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THE UPPER PAMPANGA RIVER PROJECT'S IMPACT ON NONFARM EMPLOYMENT AND REGIONAL GROWTH

by

William Sander

A B S T R A C T

The impact of the Upper Pampanga River Project, a large-scale irrigation project in the Philippines, on agricultural production and income and nonfarm employment is estimated. It is shown that the project contributes significantly to agricultural development in the Nueva Ecija region as well as to nonfarm employment in the region. The project's primary contribution to nonfarm employment in the region is brought about by additional spending by farmers on consumer goods and services. It also contributes to nonfarm jobs in the agriculturally related industries --- industries which supply inputs to the farmer or industries which process or distribute agricultural products. The impact in the agricultural industries is less significant than the impact in the consumer goods and services industries.

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*William Sander**

Irrigation development is an important component of the agricultural modernization program in the Philippines. The expansion of irrigated land should contribute significantly to agricultural development and economic growth (International Labour Office, 1974 and Asian Development Bank, 1978). In addition, irrigation development should contribute directly to labor absorption since farmers will use more labor per hectare as these cropping intensity increases (Barker and Cordova, 1978). It should also contribute indirectly to labor absorption since farmers will purchase more non-labor inputs as their cropping intensity increases and more outputs will have to be processed and marketed as

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production expands. In addition, farmers will spend more on consumer goods and services as their income increases.

This indirect expansionary impact of an irrigation project in the Philippines, the Upper Pampanga River Project (UPRP), will be examined in this paper. The focus of the study will be on the impact of the project on nonfarm employment in a city and a municipalities within its service area. After a description of the project and region in which it is located, a methodological approach to estimating the project's impact on nonfarm regional developmen will be outlined. In the following sections, empirical fi ings will be presented. The implications of the study wil be discussed in a concluding section.

Study Region

The Upper Pampanga River Project is located in the Province of Nueva Ecija. In 1975 the population of the province was 947,995 and it is estimated at over one milli today, as shown in Table 1. Cabanatuan City is the capita of the province. In 1975 its population was put at 115,25 and it is estimated at between 127 and 130 thousand today. Cabanatuan City is located in the central portion of the UPRP's service area. The project's impact on non-farm emp ment in Cabanatuan City and Talavera, an adjacent municipa lity which has a population estimated at between 58 and 6

thousand today, will be the focus of this study.

Cabanatuan City and Talavera were chosen over other cities and municipalities in the region since most observers of the region believe that this is where the most significant nonfarm employment changes in the region have occured during the past several years. This is indicated also by a 57% increase in the number of establishments in Cabanatuan City between 1975 and 1979.[1]

The Upper Pampanga River Project

The Upper Pampanga River Project was the first large-scale World Bank supported irrigation project in the Philippines. The project was authorized in 1969 to increase food production and stimulate growth by supplying "a dependable water supply for year-round paddy cultivation of 72,000 hectares with an additional area of 5,000 hectares during the wet season only" (National Irrigation Administration, 1977, p. 6). It is estimated that the project will eventually serve 83,000 hectares during the wet season and 78,000 hectares during the dry season (National Irrigation Administration, 1977, pp. A91-A92).

The project was completed in 1975 although it did not become fully operational until 1977. It was not operational during the 1976-1977 dry season although it was able to irri-

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[1]Bureau of Census and Statistics, Republic of the Phil. unpublished data.

Table 1

Population

	1975	1979[1]	% Chang
Nueva Ecija	947,995	1,046,409-1,075,288	10-13%
Cabanatuan City	115,258	127,223- 130,735	10-13%
Talavera	53,011	58,514- 60,129	10-13%

Sources: Republic of the Philippines, National Economic and Development Authority, National Census and Statistics Office, "1975 Integrated Census of the Population And Its Economic Activities, Vol. I," "1978 Philippine Statistical Yearbook," 1978.

[1]Estimate based upon an annual increase in population of 2.5% to 3.2%. These are the low and high ranges for population growth estimated by the National Economic and Development Authority in the Philippines.

gate 10,000 hectares of land during the 1973-1974 dry season and 42,000 hectares during the 1974-1975 dry season (National Irrigation Administration, 1977, p. 111).

The project is located in the upper portion of the Pampanga River Basin and it serves about 17,000 rice farmers in the Province of Nueva Ecija. The average farm size is 2.4 hectares. Fifty-one percent of the farmers cultivate 1.5 hectares or less; forty-four percent cultivate 1.6 to 4 hectares; and three percent cultivate more than 4 hectares. Approximately 16% of the farmers are owner-operators; 31% are amortizing owners (formerly tenants); and 53% are leaseholders (National Irrigation Administration, 1977, p. A115).

Since 1976 the National Irrigation Administration (NIA) has monitored the inputs into the project and the outputs from the project. NIA's input-output monitoring program will serve as a basis from which to estimate the project's impact on the agricultural economic base in the region as well as its impact on the farmers it serves.

The Economic Base Approach[1]

An economic base approach will be taken to estimate the Upper Pampanga River Project's impact on nonfarm employment in Cabanatuan City and Talavera. According to this

[1]This approach is developed more completely in (Nourse, 1968, pp. 161-163) and (Isard, 1960, pp. 189-205).

methodology economic activities within a region can be delineated into two sectors. The first sector includes activities that produce goods and services for firms and individuals outside of the region and is called the basic or export sector of the regional economy. The second sector is called the non-basic, non-export or service sector and includes activities that produce goods and services for the region.

The economic base logic is that regional growth is premised upon the expansion of the region's basic or export sector. Growth in the service sector is induced by or stems from growth in the basic sector. Thus, growth in nonfarm employment in the study region is stimulated by growth in the economic base in the region, according to this logic.

Then in order to estimate the impact of the Upper Pampanga River Project on nonfarm employment in Cabanatuan City and Talavera it is necessary to (1) estimate the UPRP's impact on the agricultural economic base in the regi (Nueva Ecija) and (2) measure the changes in the nonagricultural economic base and service sector since the project was completed. From this information one can estimate the project's contribution to the economic base in the study region and, accordingly, its contribution to stimulating nonfarm service sector employment.

Impacts of the project on agricultural production and income were estimated from the National Irrigation Administration's input-output monitoring study. Estimates of changes in the nonagricultural economic base and service sector in Cabanatuan City and Talavera were based upon a survey of 592 establishments (17% of the total) in the two localities. The Bureau of Census and Statistical compiled a list of all the establishments in Cabanatuan City and Talavera in December 1978 excluding primary and secondary public schools and government offices from which the 17% sample was made. Establishments were sampled in all of the industries in the localities. The survey was conducted between May and September of 1979.

From the sample, the number of full time jobs in each industry in Cabanatuan City and Talavera in 1975 and 1979 was estimated. 1975 was used as the base since this was the year that the UPRP became fully operational. In addition, an estimate of the market that each industry served was made. The markets were delineated as the Cabanatuan City-Talavera market, the Nueva Ecija market outside Cabanatuan City and Talavera, and the market outside of Nueva Ecija. In the analysis, the former two markets were defined as the local market and the latter as the export market. The number of full time jobs in each industry was then allocated to either

the local market or export market. For example, in the manufacture and repair of rattan furniture industry in Cabanatuan City it was estimated that there were 28 full time jobs in the industry in 1979 and 20 in 1975. Ten percent of this industry's market was outside of Nueva Ecija and ninety percent was within Nueva Ecija. Thus, it was assumed that ten percent of the industry was part of the economic base of Cabanatuan City and ninety percent of the industry serviced local demand. Accordingly, ten percent of the change in employment in the industry (8 x .1 = 0.8 jobs) was allocated to export demand and ninety percent (8 x .9 = 7.2 jobs) to local demand. This type of allocation for each industry in Cabanatuan City and Talavera gave an estimate of the change in employment between 1975 and 1979 that was attributable to local demand and the change that was attributable to export demand. Since the change in local economic activities is a function of the change in export economic activites (including agricultural exports to other regions), the impact of the UPRP on the economic base (export sectors) and, accordingly, on the local service sector can be assessed.

There are several shortcomings to the economic base approach employed here which should be mentioned. First, no allowance is made for changes in non-rice agricultural production in the region. Thus, there may be a slight under-

estimation of the economic base since non-rice agriculture may contribute to it as well as a slight underestimation of the contribution of non-rice agriculture to local demand. Second, no allowances are made for changes in non-agricultural exports elsewhere in Nueva Ecija. Thus, some of the change in service sector employment in Cabanatuan City and Talavera would have been generated by an increase in export production and income outside of those two communities, but within the Nueva Ecija region. This is probably not significant though since Cabanatuan City is the center of non-agricultural economic activity in the region. Third, no allowances were made for changes in employment outside of the formal sector----those establishments listed by the Bureau of Census and Statistics. This probably resulted in an underestimation of service sector employment since no allowance was made for changes in the so-called informal sector which includes such occupation as domestic help, door-to-door peddling of perishable goods and gambling. And, fourth, no allowances were made for income that was transferred from other regions. For example, someone could work in Manila and maintain a family in Cabanatuan City.

Impact on the Agricultural Economic Base

By 1980 the Upper Pampanga River Project is expected to irrigate 83,000 hectares during the wet season and 78,000

hectares during the dry season. Without the project, 51,000 hectares could be irrigated during the wet season, 32,000 hectares could be cultivated during the wet season by virtue of rainfed irrigation, and 5,000 hectares could be irrigated during the dry season (National Irrigation Administration, 1977, pp. A91-A92).

Without the project, 183,250 metric tons of rice could be produced yearly within the UPRP service area --- 170,750 metric tons during the wet season and 12,500 metric tons during the dry season. NIA estimated that with the project 643,000 metric tons of rice would be produced annually within the same area --- 315,400 metric tons during the wet season and 327,600 metric tons in the dry season. Their production estimates were based upon an average yield of 3.8 metric tons per hectare in the wet season and 4.2 metric tons per hectare in the dry season. Without the project, estimated yields were 2.25 and 1.75 metric tons per hectare on irrigated and rainfed land respectively during the wet season and 2.50 metric tons per hectare on irrigated land during the dry season (National Irrigation Administration, 1977, pp. A91-A92).

Thus, the project was expected to increase rice production by 459,750 metric tons (643,000 metric tons with the project minus 183,250 metric tons without the project) or by 251%. NIA attributed part of the expected increase in

production to an increase in area planted (the conversion of 32,000 hectares of rainfed land to irrigated land during the wet season and an addition of 73,000 hectares of irrigated land during the dry season) and part of the increase to expected higher yields, as noted above. If the area and yield influences are separated, 43% or 198,500 metric tons of the increase would be attributable to area and 57% or 261,250 metric tons would be attributable to yield.

In Table 2, an estimate of the Upper Pampanga River Project's incremental contribution to rice production in Nueva Ecija since the 1976 wet season is presented. This estimate was based upon the average project yield that season multiplied by the area the project served that season less 51,000 hectares during the wet season (the amount of land which could be irrigated without the project during the dry season) and 5,000 hectares (the amount of land which could be irrigated without the project during the dry season) during the dry season. Data on the average project yield and area served was provided by NIA.

The Bureau of Agricultural Economics (BAECON) of the Department of Agriculture provided NIA with estimates of rice production in Nueva Ecija each season. An estimate of rice production in the region without the UPRP was made by subtracting my estimate of UPRP's incremental contribution from

Table 2
The Upper Pampanga River Project's Contribution
To The Agricultural Economic Base in Nueva Ecija

Seasons	Rice Production with UPRP (metric tons)	Rice Production Without UPRP (metric tons)	Incremental Contribution of UPRP %	Yield Within The UPRP Service Area (metric tons/hect.)
Wet Season 1976	263,239	249,739	13,500 (5%)	2.25
Dry Season 1976-1977	P r o j e c t n o t o p e r a t i o n a l			
Wet Season 1977	387,514	349,029	38,485 (11%)	3.35
Dry Season 1977-1978	275,688	81,616	194,072(238%)	3.60
Wet Season 1978	208,210	153,491	54,719 (36%)	2.20
Dry Season 1978-1979	276,688[1/]			4.25

Sources: National Irrigation Administration Reports on the Input-Output Monitoring Program for the Upper Pampanga River Integrated Irrigation System, 1976-1979.

[1/] This is the estimate for rice production within the UPRP. It does not include rice production elsewhere in the region.

BAECON's aggregate estimate of rice production in Nueva Ecija. Thus, the UPRP's relative contribution to rice production in Nueva Ecija could be estimated by dividing the incremental contribution estimate by the estimate of rice production in Nueva Ecija without the UPRP. All of this data is arrayed in Table 2.

As Table 2 shows, the incremental contribution of the project to rice production in the region has been greatest during the dry season. During the 1977-1978 dry season, the project increased rice production in the region by 194, 072 metric tons or 238%. UPRP's contribution during the 1978-1979 dry season was even more substantial although data on rice production outside the UPRP service area during the 1978-1979 dry season is not yet available. The contribution during the wet season has been less substantial, as the table shows. Part of the poor showing during the 1976 wet season was caused by tungro infestation. A severe typhoon had a significant adverse impact on the project during the 1978 wet season.

Impact On Farmers

As the preceeding section implies, the project's primary benefit to farmers is that they are able to get at least two crops of rice per year instead of one. Secondarily, the project helps farmers get higher yields during the wet season.

Thus, farmers should be able to at least double their income since their cropping intensity has doubled. This was the case in 1977 (wet season 1977 and dry season 1977-1978), as shown in Table 3. However, during the preceeding year (1976) the wet season yields were relatively low (2.5 metric tons per hectare) because of tungro infestation and the proj did not operate during the dry season that year. Hence, net farm income was low in 1976. Yields were also relatively lo during the wet season in 1978 because of the damaging effect of a severe typhoon and net farm income was accordingly low that season also. During the 1978-1979 dry season average n farm income per hectare is about as high as the preceeding d season.

Off-farm income among farm households accounted for 1 of the total income of farm households during 1977, as Table also shows. The absolute amount of off-farm income per hect declined in 1978 although the relative share is a little hig since farm income was very low during the 1978 wet season.

To date, then, the Upper Pampanga River Project has boosted farm income significantly during the 1977-1978 and 1978-1979 dry seasons and it has enabled farmers to get slig higher yields (and hence income) during the 1976 to 1978 wet seasons than they would have received without the project. addition, agriculture has remained the primary source of far

income. Although farmers do receive income from off-farm sources it is not substantial and has not increased since the project became operational. Thus, it follows that farmers should have spent significantly more during the past few years on agricultural inputs since their cropping intensity has increased as well as more on consumer goods and services since their income is higher.

In order to get a general idea concerning incremental expenditures made by UPRP farmers, in August and September of 1979 212 UPRP farmers were surveyed and asked whether the project had enabled them to increase their income. Ninety-one percent of the farmers surveyed reponded that the project did indeed help them increase their income. The farmers were also asked what additional expenditures they were able to make and what specific items they bought because of their improved income position. Half of the farmers surveyed said they spent more on education for their children while forty-four percent spent more on appliances and thirty-five percent spent more on food, as shown in Table 4. Also, thirty percent spent more on machinery; twenty-two percent spent more on transportation; twenty-two percent spent more on furniture; eighteen percent spent more on clothing; and ten percent spent more on improvements for their home.

Table 3

Average Net Farm Income Per Hectare From Rice Production and Average Off-Farm Income Per Hectare For Farmers Within the UPRP Service Area

Season	Average Net Farm Income Per Hectare (1972 Prices)	Average Off Fa Income Per Hec (1972 Prices
Wet Season 1976	₱1,073 (585)	₱369 (202)
Wet Season 1977	1,813 (912	453 (230)
Dry Season 1977-78	2,103 (1,057)	383 (195)
Wet Season 1978	579 (270)	380 (177)
Dry Season 1978-79	2,281 (977)	285 (122)

Source: National Irrigation Administration, "Input-Output Monitoring Program for the Upper Pampanga River Integrated Irrigation System, 1976-1979."

In Table 5 the frequency of which specific items were purchased is given. The most frequently purchased item was a TV as the table shows. After that a radio/phone set, a tractor (primarily hand tractors), and an electric fan were the items that farmers most frequently purchased.

Impact On The Nonfarm Sector

In Tables 6 and 7 the changes in nonfarm employment between 1975 and 1979 in Cabanatuan City and Talavera are given. As these tables show, overall employment increased by 2,276 (or 27%) in Cabanatuan City and by 469 (or 35%) in Talavera. These tables also show the change in employment by major sector and the allocation of this change either to local demand or to export demand. In Cabanatuan City the most important sectors for labor absorption were wholesale and retail trade and communtiy and social services. Those two sectors accounted for over half of the new jobs in Cabanatuan. Transportation showed the biggest relative change---a 46% increase in the number of jobs in that sector.

In Talavera, wholesale and retail trade was the most important sector for labor absorption, and community and social services was the second most important sector. Manufacturing and transportation were the third and fourth most important sectors, respectively.

Table 4

Additional Expenditures Made By UPRP Farmers From Increments In Income, 1976-1979

Rank	Item	Percent
1	Education	50%
2	Appliances	44%
3	Food	35%
4	Machinery	30%
5	Transportation	22%
6	Furniture	22%
7	Clothing	18%
8	Home Improvements	10%

Table 5
Items Purchased by UPRP Farmers
from Additional Income, 1976-1979

Rank	Item	Percent
1	T V	27%
2	Radio/Phono	19%
3	Tractor	16%
4	Electric Fan	11%
5	Sala Set	8%
6	Bed	6%
7	Gas Range	6%
8	Refrigerator	6%
9	Sewing Machine	5%
10	Motor Bike (Tricycle)	4%

Table 6

Labor Absorption - Cabanatuan City

Sector	Employment 1975	Employment 1979	Change in Employment No.	Change in Employment %	Change Attributable to local demand No.	Change Attributable to local demand %	Change Attributable to export demand No.	Change Attributable to export demand %
Manufacturing	1,357	1,720	363	27%	322	89%	41	11%
Wholesale and Retail Trade	3,087	3,955	868	28%	831	96%	37	4%
Transportation	342	498	156	46%	141	90%	15	10%
Financing, Insurance Real Estate & Business Services	404	501	97	24%	95	98%	2	2%
Community & Social Services	1,553	1,991	438	28%	373	85%	65	15%
Personal Services	807	1,161	354	44%	341	96%	13	4%
T O T A L S	7,550	9,826	2,276	27%	2,103	92%	173	8%

In Table 8 the primary industries in which new jobs were created is given. As this table shows, sari-sari stores (wholesale and retail trade sector) ranked first in both Cabanatuan City and Talavera in terms of labor absorption. The establishment of an electric cooperative also generated as many jobs as sari-sari stores in Talavera. Higher education was the second most important sector for labor absorption in Cabanatuan City while the restaurant and cafes industry was third. A substantial increase in the number of tricycle and jeepney operators occured in both Cabanatuan City and Talavera, as the table also shows. They were the fourth and third most important industries for labor absorption in Cabanatuan City and Talavera, respectively. The increase in employment in this industry accounted for most of the increase in the transportation sector in both communities. Rice and corn milling (included in the manufacturing sector) was the fifth most important industry for labor absorption in Cabanatuan City and the fourth most important industry in Talavera. Rice and corn milling accounted for more than two thirds of the increase in manufacturing employment in Talavera.

As noted above, Tables 6 and 7 also allocate changes in employment to either local demand (the Nueva Ecija market) or export demand. As these tables show, almost all of the

Table 7

Labor Absorption - Talavera

Sector	Employment 1975	Employment 1979	Change in Employment No.	Change in Employment %	Change Attributable to local demand No.	Change Attributable to local demand %	Change Attributable to export demand No.	Change Attributable to export demand %
Manufacturing	188	284	96	51%	88	92%	8	8%
Wholesale and Retail Trade	552	697	145	26%	145	100%	0	0
Transportation	378	458	80	21%	80	100%	0	0
Financing, Insurance Real Estate & Business Services	27	31	4	15%	4	100%	0	0
Community & Social Services	54	156	102	189%	94	92%	8	8%
Personal Services	100	113	13	13%	13	100%	0	0
T O T A L S	1,328	1,797	469	35%	438	93%	31	7%

employment changes in both Cabanatuan City and Talavera (92% in Cabanatuan City and 93% in Talavera) were attributable to changes in local demand. That is, there was very little change in the nonfarm export sector during the 1975-1979 period.

Therefore, it appears that changes in the nonfarm export sector in Cabanatuan City and Talavera were relatively insignificant compared to changes in the agricultural economic base which were brought about by the UPRP. Hence, most of the changes in nonfarm service sector employment in Cabanatuan City and Talavera should be attributable to increases in agricultural production and income.

Cabanatuan City and Talavera accounts for 34.1% of the total population of the UPRP service area --- 493,740 in 1975 (National Irrigation Administration, 1977, p. 110). Therefore, the total nonfarm impact of the UPRP is, perhaps, two to three times the impact on Cabanatuan City and Talavera. That is, the project should have brought about increases in nonfarm employment in other municipalities in the region. Let us say that of the 2,541 jobs generated locally in Cabanatuan City and Talavera, 541 of those were brought about by changes in nonfarm export employment in the two communities. This assumes that the 204 export jobs generated 541 local services sector jobs --- a generous extimate. Then the UPRP

Table 8

Labor Absorption By Industry, 1975-1979

Industry	Cabanatuan		Tavalera	
	Rank	Labor Absorption	Rank	Labo Absorp
Sari-sari stores	1	286	1	86
Higher Education	2	255		
Restaurant & Cafes	3	177	7	10
Tricycle & jeepney operators	4	136	3	76
Rice and corn milling	5	69	4	68
Hospital	6	68		
Manufacturing structural concrete products	7	62	6	17
Beauty Shops	8	59		
Household appliances	9	57		
Feed, fertilizer, and insecticide dealers	10	48		
Retail dealers in rice, corn and other cereals	11	46		
Hardware stores	12	37		
Wholesale dealers in rice and corn			5	26
Electricity distribution			1	86

generated the remaining 2,000 local service sector jobs. If this is extrapolated for the whole service area, then the project may have generated 4,000 to 6,000 jobs between 1975 and 1979 --- a significant contribution to employment.

As a final point in this section, the nonfarm agricultural modernization impact in Cabanatuan City and Talavera was more significant in the consumer goods and services sector than in industries related to agricultural. As shown in Table 9, there was a 67% increase in employment (or 318 more jobs) in Cabanatuan City and Talavera in agriculturally related industries between 1975 and 1979. This change should be expected since the UPRP stimulated rice production so that there should be more rice to mill (there was a 94% increase in employment in rice and corn milling between 1975 and 1979); farmers should have purchased more inputs since most of them were able to increase their cropping intensity (there was a 289% increase in employment in the feeds, fertilizer and insecticide dealers industry); and so on. (Employment in the farm equipment and supply industry did not increase during this period because the boom in the purchase of hand tractors occured before 1975.)

Thus, although employment in agriculturally related industries increased during the 1975-1979 period as one would expect, this increase was relatively small compared to the

Table 9

Labor Absorption In Agriculturally Related Industries, Cabanatuan City and Talavera, 1975-1979

Industry	Employment 1975	Employment 1979	Change in Employment No.	Change in Employment %
Rice & corn milling	167	324	157	94%
Manufacturing mechanical implements for crops	15	15	0	0
Manufacturing agricultural machinery equipment	6	6	0	0
Rice & corn wholesale dealers	52	101	49	94%
Rice & corn retail dealers	87	149	62	71%
Farm equipment and supply dealers	128	126	-2	-2%
Feeds, fertilizer and insecticide dealers	18	70	52	289%
T O T A L S	473	791	318	67%

total increase in nonfarm employment in the region---318 jobs compared with 2,745 jobs. Therefore, the major increase in nonfarm employment that was brought about by the Upper Pampanga River Project was brought about more by an increase in spending by farmers on consumer goods and services than by an increase in the purchase of inputs and an increase in the processing and distribution of outputs.

Discussions

The Upper Pampanga River Project has contributed indirectly to regional economic growth and nonfarm employment within its service area. To the extent that the project indirectly stimulated underemployed and unemployed resources, then the project also contributed indirectly to national economic growth. Although it was not possible to estimate the project's indirect contribution to national economic growth, several of the establishments that were surveyed noted that some of their workers came from depressed areas elsewhere in the Philippines such as Bicol and the Visayas. Thus, the project certainly made an indirect contribution to national economic development by generating jobs for unemployed and underemployed workers from other regions as well as from the Nueva Ecija region.

The conclusion that irrigation development and agricultural modernization can contribute significantly to nonfarm employment and regional (or rural) growth follows Mellor's finding in India (Mellor, 1976, pp. 161-191) and Gibb's findings elsewhere in the Philippines (Gibb, 1974). Gibb's study is of particular interest since it was in the Philippines as well as in Nueva Ecija. Gibb found that the introduction of high yielding rice varieties in the late 60s generated a 37% increase in agricultural output and income in the Gapan area which is south of Cabanatuan City and Talavera. This change in the agriculture sector generated 41% increase in nonfarm employment in the Gapan area between 1967 and 1971, according to Gibb (Gibb, 1974, p.187). In addition, he found that there was a 40% increase in employment in industries which were linked to consumption oriented spending and a 45% increase in employment in industries which were linked to agricultural production. The former group of industries though accounted for over 80% of the increase in employment whereas the so-called agro-industries absorped only one-sixth of the increase in nonfarm employment (Gibb, 1974, p.190). This follows my findings that the increase in spending by farmers for consumer goods and services generated significantly more jobs than were generated in those industries linked with agriculture.

In addition, the findings of this study are consistent with expenditure studies which show that lower-income groups such as the UPRP farmers have a relatively high propensity to spend increments in income on agricultural commodities as well as upon education, household furnishings and improvements, clothing, and other consumer goods (Mellor, 1966, p.166 and International Labour Office, 1974, pp.84-85).

There are several policy implications for irrigation planning from these findings. First, an irrigation project can contribute significantly to regional development and non-farm employment. Decision-makers should recognize this contribution that an irrigation project could make to achieving regional economic development and employment objectives. Second, an irrigation projects may contribute indirectly to national economic growth. Ideally, this indirect contribution to national economic growth should be included in economic feasibility studies. In practice, project planners are probably best advised to leave indirect benefit estimates out of benefit-cost ratios even though a project may contribute indirectly to economic growth. In the United States, agencies have often included indirect benefits to artificially inflate benefit-cost ratios so that otherwise poor projects from a national economic growth standpoint looked good (Sander,1978).

Third, since many non-agricultural sectors as well as regio
benefit from irrigation development and agricultural growth
then, perhaps, some of these other sectors (or a region)
should bear some of the project's cost. This rationale for
cost-sharing has been suggested elsewhere (see Taylor, 1976

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