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IMPACT ANALYSIS OF A SMALL-SCALE IRRIGATION PROJECT IN MANICAHAN DISTRICT, ZAMBOANGA CITY

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I. PROJECT BACKGROUND

The subject of this study is a 300-hectare, small-scale irrigation system in Manicahan District some 30 kilometers from Zamboanga City. The system was rehabilitated and expanded in 1979 by the National Irrigation Administration with a project cost of around ₱250,000. This was in line with the region's thrust to attain self-sufficiency in rice as stipulated in the regional plan for the period 1978-82.

The project sought to service around 230 farmers in the area, of which almost 90 percent are tenants. These farmers cultivate 1.5 hectares of rice land on the average. Many have availed themselves of Masagana 99 loan assistance. However, some of them have not been able to pay back their loans due to low production. Consequently, because of the lack of funds, some farmers are now cultivating with less production inputs such as fertilizers and pesticides. This has influenced their production outputs. There is also the problem of inadequate distribution of irrigation water especially during the dry season. Because of this, farmers have had to resort to staggered planting. Farmers and workers are mostly from the same district of Manicahan. Some farmers also avail themselves of mechanical tractors for hire to plow their farm but harvesting, threshing and drying are still being done in the traditional way.

For purposes of comparison, another area in Balinsungay, Barangay Talabaan was also studied. The area, which is purely rainfed riceland, is 500 hectares in size and cultivated only during the wet season. During the dry season the farmers go into other sources of livelihood such as fishing. Farm sizes vary from 1 to 3 hectares and most

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farmers are tenants. Farmers who cultivate 3 or more hectares of land are usually owners of the land.

The area is so fertile that even though there is only one cropping per year, the average yield per farm exceeds 100 cavans. Working techniques in the farms do not vary very much from those in the Manicahan area except in the mode of payment to the workers.

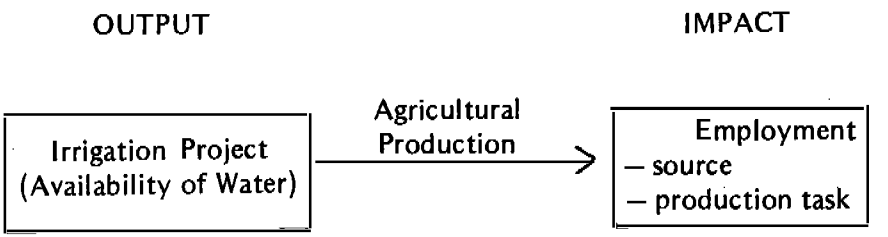
II. DESCRIPTION OF THE RESEARCH

The purpose of this study is to examine different levels of employment on farms as a result of the irrigation project. One interesting question to ask is whether irrigated farms require more labor than nonirrigated farms. This study investigates on-farm employment by source and production task, taking into account the adequacy and inadequacy of water on the farm. Specifically, this means looking into the different sources of labor used (i.e., family labor, hired labor, in-kind labor), the variation in employment for different stages of production activities from preplanting to the post-harvesting phase, the effects of the wet and dry season croppings on labor requirements, and other factors such as work techniques and manpower availability in the locality, or whether different people are involved in the different production activities.

The limited scope of the research should be noted. The research was only for one and a half months and assessment of impact was directed mainly on employment. Other factors that effect rice production like production inputs, plant diseases, and rat infestation were not given in-depth consideration..

III. IMPACT RESEARCH METHODOLOGY

CONCEPTUAL FRAMEWORK, HYPOTHESIS AND INDICATORS



A conceptual framework (see chart) tried to test the hypothesis that the availability of water on farms will bring about an increase in the level of agricultural production and thereby lead to a change in the pattern of employment, which is broken down by source and production task.

Employment

It is hypothesized that small-scale irrigation will increase farm employment through:

a) higher labor requirements of irrigated crops compared to nonirrigated crops.
b) increased labor utilization due to higher cropping intensity.

Area of Concern	*Impact Indicators*
Employment	1. Labor utilization per hectare by crop 2. Total man-days worked per year

Methods of Analysis

The methodology that was used in the analysis is the comparative approach which compares impact indicators of an irrigated area with those of a nonirrigated area. Using the "with and without" project comparison involves comparing performance in the "with project" situation with the performance in a similar "without project" circumstance. A comparison of irrigated farms with adequate and inadequate supply of water during the dry season was originally planned but was shelved since most of the respondent farmers indicated that staggered planting was practiced and it was found that they have the same cropping intensity. The evaluator decided to use as a control group purely rainfed areas which were located after some investigations and ocular inspections. Analyses were made between irrigated farms as the experimental group and rainfed farms as the control group.

Measurement of Impact Indicators

1. Number of persons employed per hectare by crop, by sex, by type of labor (with and without irrigation).
2. Number of man-days utilized per hectare by crop, by sex and by type of labor (with and without irrigation). Assuming that the

total area is fixed, the change in labor utilization due to irrigation may be viewed as the sum of two components:

i) the change in labor utilization per hectare in the wet season (L^W) due to higher labor requirements of irrigated crops given by

$$\Delta L^W = K^W \ \Delta(L^i - L^n)$$

where

Δ = total area

L^i = labor requirements per hectare for irrigated crop

L^n = labor requirement per hectare for nonirrigated crop

K^W = proportion of irrigated area to total area in the wet season,

and ii) the increase in labor utilization per hectare due to the increase in number of croppings in the dry season made possible by irrigation given by

$$\Delta L^d = aK^d \ (L^i)$$

where

a = average extra croppings

K^d = proportion of irrigated area to total area = total area

L^i = labor requirements per hectare of irrigated crop

The measurement of impact can be obtained by subtracting indicators from the study area with and without irrigation. The required data were obtained from sample surveys conducted on similar irrigated and nonirrigated areas.

Data Collection

Data collection was conducted at the farm and household levels, using one researcher and three assistant researchers. A survey questionnaire was designed to elicit information on the following:

1. Farm size.

2. Farm production (wet and dry season).
3. Number of hectares irrigated (by crop, area and season).
4. Type and quality of irrigation.
5. Water distribution (adequate, inadequate).
6. Labor utilization (by crop, operation and season).
7. Man-days labor employed:
   a) By type of labor (hired, in kind, family)
   b) By production activities
   c) By sex
8. Mode of payment for labor.
9. Source of labor.

The survey started around the last week of February 1982. It started with site investigation made by the survey team composed of one researcher and three assistants. Interviews with farm extension officers of the area were conducted and a listing of the farmers in the area was acquired through the technicians. The listing also showed the number of hectares cultivated by individual farmers. From this listing, an initial group of farmers was selected as a representative sample of the irrigated farms in the area. For this purpose, the sizes of the farms they were cultivating were considered. A pretest of the questionnaire was conducted to find out whether it was applicable to the situation. The questionnaire was eventually revised.

The survey in the area lasted for five days. It was in this survey that the evaluator found out that it would not be feasible for areas that have an inadequate supply of water for irrigation to be considered as nonirrigated, because these areas adopted staggered planting, had the same cropping intensity, and did not have much variation in terms of production outputs. Fifty-four farmers were interviewed, and the information gathered was on the 1981 cropping season.

For the nonirrigated areas, assistance was provided by field technicians form the Ministry of Agriculture. An area was identified and was chosen because of its similarity and proximity to the irrigated group. They are only about 8 kilometers apart. The same survey procedures were adopted. Fifty-three farmers were chosen from this group taking into account the sizes of their farms and the survey lasted one week.

IV. FINDINGS

Production

In terms of production, irrigated farms produced 10,062 cavans of palay as against only 4,939 cavans for nonirrigated farms. This was because irrigated farms had two cropping seasons while nonirrigated farms had only one cropping season. On the average production per hectare on irrigated farms was 144.6 cavans while nonirrigated farms produced only 72.3 cavans. These were gathered from 53 farms with a total area of 69.6 ha. of irrigated land and 47 rainfed farms with a total area of 68.3 ha. (Table 1). This shows the production for the whole year of 1981. If we were to make the comparison on the basis of one cropping season, e.g. the wet season when all farms are cultivated, we would find that, in terms of production per hectare, there was not much difference between irrigated farms and nonirrigated farms. The average wet-season production per hectare for irrigated farms was 65 cavans while for the nonirrigated farms, it was 72.3 cavans. The average production for irrigated farms per hectare was 80 cavans in the dry season and 65 cavans in the wet season.

Employment by Production Activities

Table 2 compares average man-days employed per hectare per year by production activities. For nonirrigated farms, an average of 136 man-days were employed per hectare per year while for irrigated farms a total average of 308 man-days were employed. This shows that for the same size of farm a 127 percent increase in terms of man-days employed would be achieved if a hectare of rainfed farm were to be irrigated. However, it should be noted here that considerable variation exists for activities like plowing and harrowing, weed control, harvesting, and threshing.

In Table 3, employment was broken down by low and high production for irrigated and nonirrigated farms. This shows the relationship between irrigation, production and employment. It would seem that low production in both irrigated and nonirrigated farms is associated more with employment in terms of man-days than with high production. However, chi-square statistical tests show that there are no significant statistical differences in terms of employment between high and low production in irrigated and nonirrigated farms. The same result may be obtained if average employment levels during the

TABLE 1
RICE PRODUCTION BY FARM SIZE*, CY 1981

	Irrigated Farm					*Non-Irrigated Farm*				
	No. of farms	*Total area (in hectares)*	*Total production (in cavans)*	*Average production per farm (in cavans)*	*Average production per hectare (in cavans)*	*No. of farms*	*Total area (in hectares)*	*Total production (in cavans)*	*Average production per farm (in cavans)*	*Average production per hectare (in cavans*
Less than 1 Ha.	14	7.4	1,216	86.9	164.3	11	7.4	650	59.1	87.8
1 Ha. to 1.5 ha.	25	28	4,333	173.3	154.8	22	26.5	2,176	98.9	82.1
1.6 ha. to 2.0 ha.	8	15	2,453	306.6	163.5	8	14.7	800	100.0	54.4
2.1 ha. and over	6	19.2	2,060	343.3	107.3	6	19.7	1,313	218.8	66.6
Total	53	69.6	10,062	189.8	144.6	47	68.3	4,939	405.1	72.3

*Initially, 107 farmers were interviewed. It was later determined that farmers cultivating rainfed farms larger than 2.1 hectares had been oversampled. For final analysis, adjustments were made to ensure comparability in farm size distribution between the irrigated and rainfed groups. This means a total sample size of 100.

TABLE 2
AVERAGE EMPLOYMENT IN MAN-DAYS PER HECTARE PER YEAR BY PRODUCTION ACTIVITIES CY 1981

Activities	*Irrigated*	*Non-Irrigated*
1. Raising seedlings	8	4
2. Plowing/Rotavating	18	7
3. Harrowing	19	8
4. Basal fertilization and leveling	3	2
5. Treating of seedlings	1	1
6. Transplanting	25	17
7. Water management	11	5
8. Weed control	72	19
9. Insect and pest control	14	6
10. N-Top dressing	3	1
11. Rat control	16	8
12. Harvesting and threshing	104	51
13. Cleaning and drying	14	7
Total	308	136

wet season are compared or when comparing employment levels on irrigated farms between wet and dry seasons. However, as can be seen in Tables 3-5, while the differences in total average labor are not significant, there are a few substantial differences in labor utilization for specific tasks. Among the most notable are: (1) higher labor utilization by low production farms for harvesting and threshing and (2) higher labor utilization by irrigated farms for weed control.

Employment by Type of Labor

Most of the workers involved in weed control were the same people involved in harvesting and threshing, up to cleaning and drying. This practice is common to irrigated areas where payment is usually on a share basis, 1:5, that is, one share for the workers and 5 shares for the farmer. This is practiced irrespective of whether the farm has high or low production. For nonirrigated areas, the sharing is 1:8. This is because weed control activities are usually paid in cash so as to minimize the spreading of manpower thinly to other farms.

TABLE 3
AVERAGE EMPLOYMENT LEVEL IN MAN-DAYS PER HECTARE
BY PRODUCTION ACTIVITIES, BY LEVEL OF PRODUCTION CY 1981

Activities	*Irrigated*		*Non-Irrigated*	
	Low production; 34.7 Ha.	*High production; 34.9 Ha.*	*Low production; 33.7 Ha.*	*High production; 34.6 Ha.*
1. Rasing seedlings	6.6	9.7	5.2	3.4
2. Plowing/Rotovating	14.2	22.1	6.7	7.8
3. Harrowing	15.1	21.3	7.3	9.5
4. Basal fertilization and leveling	4.1	2.6	1.9	1.8
5. Treating of seedlings	0.2	1.1	.9	0.5
6. Transplanting	19.4	29.9	17.6	16.7
7. Water management	10.8	12.1	5.8	4.0
8. Weed control	80.1	64.4	19.5	19.1
9. Insect and pest control	12.9	14.9	6.7	5.2
10. N-Top dressing	2.9	2.5	1.0	1.4
11. Rat control	16.7	15.0	8.9	6.6
12. Harvesting and threshing	120.3	88.5	64.9	37.9
13. Cleaning and drying	14.5	14.0	7.6	7.1
Total	317.8	298.1	154.0	121.0

In-kind labor constituted the majority of workers in these areas, following the common practice (see Table 6). On the average, each hectare of irrigated farm employed 57 man-days of hired labor, 159 man-days of in-kind labor and 92 man-days of family labor while each hectare of nonirrigated farm used 41 man-days of hired labor, 55 man-days of in-kind labor and 40 man-days of family labor. On a per hectare basis, it is safe to assume that in-kind labor has the highest percentage rate on the type of labor being employed by most farms for nonirrigated and irrigated farms. Table 7 shows the average employment used per hectare in irrigated and nonirrigated farms.

TABLE 4
AVERAGE EMPLOYMENT LEVEL IN MAN-DAYS PER HECTARE PER CROPPING BY PRODUCTION ACTIVITIES, WET SEASON CY 1981

Activities	*Irrigated*	*Non-Irrigated*
1. Raising seedlings	5	4
2. Plowing/Rotavating	8	7
3. Harrowing	9	8
4. Basal fertilization and leveling	2	2
5. Treating of seedlings	1	1
6. Transplanting	13	17
7. Water management	6	5
8. Weed control	37	19
9. Insect and pest control	7	6
10. N-Top dressing	2	1
11. Rat control	8	8
12. Harvesting and threshing	53	51
13. Cleaning and drying	8	7
Total	159*	136*

*No significant statistical difference.

$X^2_C = 5.4$ $X^2_C \alpha .05 = 21.03$

TABLE 5
AVERAGE EMPLOYMENT LEVEL IN MAN-DAY FOR IRRIGATED FARM BY PRODUCTION ACTIVITIES CY 1981

Activities	*Wet season*	*Dry season*
1. Raising seedlings	5	3
2. Plowing/Rotavating	8	10
3. Harrowing	9	9
4. Basal fertilization and leveling	2	1
5. Treating of seedlings	1	1
6. Transplanting	13	12
7. Water management	6	5
8. Weed control replanting	37	35
9. Insect and pest control	7	7
10. N-Top dressing	2	1
11. Rat control	8	8
12. Harvesting and threshing	53	51
13. Cleaning and drying	8	6
Total	159*	149*

*No significant statistical difference.

$X^2_c = 1.7$ $X^2_t \alpha .05 = 21.03$

TABLE 6
DISTRIBUTION OF WORKERS BY TYPE OF LABOR, BY CATEGORY, BY TYPE OF FARM

Category	No. of workers *				No. of man-days			
	Hired labor	In-kind labor	Family labor	Total	Hired labor	In-kind labor	Family labor	Total
				Irrigated Farm				
Less than 1 Ha.	304	461	318	1,083	412	1,036	1,396	2,844
One Ha. to 1.5 Ha.	582	1,516	590	2,688	992	4,345	2,539	7,876
1.6 Ha. to 2.0 Ha.	390	692	176	1,258	1,410	1,858	850	4,118
2.1 Ha. and over	278	566	252	1,096	1,188	3,848	1,590	6,626
Total	1,554	3,235	1,336	6,125	4,002	11,087	6,375	21,464
				Non-Irrigated Farm				
Less than 1 Ha.	150	90	213	453	361	185	667	1,218
One Ha. to 1.5 Ha.	265	1,065	290	1,620	748	2,169	1,023	3,940
1.6 Ha. to 2.0 Ha.	286	279	114	679	791	715	356	1,862
2.1 Ha. and over	189	266	141	696	916	703	655	2,274
Total	990	1,700	758	3,448	2,816	3,772	2,701	9,289

* Number of workers includes workers who performed more than one task. This means the actual number of people who worked is less than the total provided here. See Table 7.

TABLE 7
AVERAGE NUMBER OF EMPLOYMENT, BY TYPE, BY SEX PER HECTARE, CY 1981

Irrigated Farm						*Non-Irrigated Farm*					
No. of farms	*Total area (ha.)*	*Males*	*Man-days*	*Females*	*Man-days*	*No. of farms*	*Total area (ha.)*	*Males*	*Man-days*	*Females*	*Man-days*
53	69.6	76	258	12	50	48	68.3	37	102	13	34

IRRIGATED FARM

Average number of workers					*Average number of man-days*		
No. of farms	*Total area (ha.)*	*Hired workers*	*In-kind labor*	*Family labor*	*Hired labor*	*In-kind labor*	*Family labor*
53	69.6	22	46	19	57	159	92

NON-IRRIGATED FARM

Average number of workers					*Average number of man-days*		
No. of farms	*Total area (ha.)*	*Hired workers*	*In-kind labor*	*Family labor*	*Hired labor*	*In-kind labor*	*Family labor*
47	68.3	14	25	11	41	55	40

Employment by Sex

In the 100 farms used for evaluation, the majority of the workers used were male. Female workers were usually used for transplanting, weed control, and harvest and threshing activities. In irrigated farms, of the 21,464 man-days employed for the whole cropping season, 17,984 man-days were filled by male workers, while only 3,480 man-days were filled by female workers. In nonirrigated farms, 7,173 man-days were filled by males while 2,116 man-days were filled by females. On a per hectare basis for irrigated farms, 258 man-days were filled by males while only 50 man-days were employed by females. For nonirrigated farms, the same general proportion could be found: 102 man-days for male workers and 34 man-days for female workers.

Mode of Payment

Since most of the workers preferred sharing as a mode of payment, the majority of workers were of the in-kind type of labor. Although the "pintakasi" type of labor was given free, we have classified this type of labor as in-kind labor because expenses have been incurred in terms of food and drinks. The average payment for plowing a hectare of farm by tractor was around ₱280.00, usually with 2 operators. If this was done by carabao, the average per day was ₱15.00. On the sharing basis, if production activities involved weed control and harvesting/threshing, the proportion was one for the worker and five for the farmer. If only harvesting was involved, then the sharing system was 1:8, that is, one share for the worker and 8 shares for the farmer. On the average, for hired workers, payment usually varied from ₱8.00 to ₱10.00 depending on the type of activities.

V. CONCLUSION

The main conclusion which could be drawn with regard to the impact of irrigation on employment and labor utilization is that while irrigation is associated with higher labor utilization, that association is not consistent across all tasks, is not simply a product of higher production and productivity, and is not symptomatic of broader differences in farm management. Such conclusions should be viewed very carefully given the short time involved in the research

reported here. However, even with the limitations of the research, the results reported here do suggest the need to look at the impact of irrigation as a more complex question than perhaps has been true in the past.