

SMALL WATER IMPOUNDING SYSTEMS: IMPACTS and their VALUATION

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BSWM Mandate

The Bureau of Soils and Water Management shall:

- Advise and render assistance on matters relative to the utilization of soils and water as vital agricultural resources
- Formulate measures and guidelines for effective soil, land and water resources utilization
- Undertake soil/water resources research programs

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Small Water Impounding System

- an earthfill structure that collects and stores rainfall and runoff during rainy season for productive use during dry season.



Small Water Impounding System

- a water harvesting and storage structure for soil and water conservation, flood control, supplemental irrigation, inland fishery and recreation
- Height : 5 -15 meters
- average service area is 50 ha per project (20-150 ha)
- average investment cost is about P150,000/ha (2008)
- As of Dec 2008, about 384 SWIS serving 22,083 ha with 16,250 farmer-beneficiaries



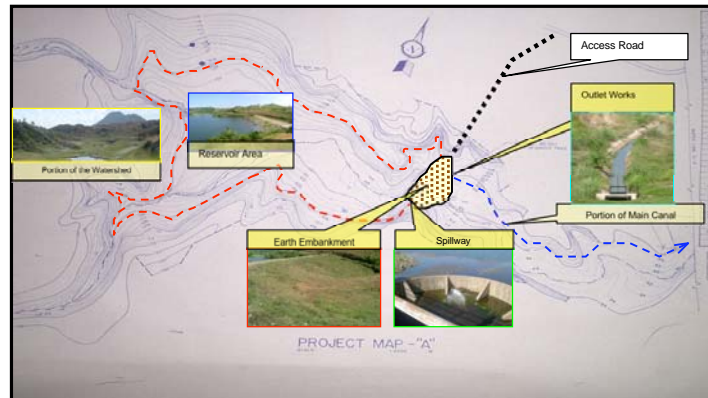


SWIS DESCRIPTION

TYPE OF STRUCTURE : MODIFIED HOMOGENOUS EARTHFILL EMBANKMENT

STRUCTURAL HEIGHT : < 30 meters

STORAGE CAPACITY : < 50 MCM



HIGHLIGHTS

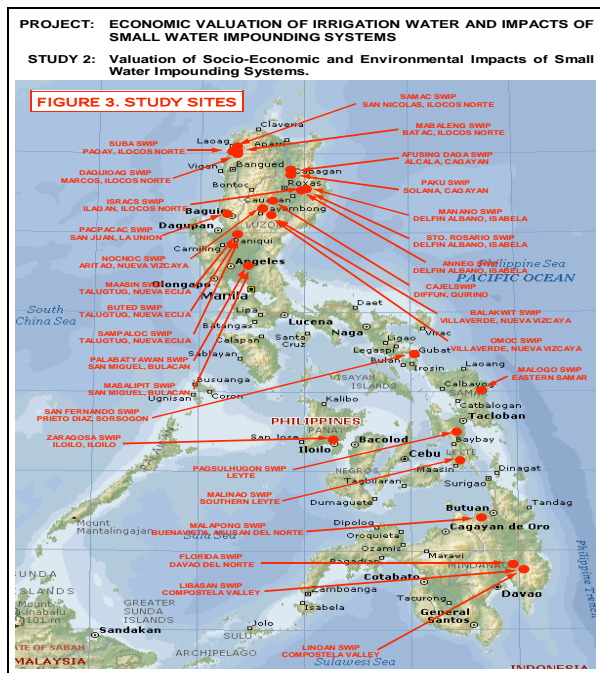
OBJECTIVES

- To identify the factors affecting the impacts of SWIS
- To determine the socio-institutional, economic and environmental impacts of SWIS
- To develop a proposed scheme for impact monitoring of SWIS

METHODOLOGY

- Sites selected - 28 SWIS
- Data generation
 - secondary data (feasibility reports/IA records)
 - primary data:
 - farm survey: farmer
 - key informants interviews
 - focus group discussion – perception on impacts
- Estimation and data analysis
 - Incidence of impact
 - Impact valuation

PROJECT LOCATION



Study sites, n=28

Figure __ Distribution of study sites by region, 28 SWIP, Philippines

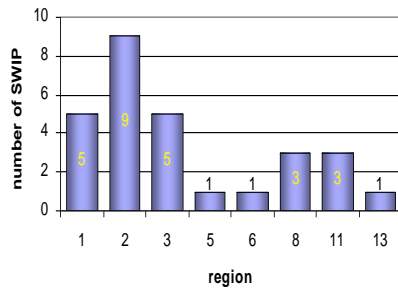
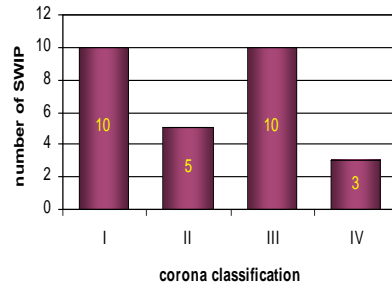


Figure __ Distribution of study sites by climatic type, 28 SWIP, Philippines

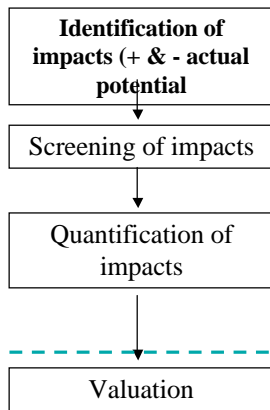


RESPONDENTS

Respondents / Key informants	No.	Total	% of total
LGU officials/ technicians	28	28	100
Irrigators Association officials	28	272 (as of conduct of the study)	10
Farmer-beneficiaries	274	1,302	21
Fishers	7	202	3
Affected landowners/ tenants/ occupants	28	136	21

IMPACT VALUATION

Process:



Key informant interviews of farmers, officers' of IA, LGU, RFU and stakeholders

Criteria:

- Significance of impact
- Vulnerability of affected parties
- Availability of mitigating measures

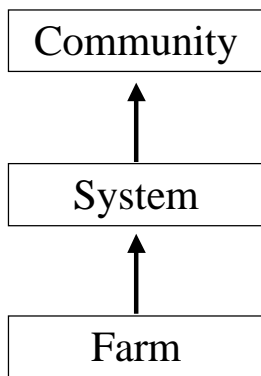
Key informant interviews and survey: extent & severity of impacts for impact group, measurement of domestic consumption

Actual net contribution to social welfare

Opportunity cost to society

IMPACT ANALYSIS

Unit of analysis



Coverage for valuation: economic uses
 4 recreation – nature & extent: current fees
 3 domestic (crop & animal raising) – productivity, income, food supply
 2 fishery dev't – productivity, income, food supply
 1 irrigation impact – benefits to prod'n income & food supply; cost of direct water supply (with & w/out land acquisition)

Coverage for valuation: environmental functions
 4 ground water recharge
 3 soil conservation (siltation)
 2 water conservation
 1 flood mitigation

RESULTS & DISCUSSIONS

Factors Affecting the Impacts of SWIS

1. Rainfall characteristics
2. Watershed characteristics
3. Resource charge
4. Leadership of the association

RESULTS & DISCUSSIONS

Factors affecting rice production in areas served by SWIS:

- amount of irrigation water released to the farm shows strong positive relation with rice production. Considering their respective beta coefficients, irrigation water has the largest contribution
- Additionally, farm inputs explain much of the variation in rice production

	Component			
	1	2	3	4
AREA	0.005	0.228	0.077	0.082
LABOR	0.842	0.236	0.104	0.061
SEED	0.821	-0.003	0.077	0.072
Amount of water	0.753	0.369	0.121	0.149
Amount of fertilizer	0.741	-0.001	0.109	-0.042
Household labor	0.736	-0.12	-0.18	-0.077
Other chemicals	0.715	-0.214	-0.178	-0.17
Land tax	0.065	0.873	-0.017	-0.076
Land rent	0.064	0.007	0.891	-0.032
Years farming	0.032	0.132	-0.339	0.753
Household size	-0.013	-0.246	0.295	0.675

Degree of association of each variable to the components

Coefficients of model predictors

	Unstandardized Coefficients		Standardized Coefficients		t	Sig.
	B	Std. Error	Beta			
(Constant)	-66.818	432.096			-0.155	0.877
CLIMATE2	1339.247	348.166	0.128		3.847	0
CLIMATE3	1579.617	274.19	0.199		5.761	0
CLIMATE4	1874.733	443.961	0.14		4.223	0
HHSIZE	-109.431	60.466	-0.054		-1.81	0.071
AMT_H2O	0.136	0.011	0.476		12.192	0
YRS_FARM	0.001	8.283	0		0	1
SEED	0.808	0.112	0.283		7.191	0
FERT	0.379	0.062	0.231		6.096	0

a. Dependent Variable: PROD
b. Selecting only cases for which SEASON = 1

	R	R Square	Adjusted R Square	Std. Error of the Estimate
Model 1	0.877	0.769	0.762	1857.247

Predictors: (Constant), FERT, YRS_FARM, HHSIZE, CLIMATE4, CLIMATE2, CLIMATE3, AMT_H2O, SEED
Dependent Variable: PROD

Analysis of Variance of the regression model

Goodness of fit is highly significant. R² is 77%

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3002355107	8	375294388.3	108.801	0
	Residual	900285100.6	261	3449368.201		
	Total	3902640207	269			

Predictors: (Constant), FERT, YRS_FARM, HHSIZE, CLIMATE4, CLIMATE2, CLIMATE3, AMT_H2O, SEED
Dependent Variable: PROD

RESULTS & DISCUSSIONS

•Incidence of impacts

•Who lost?
 •Displaced farmers/
 affected landowners
 - 136

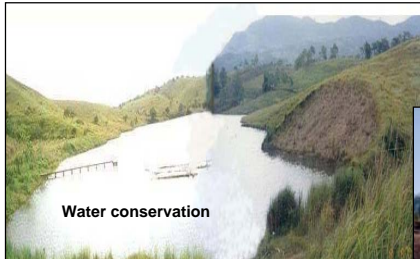
•Who gain?
 •Farmers - 1,302
 •Fishers - 202
 •Households- 47
 •IA - 28
 •LGU - 28

•Who paid?
 •Farmers - 1,302
 •Fishers - 202
 •IA - 28
 •LGU - 28
 •Patrons - 365

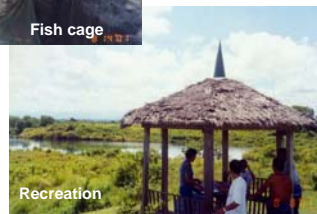
RESULTS & DISCUSSIONS

MULTIPLE FUNCTIONS OF SWIP

<i>Environmental functions</i>	<i>Economic functions</i>
• Soil and water conservation	– Consumptive
• Flood mitigation	• Crop production
• Ground water recharge	• Inland fishing (outside reservoir)
• Biodiversity	• Livestock
• Land use (new areas opened up)	• Domestic use
<i>Social functions</i>	– Non-consumptive
• Job generation	• Inland fishing (at reservoir)
• Sanitation	• Recreation
• Access (road)	• Water transport (at reservoir)
• Enhance leadership	<i>Research function</i>
• Peace and order	



Environmental Function



Economic Functions



Socio-institutional Functions

RESULTS & DISCUSSIONS

Direct impacts	Indirect impacts
<ul style="list-style-type: none"> • Increased crop production 	<ul style="list-style-type: none"> • Increased income
<ul style="list-style-type: none"> • Increased fish production 	<ul style="list-style-type: none"> • Increased welfare levels (food, education, medical care, housing, clothing, consumer durables)
<ul style="list-style-type: none"> • Increased poultry & livestock production 	<ul style="list-style-type: none"> • Employment benefits
	<ul style="list-style-type: none"> • Recreation benefits
	<ul style="list-style-type: none"> • Peace and order benefits
	<ul style="list-style-type: none"> • Probable multiplier benefits

RESULTS & DISCUSSIONS

Impacts of SWIS

- Environmental

Soil & water conservation

Volume of water conserved for 21 SWIP= 12.74 M cu.m.
 211 cu.m/year (Balakwit) & 1,260 cu.m (Omoc) of soil sediments was captured minimizing soil erosion downstream

Improved ground water recharge
 shallow wells adjoining the reservoir had increase in water yield

Bio-diversity conservation

Watershed serve as habitat for birds, other fauna & flora

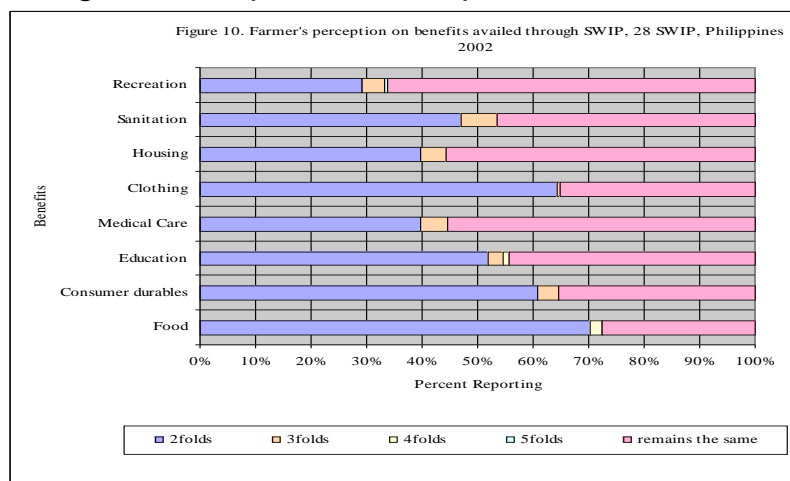
Flooding Mitigation

Area affected was reduced; damage cost was reduced from PhP 0.8M to PhP 0.5M

RESULTS & DISCUSSIONS

Impacts of SWIS

- Magnitude of perceived impacts



RESULTS & DISCUSSIONS

Impacts of SWIS

- Magnitude of perceived impacts

Farmers were also able to acquire properties averaging PhP215 to PhP27,330 per farmer-beneficiaries

Properties acquired:

- } farm land,
- } residential lot
- } vehicle
- } appliances

RESULTS & DISCUSSIONS

Impacts of SWIS

- Socio-Economics

Farm level

Item	Unit	Quantity
Rice production		
Cropping intensity	times a year	2 to 3
Additional rice production	kg/ha	4,480
Added income	PhP/ha	36,288
Inland fishing		
Pond production	kg/fisher	128
Income from fishing	PhP/fisher	5,888

RESULTS & DISCUSSIONS

Impacts of SWIS

•Socio-Economics

System Level

Item	Unit	Quantity
Rice production (28 SWIPs)	mt	48,134
Value of rice production	PhP million	40.78
Added income to rice farmers	PhP million	17.37
Inland fishing (7 SWIPs)		
Tilapia production	kg	33,398

RESULTS & DISCUSSIONS

Impacts of SWIS

•Socio-Economics

Community Level

Item	Unit	Quantity
Supporting capacity	persons	
Rice production		27,769
Inland fishing		928
Job generation	persons	3,743
Farm inputs purchased/utilized	PhP	6,535,899
Seeds		1,422,289
Fertilizers		3,567,352
Farm chemicals		1,546,258

RESULTS & DISCUSSIONS

Impacts of SWIS

•Socio-Economics

Recreation

320 visitors/year at P5/head recreation fee
 = P1,600.00 income for IA

Improve Access

Embankment serves as **access** to neighboring barangays (Suba, Nocnoc, Palabatyawan, Maasin, Sampaloc & Masalipit)

RESULTS & DISCUSSIONS

Impacts of SWIS

•Economic

Crop Production

Farm labor utilization (man-day/ha)			
climate type	labor	1st cropping	2nd cropping
type I & III	family	16	15
	hired	55	52
type II & IV	family	12	13
	hired	56	51
Job generated (man-day)			
type I & III	family	240	1,935
	hired	825	6,708
type II & IV	family	144	390
	hired	672	1530

Crop production increase (kg/ha)		
Climate Type	1st Cropping	2nd Cropping
type I & III	444	3,460
type II & IV	1,878	3,667
Area utilization (ha)		
type I & III	15	129
type II & IV	12	30

RESULTS & DISCUSSIONS

Impacts of SWIS

- Economic

Fishery

Production in 7 SWIP- 38,398 kg/year

Income generated:

Fishers- PhP 866,860.00 MAFC-PhP45,000.00

IA- PhP 563,300.00 LGU- PhP45,000.00

Total production can supply the consumption requirement of 928 persons per year.

RESULTS & DISCUSSIONS

Impacts of SWIS

- Economic

Domestic Piggery

An additional income of PhP 4,340 every 4 months; meat production can feed 135 persons annually.

Backyard gardening

Additional income of PhP 20/sqm every 4 to 6 months

RECOMMENDATION

Proposed scheme for impact monitoring of SWIS

- a. Preliminary assessment** – to initially identify key impacts that need to be assessed, their significance and importance;
- b. Scoping and gathering of baseline information** – to ensure that the assessment focuses on key issues and to determine where more information is required;
- c. Impact assessment and evaluation** – to undertake detailed field investigations and assessment of project impacts.

Conclusion

- Other than irrigation function, the study confirmed that SWIS serves a multiple purpose- environmental, economic, socio-institutional and research functions.
- SWIS improved the welfare of farmers. A twofold benefit from SWIS is derived by farmers in terms of available food in their table, clothing, consumer durables or appliances, education of their children and sanitation.
- SWIS improved purchasing power of the farmers - Farmers were able to acquire properties like farmland, residential lot, vehicle, appliances and farm equipment from increased production due to SWIS.

Conclusion

- With incidence of impacts favoring many benefits than the affected parties & considering the multiple benefits derived from the implementation of SWIS outweighing the negative impacts, similar project is worth implementing in appropriate areas of the country in the future.

Plans for CY 2009

- SWIS Budget - P 603 M
- Rehabilitation of Existing SWIS
- Construction of New SWIS
 - New - 131
 - Additional Service Area - 7,143 ha.
 - Farmer Beneficiaries - 4,977
 - Projected Increase in Production - 29,737mt/yr