee			(months)		(SSP/month)		(months)		(SSP/month)
(e) Others ()			(times)		(SSP/time)		(times)		(SSP/time)
(f) Others ()			(times)		(SSP/time)		(times)		(SSP/time)
(g) Others ()			(times)		(SSP/time)		(times)		(SSP/time)

**Agro-chemical: weedicide, insecticide, pesticide

4.6 Total quantity and unit price of seeds/seedling used

(a) Quantity sowed	(kg)	(kg)
(b) Unit price of seed	(SSP\$/kg)	(SSP\$/kg)
(c) Percentage of seed transplanted	(%)	(%)

4.7 Labor, mechanical and animal requirement

*If farmers carried out following activities in few times, please sum the man-days of the labors.

	(person*day)	Family		Hired		Family		Hired	
		Men	Women	Men	Women	Men	Women	Men	Women
(a) Land preparation (plough, puddling, leveling)									
(b) (Nursery preparation)									
(c) Seeding/Broadcasting									
(d) Planting/Transplanting									
(e) Fertilizing									
(f) Application of agro-chemical**									
(g) Weeding									
(h) Irrigating									
(i) Harvesting									
(j) Post-harvest processing/ bagging									
(k) Transportation and storing									
(2) <u>Tractor</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Land preparation									
(b) Transportation									
(3) <u>Draft animal</u>	(head*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Land preparation									
(b) Transportation									
(4) <u>Sprayer</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Application of agro-chemical									
(5) <u>Weeder</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Weeding									
(6) <u>Water pump</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Irrigating									
(7) <u>Thresher</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Threshing									
(8) <u>Other Costs</u>		<u>Amount</u>		<u>Unit price</u>		<u>Amount</u>		<u>Unit price</u>	
(a) Purchasing cost for bags		(pieces)		(SSP/piece)		(pieces)		(SSP/piece)	
(b) Other transportation cost		(times)		(SSP/time)		(times)		(SSP/time)	
(c) Sales charge		(times)		(SSP/time)		(times)		(SSP/time)	
(d) Land tenant fee		(months)		(SSP/month)		(months)		(SSP/month)	
(e) Others ()		(times)		(SSP/time)		(times)		(SSP/time)	
(f) Others ()		(times)		(SSP/time)		(times)		(SSP/time)	
(g) Others ()		(times)		(SSP/time)		(times)		(SSP/time)	

**Agro-chemical: weedicide, insecticide, pesticide

4.6 Total quantity and unit price of seeds/seedling used

(a) Quantity sowed	(kg)	(kg)
(b) Unit price of seed	(SSP\$/kg)	(SSP\$/kg)
(c) Percentage of seed transplanted	(%)	(%)

4.7 Labor, mechanical and animal requirement

*If farmers carried out following activities in few times, please sum the man-days of the labors.

	(person*day)	Family		Hired		Family		Hired	
		Men	Women	Men	Women	Men	Women	Men	Women
(a) Land preparation (plough, puddling, leveling)									
(b) (Nursery preparation)									
(c) Seeding/Broadcasting									
(d) Planting/Transplanting									
(e) Fertilizing									
(f) Application of agro-chemical**									
(g) Weeding									
(h) Irrigating									
(i) Harvesting									
(j) Post-harvest processing/ bagging									
(k) Transportation and storing									
(2) <u>Tractor</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Land preparation									
(b) Transportation									
(3) <u>Draft animal</u>	(head*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Land preparation									
(b) Transportation									
(4) <u>Sprayer</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Application of agro-chemical									
(5) <u>Weeder</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Weeding									
(6) <u>Water pump</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Irrigating									
(7) <u>Thresher</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Threshing									
(8) <u>Other Costs</u>		<u>Amount</u>		<u>Unit price</u>		<u>Amount</u>		<u>Unit price</u>	
(a) Purchasing cost for bags		(pieces)		(SSP/piece)		(pieces)		(SSP/piece)	
(b) Other transportation cost		(times)		(SSP/time)		(times)		(SSP/time)	
(c) Sales charge		(times)		(SSP/time)		(times)		(SSP/time)	
(d) Land tenant fee		(months)		(SSP/month)		(months)		(SSP/month)	
(e) Others ()		(times)		(SSP/time)		(times)		(SSP/time)	
(f) Others ()		(times)		(SSP/time)		(times)		(SSP/time)	
(g) Others ()		(times)		(SSP/time)		(times)		(SSP/time)	

**Agro-chemical: weedicide, insecticide, pesticide

4.6 Total quantity and unit price of seeds/seedling used

(a) Quantity sowed	(kg)	(kg)
(b) Unit price of seed	(SSP\$/kg)	(SSP\$/kg)
(c) Percentage of seed transplanted	(%)	(%)

4.7 Labor, mechanical and animal requirement

*If farmers carried out following activities in few times, please sum the man-days of the labors.

	(person*day)	Family		Hired		Family		Hired	
		Men	Women	Men	Women	Men	Women	Men	Women
(a) Land preparation (plough, puddling, leveling)									
(b) (Nursery preparation)									
(c) Seeding/Broadcasting									
(d) Planting/Transplanting									
(e) Fertilizing									
(f) Application of agro-chemical**									
(g) Weeding									
(h) Irrigating									
(i) Harvesting									
(j) Post-harvest processing/ bagging									
(k) Transportation and storing									
(2) <u>Tractor</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Land preparation									
(b) Transportation									
(3) <u>Draft animal</u>	(head*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Land preparation									
(b) Transportation									
(4) <u>Sprayer</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Application of agro-chemical									
(5) <u>Weeder</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Weeding									
(6) <u>Water pump</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Irrigating									
(7) <u>Thresher</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Threshing									
(8) <u>Other Costs</u>		<u>Amount</u>		<u>Unit price</u>		<u>Amount</u>		<u>Unit price</u>	
(a) Purchasing cost for bags		(pieces)		(SSP/piece)		(pieces)		(SSP/piece)	
(b) Other transportation cost		(times)		(SSP/time)		(times)		(SSP/time)	
(c) Sales charge		(times)		(SSP/time)		(times)		(SSP/time)	
(d) Land tenant fee		(months)		(SSP/month)		(months)		(SSP/month)	
(e) Others ()		(times)		(SSP/time)		(times)		(SSP/time)	
(f) Others ()		(times)		(SSP/time)		(times)		(SSP/time)	
(g) Others ()		(times)		(SSP/time)		(times)		(SSP/time)	

**Agro-chemical: weedicide, insecticide, pesticide

4.6 Total quantity and unit price of seeds/seedling used

(a) Quantity sowed	(kg)	(kg)
(b) Unit price of seed	(SSP\$/kg)	(SSP\$/kg)
(c) Percentage of seed transplanted	(%)	(%)

4.7 Labor, mechanical and animal requirement

*If farmers carried out following activities in few times, please sum the man-days of the labors.

	(person*day)	Family		Hired		Family		Hired	
		Men	Women	Men	Women	Men	Women	Men	Women
(a) Land preparation (plough, puddling, leveling)									
(b) (Nursery preparation)									
(c) Seeding/Broadcasting									
(d) Planting/Transplanting									
(e) Fertilizing									
(f) Application of agro-chemical**									
(g) Weeding									
(h) Irrigating									
(i) Harvesting									
(j) Post-harvest processing/ bagging									
(k) Transportation and storing									
(2) <u>Tractor</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Land preparation									
(b) Transportation									
(3) <u>Draft animal</u>	(head*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Land preparation									
(b) Transportation									
(4) <u>Sprayer</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Application of agro-chemical									
(5) <u>Weeder</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Weeding									
(6) <u>Water pump</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Irrigating									
(7) <u>Thresher</u>	(unit*days)	<u>Own</u>		<u>Hired</u>		<u>Own</u>		<u>Hired</u>	
(a) Threshing									
(8) <u>Other Costs</u>		<u>Amount</u>		<u>Unit price</u>		<u>Amount</u>		<u>Unit price</u>	
(a) Purchasing cost for bags			(pieces)		(SSP/piece)		(pieces)		(SSP/piece)
(b) Other transportation cost			(times)		(SSP/time)		(times)		(SSP/time)
(c) Sales charge			(times)		(SSP/time)		(times)		(SSP/time)
(d) Land tenant fee			(months)		(SSP/month)		(months)		(SSP/month)
(e) Others ()			(times)		(SSP/time)		(times)		(SSP/time)
(f) Others ()			(times)		(SSP/time)		(times)		(SSP/time)
(g) Others ()			(times)		(SSP/time)		(times)		(SSP/time)

**Agro-chemical: weedicide, insecticide, pesticide

4.8 Labor cost

If you hired labor for the farming, please tell us the unit hiring cost of the labor.

Land preparation (plough, puddling)	Male	Female	Meal/ Tea	
	(SSP/day)	(SSP/day)	Unit price (SSP/time)	(times/day)
(a) leveling				
(b) (Nursery preparation)				
(c) Seed sowing				
(d) (Planting/ Transplanting)				
(e) Fertilizing				
(f) Application of pesticide				
(g) Weeding				
(h) (Irrigating)				
(i) Harvesting				
(j) Post-harvest processing/ bagging				
(k) Transportation and storing				

If farmers pay wages to labors in kind, please convert them to SSP with the local price.

E.g., a male wage is 3 kg of paddy per day, the local unit price is SSP 10 /kg; 3*10 = SSP 30 /day.

4.9 Procurement of farm inputs

(1) From where do you obtain your farm inputs? (Multiple answers) (✓ in boxes)

	Agro-chemicals	Fertilizer	Seed-Cereal	Seed-Bean	Seed-Vegetable	Seed-Others	Fuel for Tractor
1 Government	1	1	1	1	1	1	1
2 NGO	2	2	2	2	2	2	2
3 Town shop	3	3	3	3	3	3	3
4 Village shop	4	4	4	4	4	4	4
5 Trader	5	5	5	5	5	5	5
6 Other farmers	6	6	6	6	6	6	6
7 Farmers' organization	7	7	7	7	7	7	7
8 Others	8	8	8	8	8	8	8
9 Made by themselves	9	9	9	9	9	9	

(2) Are there any problem in obtaining farm inputs? (✓ in box)

Yes No → Go to 4.8

What are the major problems in purchasing farm inputs? (Multiple answers) (✓ in boxes)

	Agro-chemicals	Fertilizer	Seed-Cereal	Seed-Bean	Seed-Vegetable	Seed-Others	Fuel for Tractor
1 Non availability	1	1	1	1	1	1	1
2 Not available when needed	2	2	2	2	2	2	2
3 Available in small quantities only	3	3	3	3	3	3	3
4 Expensive	4	4	4	4	4	4	4
5 Transport problems	5	5	5	5	5	5	5
6 Lack of finance	6	6	6	6	6	6	6
7 Low quality	7	7	7	7	7	7	7

4.11 Loss of pre-harvest

(1) What are important causes of pre-harvest damage or loss in your cereal cultivation? *(Multiple answers)*

1	Domestic animals	4	Pest	8	Shortage of irrigation water
2	Birds	5	Disease	9	Others
3	Other wild animals	6	Too much rain		
		7	Too little rain		

(2) What are important causes of pre-harvest damage or loss in your other crops cultivation? *(Multiple answers)*

1	Domestic animals	4	Other pest	8	Shortage of irrigation water
2	Birds	5	Disease	9	Others
3	Other wild animals	6	Too much rain		
		7	Too little rain		

4.12 Quality of crop production

(1) What are important factors for quality of cereal? *(Multiple answers)*

1	Unified varieties	5	Grain damaged by insects
2	Moisture contents	6	Colour of grain
3	Ratio of broken grain	7	I don't care the quality.
4	Ratio of contamination (e.g. straw, husk, stone, sand, weed seed, etc.)	8	Others ()

(2) What are important factors for quality of other crops? *(Multiple answers)*

1	Unified varieties	5	Vegetable damaged by insects
2	Moisture contents	6	Colour of vegetable
3	Ratio of broken vegetable	7	I don't care the quality.
4	Ratio of contamination (e.g. stone, sand, etc.)	8	Others ()

4.13 Farming plan in future irrigation scheme

(1) Which crop in each group are you willing to cultivate if you will be engaged in irrigated agriculture?

1	Maize	5	Ground nut	9	Tomato	(Others)	
2	Sorghum	6	Cowpea	10	Okra	14	
3	Cassava	7	Sesame	11	Jew's mallow (Mulukhiya)	15	
4	Common Beans	8	Sugarcane	12	Amaranthus	16	
				13	Egg plant	17	

(2) Which farming plan do you prefer if you will be engaged in irrigated agriculture?

	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Reason
Rainy season													

(3) Please choose the reason why you selected the farming type. (Multiple answers)

- 1 Highest income generation
- 2 Additional supply of staple food for yourself
- 3 Easy to cultivate
- 4 Others (please specify: _____)

Q-5 Income from Other Crops in Home Garden, Livestock and Other Products in the Last One Year

(1)-1 Income from Home Garden

	(I)	(II)	(III)	(IV)	(V)
1) <u>Name of crops cultivated</u>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>
2) <u>Cultivated extent</u> (fed)	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>
3) <u>Month of Seeding/Planting - Harvesting</u> <small>*If the activities are carried out for several month, please fill in the all months.</small>	-	-	-	-	-
4) <u>Crop production</u>	↓	↓	↓	↓	↓
(a) Total production (kg)	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>
(b) Home consumption (kg)	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>
(c) Quantity sold (kg)	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>
(d) Unit price (SSP/kg)	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>
(e) Gross income (c) x (d)(SSP)	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>
5) <u>Family labor</u>					
(a) Land preparing(person*day)	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>
(b) Seedling/ Planting person*day)	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>
(c) Weeding (person*day)	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>
(d) Harvesting (person*day)	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>
6) <u>Expenditure of input material</u>					
(a) Seed (SSP)	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>
(b) Fertilizer (SSP)	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>
(c) Agro-chemical (SSP)	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>
(d) Total expenditure (SSP)	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>
7) <u>Net income (last one year)</u> <small>(e) Gross income (c)</small>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>
(d) Total cost for input material (SSP)	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>
	(End)	(End)	(End)	(End)	(End)

(1)-2 Income from Home Garden

	(VI)	(VII)	(VIII)	(IX)	(X)
1) <u>Name of crops cultivated</u>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>
2) <u>Cultivated extent</u> (fed)	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>
3) <u>Month of Seeding/Planting - Harvesting</u> <small>*If the activities are carried out for several month, please fill in the all months.</small>	-	-	-	-	-
4) <u>Crop production</u>	↓	↓	↓	↓	↓
(a) Total production (kg)	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>
(b) Home consumption (kg)	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>
(c) Quantity sold (kg)	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>
(d) Unit price (SSP/kg)	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>
(e) Gross income (c) x (d)(SSP)	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>
5) <u>Family labor</u>					
(a) Land preparing(person*day)	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>
(b) Seedling/ Planting person*day)	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>
(c) Weeding (person*day)	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>
(d) Harvesting (person*day)	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>
6) <u>Expenditure of input material</u>					
(a) Seed (SSP)	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>
(b) Fertilizer (SSP)	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>
(c) Agro-chemical (SSP)	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>	<input style="width: 100%; border-top: 1px dashed black;" type="text"/>
(d) Total expenditure (SSP)	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>
7) <u>Net income (last one year)</u> <small>(e) Gross income (c)</small>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>
(d) Total cost for input material (SSP)	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>
	(End)	(End)	(End)	(End)	(End)

	(I)	(II)	(III)	(IV)	(V)
(3) Other products					
1) Name of products	Fish	Honey	Hunting	Others ()	Others ()
2) Production					
(a) Total production (kg)	()	()	()	()	()
(b) Home consumption (kg)	()	()	()	()	()
(c) Quantity sold (kg)	()	()	()	()	()
(d) Unit price (SSP/kg)	()	()	()	()	()
(e) Gross income (SSP)					
3) <u>Family labor</u>					
(a) Caring (person*day, 7hrs/day)					
(b) Feeding (person*day, 7hrs/day)					
(c) Collections (person*day, 7hrs/day)					
4) <u>Expenditure of input material</u>					
(a) Feed (SSP)					
(b) Equipment (SSP)					
(c) Total expenditure (SSP)					
5) <u>Net income (last one year)</u>					
(a) Gross income (SSP)					
(b) Total cost for input material (SSP)					

Q-6 Wages/ Salary, Leasing, Business and Other Income

Note: All the income earned by all members of the family should be included.

Items	(SSP/month)	(months/year)	(SSP/year)
(1) Wages from working on other farms			
(2) *What kind of animals do you lease? ()			
(3) Leasing for farm machinery and equipment			
(4) Leasing for non-farm machinery, equipment and transportation			
(5) Salary from other occupations (government official, driver, company employee, etc.)			
(6) Wages as casual worker			
(7) Earnings from business (boutique, restaurant, three wheeler, taxi, etc.)			
(8) Receipt of gifts and remittance from relatives and others			
(9) Lease of farm land			
(10) Interest earned from money loaned			
(11) Other non-farm income ()			
(12) Other non-farm income ()			
(13) Other non-farm income ()			
(14) Other non-farm income ()			
(15) Other non-farm income ()			

Q-7 Living Expenses

*The column of the both monthly cash outlay and yearly cash outlay should be filled out because monthly outlay does not occur in every month.

Items	Self Supply			Cash Outlay	
	Monthly (kg)	Yearly (kg)	Market price (SSP/kg)	Monthly (SSP/month)	Yearly (SSP/year)
(1) Foods					
(a) Maize					
(b) Sorghum					
(c) Cassava					
(d) Common Beans					
(e) Ground nut					
(f) Sesame					
(g) Other tubers and Roots					
(h) Fish					
(i) Meat and Eggs					
(j) Vegetables					
(k) Flour					
(l) Bread					
(m) Tea and Coffee					
(n) Milk (powder) & Yogurt					
(o) Liquor and Soft drinks					
(p) Cooking oil					
(q) Sugar and Salt					
(r) Spice & Other foods					
(2) Tobacco and Cigarettes					
(3) Soap, Shampoo, etc.					
(4) Electricity charges					
(5) Expenses for firewood, cooking fuel and LP-gas					
(6) Expenses for lighting fuel					
(7) Household furnishing and equipment					
(8) Repair and maintenance of house					
(9) Clothing					
(10) Medical care					
(11) Education					
(12) Recreation					
(13) Expenses for ceremonial occasions					
(14) Transportation and communication					
(15) Remittance to relatives					
(16) Land and house rent					
(18) Taxes					
(19) Loan repayment					
(20) Others ()					
(21) Others ()					
(22) Others ()					
(23) Others ()					
(24) Others ()					

Q-8 Present Farming Situation

8.1 Problems related to farming ?(Multiple answers) (✓ in boxes)

- | | |
|----|--|
| 1 | Water shortage |
| 2 | Drought damage |
| 3 | Low yield of crops |
| 4 | Drainage problems |
| 5 | Damage by pests and diseases |
| 6 | Weed damage |
| 7 | Damage by wild animal |
| 8 | Difficulty in hiring animal/mechanical power |
| 9 | Labour shortage |
| 10 | Difficulty in obtaining seeds |

- | | |
|----|---|
| 11 | Difficulty in purchasing agro-chemicals |
| 12 | Difficulty in purchasing fertilizer |
| 13 | Lack of farm roads |
| 14 | Damage by domestic animal |
| 15 | Shortage of selling opportunity |
| 16 | Lack of storage facilities |
| 17 | Problems related to loans |
| 18 | Other |
- -----

8.2 Which item do you need to improve on your farming ? (Multiple answers)(✓ in boxes)

- | | |
|---|--|
| 1 | To acquire irrigation water |
| 2 | To improve irrigation facilities |
| 3 | To drain out excess water |
| 4 | To prevent pests and diseases |
| 5 | To prevent damage by animal |
| 6 | To prevent weed damage |
| 7 | To improve supplying system of farm inputs |
| 8 | To improve farm road |
| 9 | To improve transportation of products |

- | | |
|----|---|
| 10 | To introduce improved seed/plant varieties |
| 11 | To improve farming practices |
| 12 | To introduce mechanized farming |
| 13 | To strengthen agricultural extension services |
| 14 | To improve and expand agricultural credit |
| 15 | To construct drying yard |
| 16 | To construct processing facilities |
| 17 | To construct storage facilities |
| 18 | Other |
- -----

Q-9 Selling of Agriculture Products

(1) Do you have any products to sell at a market/ to a middleman(✓ in boxes)

Yes No → Go to Q10

(2) What is the distance from your house to the sales point?

km

(3) What is the mode of the transport ? (Multiple answer) (✓ in boxes)

- | | | | | | | | |
|---|------------|---|-------------|---|---------|---|---------------|
| 1 | Public bus | 3 | Private car | 5 | Bicycle | 7 | No need |
| 2 | Tractor | 4 | Motorbike | 6 | On foot | 8 | Others: ----- |

(4) What is cost of transport / bags ? SSP/bag 1bag = kg

(5) What are the major problems in marketing of products ? (Multiple answer)(✓ in boxes)

- | | | | |
|---|-----------------------------------|---|----------------------------|
| 1 | Low selling prices | 6 | Lack of packaging material |
| 2 | Lack of transportation facilities | 7 | Others: ----- |
| 3 | High cost of transportation | | ----- |
| 4 | Lack of storage facilities | | ----- |
| 5 | Quality problems of products | | ----- |

Q-10 Existing Farmers' Group and Farmers' Organization (FG/FO)

(1) Are you a member of the Farmers' Group or farmers' organization (FG/FO) ?

Yes No (✓ in box)

(2) How many members of your FG/FO? _____

(3) If "Yes", what are the objectives of the FG/FC (Multiple answer) (✓ in boxes)

- | | |
|---|--|
| 1 | Cooperative purchasing of farm inputs such as fertilizers, agro-chemical |
| 2 | Cooperative shipping of products |
| 3 | Loan arranged for the farmer |
| 4 | Maintain common resources in the community |
| 5 | Organize social activities for the village |
| 6 | Others |

(4) Are you satisfied about the present activities of FG/FO ? (✓ in box)

1 Fair satisfied 2 Satisfied 3 No answer 4 Not satisfied

(5) Are there any problems in the FG/FO(✓ in box)

Yes No

If "Yes", what are the problems ? (Multiple answer)(✓ in boxes)

- | | |
|---|---|
| 1 | Farmers have no interest to the organization's activities. |
| 2 | No leader. |
| 4 | No fund to manage FG/FO. |
| 5 | No definite article and bylaw. |
| 6 | No participation of farmers in the farmers' organization. |
| 7 | FG/FO is managed only on leader's ideas and opinions of members are not considered. |
| 8 | Leader has no sense of responsibility to the members. |
| 9 | Others |

Q-11 Irrigation Service Charge / Activity of WUA or WG (✓ in a box)

(1) Are you a member of WG (Water Group) or WUA (Water Users Association)? (✓ in box)

Yes → Go to (2) No → Go to Q-12

(2) What kind of WG or WUA do you participate?

1 WUA 2 Traditional WG 3 Others()

(3) If an irrigation project can increase the yield of a crop,

how much percent of the increment would you like to pay as the water _____%

Q-12 Loan

(✓ in boxes)

(1) Do you borrow the money?

Yes →Go to (2)

No →Go to (9)

(2) If "Yes", from where do you borrow the money?

(Multiple answer)

Private bank (name: _____)

NGO (name: _____)

Credit Cooperative

Farming group

Relative

Neighbor

others _____

(3) How much do you borrow money currently?

0-140 SSP

141-350 SSP

351-700 SSP

701-1,400 SSP

1,401-3,500 SSP

above 3,501 SSP

(4) Which collateral do you provide to borrow money?

Land

Other collateral _____

(5) How much is interest rate?

_____ % per

year

month

other period _____

(6) How long is the repayment period?

1 week

2 weeks

1 month

3 month

6 month

1 year

until harvest season

others _____

(7) How often do you repay?

Every week

Every 2 weeks

Every month

Every 3 months

Every harvest season

others _____

(8) What is purpose of borrowing money?

(Multiple answer)

Agri. inputs (seeds, fertilizer, etc.)

Agricultural machine

Hiring agri. labor

Food

Housing

other agri. activity _____

Emergency (illness, injury)

Education

others _____

(9) Why you don't borrow money? (Skip this question if the answer of (1) is "Yes")

Not necessary

No place to borrow money

Interest rate is too high

Unable to provide collateral

others _____

Q-13 Agricultural Services / Agricultural Activities (✓ in boxes)

For the crop cultivation, from whom have you received any services during the last one year ?

13.1 (Multiple answer)

- 1 Government extension worker
 2 NGO
 3 Private company
 4 Other organization
 5 Farmers Group
 6 Others ()

13.2 If you answered "1)Government extension worker" in 13.1, please answer next questions.

(1) How often did you receive agricultural service from Gov. Extension worker in a year? _____ times/year

(2) What advise did you receive from the extension worker ? (Multiple answer)

- 1 Improved seeds
 2 Insecticide use
 3 Soil improvement
 4 Fertilizer application
 5 Cultivation method
 6 Others

(3) Did you have any benefits from the extension services ?

- 1 Yes, very much
 2 Yes, some
 3 No, not helpful

13.3 If you answered the number except "1)Government extension worker" in 13.1, please answer next questions:

①The name of organization ()

(1) How often did you receive agricultural service from the organization in a year? _____ times/year

(2) What advise did you receive from the organization ? (Multiple answer)

- 1 Improved seeds
 2 Insecticide use
 3 Soil improvement
 4 Fertilizer application
 5 Cultivation method
 6 Others

(3) Did you have any benefits from the organization ?

- 1 Yes, very much
 2 Yes, some
 3 No, not helpful

②The name of organization ()

(1) How often did you receive agricultural service from the organization in a year? _____ times/year

(2) What advise did you receive from the organization ? (Multiple answer)

- 1 Improved seeds
 2 Insecticide use
 3 Soil improvement
 4 Fertilizer application
 5 Cultivation method
 6 Others

(3) Did you have any benefits from the organization ?

- 1 Yes, very much
 2 Yes, some
 3 No, not helpful

③The name of organization ()

(1) How often did you receive agricultural service from the organization in a year? _____ times/year

(2) What advise did you receive from the organization ? (Multiple answer)

- 1 Improved seeds
 2 Insecticide use
 3 Soil improvement
 4 Fertilizer application
 5 Cultivation method
 6 Others

(3) Did you have any benefits from the organization ?

- 1 Yes, very much
 2 Yes, some
 3 No, not helpful

13.4 For the livestock raising, did you have any extension services from Government veterinary-extension office during the last one year ?

Yes →Go to (1) No →Go to 13.5

(1) What services/advice did you receive from the veterinary extension ? (*Multiple answer*)

1 Animal breeding 2 Animal food 3 Vaccination
 4 Artificial Insemination 5 Medicine 6 Others

(2) Did you have any benefits from the extension services ?

1 Yes, very much 2 Yes, some 3 No, not helpful

13.5 What services do you need for improving farming (crop cultivation and livestock raising) ?

Crop cultivation:

Livestock raising:

Q-14 Gender/ Roles and Responsibilities (✓ the box, Multiple answer)

(1) Who sells products to market or trader?

(Cereals)

Male

Female

Children

(Vegetables)

Male

Female

Children

(Livestock)

Male

Female

Children

(2) Who manages the income?

(Cereals)

Male

Female

(Vegetables)

Male

Female

(Livestock)

Male

Female

(Non-farm income)

Male

Female

(3) Who transports drinking water ?

Male

Female

Children

(a) Distance from house to the water source?

meter

(b) How many times do you transport per day?

times/day

(c) How long does it take to get there and back?

hours/time

(4) Who collect firewood?

Male

Female

Children

(a) Distance from house to collecting points on the average?

meter

(b) How many times do you collect per week?

times/week

(c) How long does it take to get there and back?

hours/time