Socio-Economic and Water Management Practices Affecting Diversified Cropping Among Farmers Served Within the TASMORIS Area

Alfredo S. Reyes and P. Dionisio R. E. Reyes[1]

Abstract

A socio-economic survey conducted in the Tarlac-San Miguel-O'Donnel River Integrated Irrigation System (TASMORIS) revealed the potential for crop diversification in the area. Soil, climate and location were ideal for diversification. Non-rice crops like corn and sunflower can be alternative crops to rice. Plantingnon-rice cropscanincreaseland utilization to as much as 90% as well as net profits to as much as 1.5 times (i.e., corn after rice) than that from rice. Although no differences were observed between rice and the identified non-rice crops, there is still a need to further evaluate their potential as alternate to rice. With proper financial and technical assistance similar to that of the Dry Season Irrigation Management Project (DSIMP), non-rice crops can he a substitute for rice monoculture.

Importance/Significance of the Study

The Philippine economy has always been characterized as predominantly agricultural, i.e., 65% of the total populace is dependent on agriculture as their source of livelihood. Agriculture accounts for 60% of national exports and about 33% of gross national product (PCARRD Monitor, May 1986).

Considering agriculture as the economy's hackhone, there is then a need to strengthen agricultural crop production. A crucial element in crop production is water. Its availability, as well as, its proper management and use is essential for crop production. Water comes from the atmosphere in the form of rain or precipitation, the earth's surface like rivers, streams and other bodies of water, and from groundwater.

The seasonal precipitation in the country is largely due to varied weather systems. Generally, rainfall is unevenly distributed and often cannot adequately meet moisture requirements for a successful crop growth (Philippines Recommends for Irrigation Wafer Management, 1982).

Providing upland crops with adequate water, especially during the dry months when solar radiation is high, increases production. This, coupled with removal of excess water during the rainy season, is the main consideration of water management.

Water and soil moisture are essential for continuous lowland cropping. Distinct wet and dry seasons in most parts of the country make year-round supply impossible. At the height of summer in upland as well as lowland areas, crop production is hardly possible especially where communal irrigation is non-existent (PCARRD Monitor, October 1986).

In areas with low annual rainfall and even in areas where total annual rainfall is fairly high but where little or no rain falls during the crop-growing season, irrigation is still needed to grow crops.

The success, therefore, of an irrigation project could only be measured by its agro-socio-economic impact on its beneficiaries and on the national economy. It is therefore necessary to consider agricultural development in implementing irrigation projects (Balog Multi Purpose Project Pre-Appraisal Study, NIA, 1987).

Study Area

The Tarlac-San Miguel-O'Donnel River Integrated Irrigation System (TASMORIS) is one

[1]Associate Professor and Director for Research, Pampanga Agricultural College, Magalang, Pampanga and Research Assistant. International Irrigation Management Institute, respectively.

of the country's national irrigation system. It was chosen as the study area because of its potential for crop diversification. The National Irrigation Administration (NIA) identified corn and sunflower as potential alternative crops for rice during its pilot testing of the Dry Season Irrigation Management Project (DSIMP) during crop year 1986/87. The area is accessible and proximate to Metro Manila; thus, enabling farmers to market their produce.

TASMORIS was formed from the merger of three irrigation systems in Tarlac, namely, the Tarlac River Irrigation System (TARRIS), the San Miguel-O'Donnel River Irrigation System (SMORIS) and the Camiling River Irrigation System (CAMRIS). TASMORIS has a service area of 9,580 hectares, 8,843 hectares of which are adequately imgated. The service area covers seven towns in Tarlac namely La Paz, Victoria, Capas, Tarlac and certain parts of Concepcion, Pura, and Gerona.

Statement of the Problem

A survey was conducted to determine the reasons of farmers in selecting crops and cropping patterns, as well as, land utilization practices in areas where proper control over available water was not possible either due to technical or non-technical (i.e., socio-economic, institutional) constraints.

Objectives of the Study

The study was focused on the socio-economic profile of farmers served by TASMORIS. It also identified and documented the economics of cropping patterns employed by farmers in irrigated and rainfed areas of TASMORIS.

Specifically, the study aimed to:

1. Determine the socio-economic profile of farmers served by TASMORIS;
2. Identify crops other than rice which farmers have been planting for crop diversification:
3. Determine the economics of crop diversification, specifically cost, yield and gross and net returns;
4. Identify problems and situations affecting farmers' production in relation to marketing, price and credit; and
5. Propose recommendations that can help solve the problems identified.

Methodology

A questionnaire-interview schedule was prepared with the assistance of IIMI. The questionnaire-interview schedule was pre-tested before the survey was conducted.

A list of farmers under TASMORIS was obtained from the NIA office in Tarlac to facilitate identification of respondents.

Surveys for the first and second phases were conducted in the dry season, 1986/87 and 1987/88, respectively. Data gathered were compiled, tabulated and statistically analyzed

One hundred twenty-five respondents were interviewed during the first phase. Respondents consisted of farmers under TASMORIS whose farms were located at specific laterals within the system, 31 other farmers from the DSIMP and 25 local traders. However, DSIMP was terminated after the first phase survey and data from the traders were only included during the same phase. Maintaining the original set of respondents, the second phase added to its sample size, 60 farmer-respondents. Nine respondents were replaced due to relocation. Additional respondents were also interviewed.

Results and Discussion

To obtain an overview of the extent of crop diversification in the system, the first survey interviewed specific farmers based on their location within the system. The second survey interviewed the same farmers but concentrated on cropping patterns and the economics of growing crops like rice, corn and mungbean.

Table 1 presents the demographic profile of the sample population. Average ages of the farmers, their wives and children ranged from 46-50 years, 42-47 years and 16-17 years, respectively. On the average, a farmer finished grade five while his wife finished grade six. A farmer's child was able to finish a year in high school or at least graduated from elementary. Family size is relatively small, with an average of three children or a farm household of five. Generally, a farmer has been farming for 25 years.

Rice-rice cropping pattern was predominant among farmers located at the portions closest the canals or dam. Other cropping patterns employed in the area which involved non-rice crops were rice-irrigated corn and rice-rainfed munghean. Rice-rainfed mungbean cropping pattern was pre-

Table 1. Demographic profile of farmer respondents under **TASMORIS.**

	Crop Years	
	1986/87	1987/88
Age (in years)		
Farmer	50	46
Farmer's Wife	47	42
Children	17	16
Educational Attainment (in grade levels)		
Farmer	5	6
Farmer's Wife	5	6
Children	7	7
Number of Children	3	3
Farming Experience (years)	26	24

dominant among fanners located at the tail portion of the system while the rice-irrigated corn cropping pattern was adopted by farmers at the middle section. Another cropping pattern involved the combination of both rice and non-rice crops planted during the same cropping season. Crops were either planted in relay in the same area or simultaneously, with plots planted to various crops. Some farmers employed cropping patterns like rice-rainfed corn and rice-irrigated munghean.

The choice of crops or cropping patterns depend on a number of factors: Rice-rice farmers considered sufficient irrigation water supply and location of their farm; Rice-irrigated corn farmers attributed their reasons to experience; and insufficient water prompted rice-rainfed mungbean farmers to adopt such cropping pattern. Soil and crop factors as well as market conditions and availability of inputs were also considered by the farmer in choosing his cropping pattern.

Table 2 shows percentage of land utilization per cropping pattern. During 1986/87 dry season, land utilization regardless of cropping pattern decreased. From almost 100% during the 'wet season this was reduced to about one half to three fourths during the dry season. Rice-rice cropping pattern had the highest land utilization during the 1987/88 dry season due to theirlocation within the system, i.e., located closest to the source (the dam). However, land utilization under the rice-rice pattern increased during the 1987/88 dry season. Though still lower than the wet season utilization, an increase from the previous crop year was observed. The increase in land utilization for rice-non-rice cropping pattern was due to the campaign on massive corn planting initiated by the government.

Table 3 presents average yield/ha, price/kg and gross returns/ha during the 1986/87 and 1987/88 dry seasons of the farms in TASMORIS. Rice exhibited the highest yield during the 1986/87 dry season. Rice also generated the highest gross returns in spite of the low farmgate prices for that year. However, irrigated corn proved better in terms ofproductionduring 1987/88 dry season. In spite of a decrease in farmgate prices, corn farms obtained an average gross return of PI1,876/ha. Yields of irrigated and rainfed munghean were low during both 1986/87 and 1987/88 dry seasons. Higher prices for munghean did not result in high gross returns.

Comparably, rainfed munghean had better yield than irrigated mungbean in both dry seasons. Although there was a higher price for irrigated mungbean, rainfed munghean still earned a larger gross return. Farmers said that it was not the lack of water which determined the good harvest for

Table 2. Percent land utilization, TASMORIS, 1986/87 and 1987/88 dry seasons.

Cropping Pattern	1986/87		1987/88	
	Wet Season	Dry Season	Wet Season	Dry Season
Rice - Rice	98	72	98	99
Rice - Non-Rice	100	58	100	90
Rice - Rice+Non-Rice	91	58	92	76

Table 3. Total yield, average price and gross returns of farms in TASMORIS, 1986/87 and 1987/88 dry seasons.

	1986/87			1987/88		
	Total Yield (kg/ha)	Price (₱/kg)	Gross Returns (₱/ha)	Total Yield (kg/ha)	Price (₱/kg)	Gross Returns (₱/ha)
Irrigated Rice	3165	2.84	9131	2814	3.15	8855
Irrigated Corn	2361	3.63	8557	347s	3.43	11876
Semi-irrigated Mungbean	I26	9.13	1241	100	10.00	998
Rainfed Mungbean	207	9.50	1972	I24	9.83	1241
Rainfed Corn	1096	4.15	4308	—	—	—

rmungbean but the timeliness of water supply. Water is crucial especially during the reproductive stage of mungbean. Lack of water is detrimental to flower and pod formation. Similar cases were observed in the Ilocos project sites [2]. Farmers preferred not to use irrigation water if it would be delayed.

Mean returns above variable costs [3] to irrigated and rainfed crops are shown in Table 4. During the 1986/87 dry season, returns to rice and irrigated corn were not different. However, during the 1987/88 dry season, there was a marked increase in returns to irrigated corn. Returns to mungbean also showed the crop's potential for planting in rainfed areas rather than in irrigated areas. Although yields decreased during both crop years, rainfed mungbean was still more profitable than imgated mungbean. This further support the observation that it is not only the amount of water that counts in mungbean production, but the timeliness of its availability.

Table 4. Summary of mean returns above variable cost (₱/ha) of irrigated and rainfed crops, TASMORIS, 1986/87 and 1987/88 dry seasons.

	1986/87	1987/88
Irrigated Rice	4314	4930
Irrigated Corn	4371	7471
Semi-Irrigated Mungbean	(62)	(404)
Rainfed Munghean	686	43
Rainfed Corn	1407	—

Differences between mean returns of crops for both crop years were determined (Table 5). Rice and irrigated corn have higher returns above variable cost than irrigated mungbean during the 1986/87 dry season. Returns above variable cost to irrigated corn was higher than irrigated mungbean during the 1987/88 dry season. Results, therefore, indicate that corn is potential crop for diversification in the area. Returns for rainfed mungbean still were higher than that of irrigated mungbean, though the difference was not significant. Therefore, mungbean is recommended for planting in rainfed than irrigated areas in TASMORIS.

[1] First Progress and Interim Reports, TA 859 Philippines, Study on Irrigation Management for Crop Diversification, August 1987 and September 1988 respectively.
[2] Can also be referred to as returns.

Table 5. Summary of 1-test results for yield and returns above variable cost of different irrigated (Ir) and Rainfed (Rf) crops, TASMORIS, 1986187 and 1987188 drv seasons.

	Differences	
	Yield (kg/ha)	Returns above variable cost (₱/ha)
1986/87		
Ir. Rice vs. Ir. Mungbean	na	**4,436** **
Ir. Rice vs. Ir. Corn	na	**3** ns
Ir. Corn vs. Ir. Mungbean	na	**4,433** **
Ir. Corn **vs.** RI. Corn	1,265 ns	**2,964** ns
Ir. Mungbean vs. Rf. Mungbean	(81)ns	**(748)** ns
Rf. Corn vs. Rf. Mungbean	na	**721** ns
1987/88		
Ir. Rice vs. Ir. Corn	na	**(2,641)** ns
Ir. Rice **vs.** Ir. Mungbean	na	**5,334** ns
Ir. Corn vs. Ir. Mungbean	na	**7,975** *
Ir. Mungbean **vs. RI.** Mungbean	(24)ns	**(447)** ns

** - Significant at 1%
* - Significant at **5%**
ns - Not significant
na - Not applicable (not comparable)

Table 6 shows the average costs of labor, power, and materials incurred by farmers during the 1986/87 and 1987/88 dry seasons. Total costs incurred for labor, power and materials was equal to the total variable cost of production. **A** shift in investment proved to be a disadvantage on rice production. With **54%** of the total variable cost invested on labor and power during the 1986/87 dry season, returns were higher than when 61% of the total variable cost was invested on material inputs. Therefore, the amount of farm inputs should not only be increased but also properly managed to maximize production. Also irrigated non-rice crops, specifically irrigated corn, depend on farm inputs, rather than on labor and power. Farm operations like primary and secondary land preparation and crop management for non-rice crop production require intensive farm labor and machinery. However the demand for farm labor and power was offset by abundant family labor since the dry season months coincided with the schools' vacation. There were **also** transient farmers **from** adjacent areas who were hired to help plant either a second or third crop.

For capital, farmers availed of credit for farm inputs. Neighbors and friends were the common sources of credit. Farmers preferred to borrow from these sources due to their familiarity with the lenders and the relative ease of obtaining the needed money. Compared with local money lenders and traders who charge interest rates of 13-18% per month, neighbors and relatives charged lower interest rates, sometimes even interest-free. However, most farmers still preferred to obtain loans from banks.

Farmers who avail **of** credit with high interest rates opted to plant less input-intensive crops like native corn and mungbean. They also reduced the size of their farms commensurate to the available capital. Expected profitability of the crop was also a factor in determining farm size.

Price was the foremost consideration in marketing farm produce. Other marketing factors considered were transportation cost and familiarity or established rapport with the trader.

Marketing related problems identified were low and fluctuating prices, lack of transportation facilities, and distance of the market to the farm.

Production problems of farmers under TASMORIS were more water related. There was either lack of water downstream, excess water upstream, or inefficient delivery of water to some areas.

Table 6. Production cost of farms in TASMORIS, 1986/87 and 1987/88 dry seasons.

	Labor and Power Cost (₱/ha)	Percent of Total Expenses	Material Cost (₱/ha)	Percent of Total Expenses
1986187				
Irrigated Rice	2,580	54	2,177	46
Semi-Irrigated Mungbean	363	28	939	72
Irrigated Corn	1,752	42	2,432	58
Rainfed Corn	1,191	41	1,405	59
Rainfed Mungbean	444	35	842	65
1987-1988				
Irrigated Rice	1,523	39	2,402	61
Semi-Irrigated Mungbean	400	29	1,002	71
Irrigated Corn	1,788	42	2,517	58
Rainfed Corn	—	—	—	—
Rainfed Mungbean	336	28	862	72

Dry Season Irrigation Management Project (DSIMP). Pilot test for the DSIMP was launched in November 1986. The project aimed to: (1) alleviate the problem of inadequate water during the dry season by planting low-water-requiring-crops like corn, mungbean and sunflower, and (2) assist small farmers increase their production and consequently their income.

The project provided technical and financial support to farmers who were members of an irrigators' association and who were willing to act as cooperators. Technical and financial support came from the National Irrigation Administration (NIA), and other government and private agencies, Farmers were extended technical support through seminars and training courses on production and management of non-rice crops and on water management practices. Individual loans amounting to ₱2,700 were granted to farmer cooperators to purchase farm inputs like fertilizer and insecticides and payment for farm labor. Payment for irrigation services and association fees were also included in the loan. Loans were paid back to NIA upon disposal/sale of farm produce. In cases where farmers encountered marketing problems, NIA provided for outlets for their produce with the farmers having the option to solicit better buyers.

DSIMP covered two irrigation systems, namely, the Sta. Monica Communal Irrigation System (SMCIS) in Concepcion, Tarlac and TASMORIS, in Talaga, Capas, Tarlac. There were 13 farmer-cooperators from SMCIS and 11 from Talaga. All cooperators were considered as respondents. For comparison, seven rice farmers who were not covered by the project were also interviewed.

Farmers' profile under DSIMP was similar to farmers under TASMORIS. However, DSIMP farmers had a smaller household size. Average age of children of farmers under DSIMP was 12 years old.

Of the three crops planted by farmers under DSIMP, corn yielded the highest. In spite of the low farmgate price for corn, higher gross return was obtained than from other crops (Table 7). Compared with rice, irrigated corn still performed better. Irrigated mungbean in SMCIS had better yield than those in TASMORIS. Returns, however, show that although corn production exhibited high gross earnings, net returns from it were very low (Table 8). Similar results were obtained for irrigated mungbean in SMCIS. Most of the expenses incurred in growing non-rice crops were on farm inputs like fertilizers and insecticides (Table 9).

Table 7. Total yield, price and gross returns of crops under DSIMP, 1986/87 dry season.

	N	Total Yield (kg/ha)	Price (₱/kg)	Gross Returns (₱/ha)
Crops with DSIMP Support				
SMCIS				
Munghean	8	277	10.00	2,710
Sunflower	3	312	12.00	3,741
Talaga				
Sunflower	1	800	13.50	10,800
Corn	6	2,071	3.80	1,870
Mungbean	6	86	9.42	334
Crops w/o DSIMP Support				
Rice	7	2,736	2.60	7,135

Table 8. Summary of mean returns above variable cost of selected crops in SMCIS and TASMORIS, with or without DSIMP support, 1986/87 dry season.

	N	Returns above Variable cost (₱/ha)
Crops with DSIMP Supporr		
SMCIS		
Mungbean	8	803
Sunflower	3	1,255
Talaga		
Sunflower	1	4
Corn	6	16
Mungbean	6	(1,123)
Crops w/o DSIMP Supporr		
Rice	7	3.561

Table 9. Production cost of farms in SMCIS and TASMORIS, with or without DSIMP support, 1986/87 dry season.

	Labor and Power Cost (₱/ha)	Percent of Total Expenses	Material cost (₱/ha)	Percent of Total Expenses
Crops with DSIMP Support				
SMCIS				
Mungbean	808	41	1,159	59
Sunflower	585	24	1,901	76
Talaga				
Sunflower	1,750	41	2,550	59
Corn	328	14	2,368	86
Mungbean	514	35	943	65
Crops w/o DSIMP Supporr				
Rice	2,173	61	1,401	39

Table 10. Summary of t-lest results for yield and return above variable cost of diffcrcnt irrigated (Ir) and rainfed (Rf) crops in SMCIS and TASMORIS with DSIMP support, 1986/87 dry season.

	Differences	
	Yield (kg/ha)	Returns above variable cost (₱/ha)
Within systems		
SMCIS		
Ir. Rice vs. Ir. Mungbean	na	2,758 *
Ir. Rice vs. Ir. Sunflower	na	2,307 *
Ir. Mungbean vs. Ir. Sunflower	na	(452) ns
Talaga		
Ir. Corn vs. Ir. Munghean	na	(6,297) **
Across systems		
SMCIS		
Ir. Mungbean vs. Talaga Ir. Mungbean	242 **	(1,926) **

** -Significant at 1%
* - Significant at 5%
ns - Not significant
na - Not applicable (not comparable)

Differences between crop yield and returns are shown in Table 10. Rice performed better over irrigated mungbean and sunflower in SMCIS while irrigated corn performed better than irrigated mungbean in TASMORIS. Mungbean production in SMCIS was more profitable than in TASMORIS.

The pilot test identified sunflower as a potential crop for diversification. Although there were only four farmer-cooperators who planted sunflower, favorable results were obtained. Farmers under TASMORIS who planted sunflower obtained gross returns of 66% higher than when planting rice. In SMCIS, planting sunflower was more profitable than irrigated mungbean with net earnings of ₱1255 or 56% more than mungbean (Table 8). Sunflower commands a higher unit price than other crops. However, there is still a need to study the market potential of sunflower. Feed millers and mixers are the only buyers of sunflower. Sunflower seeds are used as feed boosters for game fowls.

Even if most farmer cooperators sought the assistance of NIA to sell their produce, marketing was still a problem. Most market outlets were located far from the farm, thus, farmers incurred high transportation cost.

Conclusions and Recommendations

Results of the study showed that there is a high potential for crop diversification in TASMORIS. Further research on the adaptability and profitability of growing non-rice crops like corn and sunflower in the areas covered by TASMORIS should be conducted. The potential of sunflower as an alternative crop for diversification and its possible uses other than feed must also be studied.

With adequate support in the form of technical know-how, financial assistance and exploring market outlets, growing corn and sunflower can be alternative sources of income during the dry season. Comparable, if not, greater profits than from rice can be obtained with proper crop management for corn and sunflower. Projects like DSIMP can catalyze crop diversification.

There is a need for research in land utilization and farm labor to serve as benchmark information in determining profitability of non-rice crops for crop diversification.

When asked whether they would plant non-rice crops during the 1988/89 dry season, farmers responded positively provided financial and technical assistance are available. Without these incentives, farmers would just fallow their land.