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Does Access to Microfinance Improve Farm Production? Evidence from Rice Farmers in San Francisco, Agusan del Sur, Philippines

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Abstract

Poverty level remains high (36.7%) in agricultural areas in the Philippines. The second poorest province in the Philippines is Agusan del Sur with incidence reaching as high as 51.2%. One of the approaches to alleviate poverty is to provide access to capital through microfinance. This study draws conclusion on the link between access to microfinance and farm production taking the municipality of San Francisco in Agusan del Sur as a case. A total of 95 rice farmers were interviewed. Data revealed that microfinance client farmers were producing 27% more than non-client farmers. The production data were fitted using five production functions namely; (1) Neoclassical, (2) Neoclassical with interaction, (3) Cobb-Douglas, (4) Transcendental and (5) Transcendental with interaction. Using ordinary least squares method, Neoclassical function best fit the data with access to microfinance significantly improving farm production by 23%. Output was most responsive to land (0.60 elasticity (E)), followed by fertilizer (0.18 E), labor (0.14 E), herbicide (0.12 E), seed (0.02 E) and pesticide use (0.00 E). Irrigated farms were 23% more productive than non-irrigated farms. Despite the positive impact of access to microfinance, only 34% of the farmers had availed agricultural microfinance loan from formal institutions while only 18% took advantage during the 2nd season of 2010 rice production.

Keywords: Microfinance, Ordinary Least Squares, Production Function Modeling, Rice farming

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Introduction

Poverty remains to be a pressing problem in the Philippines. In the latest 2009 poverty incidence report, the National Statistical Coordination Board (NSCB) revealed that the poverty incidence for farmers in the Philippines is at 36.7%. Mindanao-wide figures were above the national rate and were higher compared to the 2006 poverty incidence report except for Davao region which incidence remained the same. The increase in incidence was highest in Zamboanga Peninsula with 2.4% increase followed by Caraga region with 2.1% increase (NSCB 2013a).

Caraga is characterized as a region of poverty amidst bounty (National Economic Development Authority [NEDA]–Caraga 2009). It is a resource-rich region but has consistently ranked at the bottom in terms of development. Among the poorest provinces of Caraga, Agusan del Sur has the highest poverty incidence of 51.2% in 2009. It is the second poorest province in the Philippines next to Zamboanga del Norte (NSCB 2013b). From 2006 report, poverty incidence in the province increased by 5.7%. This happened despite the fact that Agusan del Sur is the leading rice producing province in the Caraga region with 176,876.50 mt produce in 2009 equivalent to 42% of the total production in the region (Bureau of Agricultural Statistics [BAS] 2013).

As a vehicle to reduce poverty incidence in the country, the Philippine government promoted microfinance. It includes provision of a broad range of financial services such as deposits, loans, money transfers and insurance to poor, low-income household and microenterprises (Asian Development Bank [ADB] 2013). In particular, agriculture microfinance is a subset of rural finance dedicated to agriculture-related activities such as input supply, production, distribution, wholesale, processing and marketing (Microfinance Council of the Philippines, Inc. [MCPI] 2010). Recent studies have provided evidence to the link of access to microfinance or microcredit to improving the livelihood of the low income households and small scale women business entrepreneurs (Ike and Uzokwe 2012; Ike 2013).

There were already a number of laws passed to support microfinancing in the Philippines. Among those were the Magna Carta for Small Enterprises (Republic Act [RA] 6977) with amendments in RA 8289; the Social Reform and Poverty Alleviation Act (RA 8425); Agriculture and Fisheries Modernization Act (RA 8435), General Banking Act (RA No. 8791), and Barangay Micro Business Enterprises Act (RA 9178). Furthermore, Executive Order (EO) 558 was issued on August 8, 2006 by former President Gloria Macapagal Arroyo to repeal the market-oriented credit policies under EO 138. In effect, it allowed all government agencies to lend money for “unserved” areas of microfinance institutions.

The main objective of this study is to compare the rice production of microfinance client and non-client farmers in the poverty stricken province of Agusan del Sur. In particular, the research is focused in the municipality of San Francisco which contributed as much as 12,847 mt of rice during the second semester of 2009 as reported by the Municipal Agriculture Office (MAO) but suffering from high poverty incidence of 39.7% during the same year (NSCB 2013c). Client farmers are those who availed microfinance services during the 2nd semester rice production in 2010. The study contributes to the ongoing research on the impact of microfinance in agriculture using quantitative methods, specifically using econometric modeling.

Methodology

San Francisco, Agusan del Sur is located on the eastern part of the province; bounded on the North by the capital town of Prosperidad; on the South by the Municipality of Rosario; on the East by Surigao del Sur; and on the West by the Municipality of Talacogon. It has a total land area of 39,253 hectares or a total of 22 barangays (villages).

A total population of 2,546 rice farmers was identified by the MAO. According to the Mindanao Microfinance Council, Inc., data on all financial institutions offering agriculture microfinance in the municipality which include People’s bank of Caraga, Enterprise bank, Kabalikat sa Maunlad na Buhay, Inc. and San

Francisco Growth Enhancement Multipurpose Cooperative among others totaled to 459 (18%) rice farmers in 2010. These farmers are referred in this study as client farmers while those not in the list of the financial institutions are referred as non-client farmers.

Ninety-five respondents were interviewed from the total population of rice farmers. Simple random sampling was performed. To have the same proportion of client and non-client farmers, 18% of 95 respondents were randomly chosen from the list of client farmers while 82% of the 95 respondents were randomly chosen from non-client farmers. Hence, a total of 17 client and 78 non-client farmers were surveyed on their second semester rice production in 2010.

The study described the general profile of rice farmers using descriptive statistics. In econometric analysis, the study used the production functions namely: (1) neoclassical, (2) neoclassical with interaction, (3) Cobb-Douglas, (4) transcendental and (5) transcendental with interaction production functions (Debertin, 1986). Production function modeling is widely applied in agriculture (Tvrdon, 2003; Ekbom and Sterner, 2008).

The model adopted is explained as:

$$Y_i = f(Land, Labor, Seed, Fert, Pest, Herb, Irri, Micro, Age, HS, Exp) \quad (1)$$

where:
Y_i = Volume of Production (kg)
Land = Farm size (ha)
Labor = Quantity of Labor used (man-days)
Seed = Seeds used (kg)
Fert = Fertilizers used (kg)
Pes = Pesticides used (L)
Herb = Herbicides used (L)
Irri = 1 if farm is irrigated; 0 otherwise (i.e., if farm is rain-fed)
Micro = 1 if microfinance client; 0 if otherwise (i.e., non-client)
Age = age of the farmer (years)
HS = household size (number of household members)
Exp = experience in rice farming (years)

Models were tested to determine which best fit the data. Diagnostic tests include hetero-scedasticity of the variance, test of specification, significance of the model, and normality of residuals. Values of adjusted R-squared were also taken into consideration. The Ordinary Least Squares (OLS) estimation was performed through the use of GNU Regression Econometrics and Time-series Library (GRETL) software (Adkins 2010).

Results and Discussion

Two main groups of farmers were identified in this study: (1) client farmers who availed microfinance services during the 2nd season rice production in 2010, and (2) the non-client farmers. These two types of farmers did not differ in their profile. The following are the demographic features of the farmers in general: male, married, average age of 48 years old; a household size of 5 members; with 23 years farming experience; having elementary to secondary education; rice farming as major occupation; who owns his land of about 2.07 ha; devoted 1.85 ha for rice production; uses 53.03 kg of seed per ha (RC 82 variety); facing a daily wage rate of PhP 156/day; hired 11.85 man-days/ha for labor not including family labor; applied fertilizer at a rate of 136.28 kg/ha; used pesticide at 1.66 L/ha; herbicide at 0.98 L/ha, and an insignificant amount of manure at 0.04 kg/ha. Their other sources of income include carpentry, livestock farming, and operating a small retail store in the neighborhood.

Based on the results, farmers who availed microfinance services had higher rice production (Table 1) compared to those who did not avail. There were four factors that contribute to higher production: (1) fertilizer use (2) herbicide use (3) seed use, and (4) irrigation.

Table 1: Rice Production of Microfinance Client and Non-client Rice Farmers, 2nd Season 2010

	Output	Land	Labor	Fertilizer	Seed	Pesticide	Herbicide	Irrigation
	(kg)	(ha)	(man-days)	(kg)	(kg)	(L)	(L)	1-irrigated; 0-else
Non-client	3962.26	1.85	21.46	248.08	99.81	3.24	1.79	0.19
Client	5007.76	1.84	24.00	270.59	90.29	2.35	1.94	0.24
All	4149.35	1.85	21.92	252.11	98.11	3.08	1.82	0.20
Per hectare Analysis								
Non-client	2141.76	1.85	11.60	134.10	53.95	1.75	0.97	
Client	2721.61	1.84	13.04	147.06	49.07	1.28	1.05	
All	2242.89	1.85	11.85	136.28	53.03	1.66	0.98	

Client farmers used more fertilizer (147.06 kg/ha) compared to non-client farmers (134.10 kg/ha). Fertilizers when applied at the right level boosts production dramatically. Herbicide use was found to be higher for client farmers (1.05 L/ha) compared to non-client farmers (0.97 L/ha). Depending on the type of weeds and the timing of application, herbicides substitute manual weeding (labor). One of the limitations of the data was on the timing of application and other technical information such as type of dominant weed species. Pre-emergence herbicide arrests weeds prior to planting giving due advantage to rice. Once the crop has established, then it can compete and suppress weeds. Manual labor is mainly employed when weeds start to overcome the crop after planting. In the said situation, herbicide application would be very selective or totally avoided due to risk of crop damage. The results of survey showed that the predominant herbicide applied are broad spectrum herbicide.

On planting materials, the use of certified seeds appears to be uniform in terms of variety between client and non-client farmers. However, there was a marked difference in the amount of seeds used. Client farmers used lesser seeds (49.07 kg/ha) compared to non-client farmers (53.95 kg/ha). Optimum rice population per ha is a necessary information particularly the planting distance and number of plants per hill and per ha. Overpopulation results to intra-specific competition for nutrients, and increased mutual shading of leaves creating favorable microclimate for insect pests and diseases. This claim is supported by the increase application of pesticide of non-client farmers (1.75 L/ha) as compared to client farmers (1.28 L/ha).

Furthermore, reduced yield of non-client farmer can be attributed to low investment in irrigation (10%) compared to client farmers (13%). The reasons for low investment in irrigation include high cost, dependence on rainfall, and natural limitation of water supply in the area. In fact, most of the farms are rain-fed for rice production. Other problems identified include poor drainage facility, lack of government support and farm-to-market road problems.

Client farmers produced 2,721.61 kg/ha while non-client settled at 2,141.76 kg/ha. This translates to 27% higher production of client farmers than non-client farmers. Client farmers were also users of machineries such as tractor (52%) and “turtle” (18%); while for non-client rice farmers, a few of them owned tractor (45%) and “turtle” (1%). Such farm machineries increase further rice production. Tractors plow field faster and break up soil in large clods; while, “turtle” facilitates harrowing of field faster or breaks up clods faster. In effect, the activity is finished within a day or two giving due competitive advantage to rice crop to establish while delay in the growth and emergence of weeds will be more likely the scenario for longer harrowing activity.

Econometric modeling was performed to support the difference in the production of client versus non-client farmers. The inputs considered were land area, labor, seed, fertilizer, and crop protection chemicals which include pesticide and herbicide use. Due to insignificant amount of manure it was no longer considered in the model. In addition, farm attributes such as microfinance provision and irrigation, and farmer's profile such as age, household size and experience in rice farming were considered. The production data were fitted into the five production functions namely; (1) neoclassical, (2) neoclassical with interaction, (3) Cobb-Douglas, (4) transcendental and (5) transcendental with interaction models.

Homoscedastcity of the variance of the error terms assumption was tested. Heteroscedastic models were corrected using generalized least squares approach. As the inputs to production contribute directly to output and are independent from each other, collinearity is not an issue. Similarly, serial correlation is not applicable since cross-section data were used and the ordering of the data is arbitrary. Test of specification was conducted using Ramsey's RESET. Significance of the model, normality of residuals, and adjusted R-squared were taken into consideration (Table 2).

Table 2: Diagnostic Tests of Five Production Function Models

Model	Sample Size	Adjusted R2	Significance of the model	Normality of Residuals	Heteroskedasticity test	Ramsey's RESET
Neo-classical	95	0.87	6.27e-33***	Jarque-Bera test: 2.97e-012. Not normal	White's test: 0.003585. Heteroskedastic. Corrected using Heteroskedasticity-corrected model	n/a
Neo-classical with interaction	95	0.94	3.65e-40***	Jarque-Bera test: 0.00144528. Not normal	White's test: 0.019892. Heteroskedastic. Corrected using Heteroskedasticity-corrected model	n/a
Cobb-Douglas	60	0.73	3.70e-14***	Jarque-Bera test: 0.0161862. Not Normal	White's test: 0.55434. Homoskedastic	Squares and cubes: 0.138 Squares only: 0.0463 Cubes only: 0.0472 Correctly specified
Transcendental	60	0.75	9.74e-12***	Jarque-Bera test: 0.268311. Normal	White's test: 0.226603. Homoskedastic	Squares and cubes: 0.319 Squares only: 0.347 Cubes only: 0.297 Correctly specified
Transcendental with interaction	60	0.84	5.99e-14***	Jarque-Bera test: 2.78898e-008. Not Normal	White's test: 0.191048. Homoskedastic	Squares and cubes: 0.443 Squares only: 0.421 Cubes only: 0.444 Correctly specified

***significant at 1%

Among the five production models (Table 3), neoclassical and transcendal functions revealed access to microfinance being a significant factor to production. Both models were significant at 1% alpha and satisfying homoscedasticity and specificity assumptions. However, Neoclassical was preferred over transcendental function because of the former having more number of significant variables, more sample size used and higher adjusted R^2.

Table 3: Comparison of Five Production Function Models

	Neo-classical			**Neo-classical with interaction**			**Cobb-Douglas**			**Transcendental**			**Transcendental with interaction**		
	coeff	pval		coeff	pval		coeff	pval		coeff	pval		coeff	pval	
Const	-148.91	0.78		2032.62	0.01	***	5.60	0.00	***	6.92	0.00	***	7.14	0.00	***
Land	210.34	0.69		-382.49	0.46					0.23	0.15		-0.40	0.16	
Labor	66.11	0.11		5.55	0.87					0.02	0.41		-0.03	0.30	
Fert	-2.58	0.27		8.70	0.00	***				0.00	0.20		0.00	0.02	**
Seed	1.42	0.89		9.32	0.16					0.00	0.72		0.00	0.63	
Pest	-284.37	0.17		-395.77	0.00	***				0.03	0.74		0.16	0.03	**
Herb	601.61	0.05	*	-813.40	0.02	**				0.07	0.55		-0.64	0.04	**
Land^2	308.82	0.01	***	-443.37	0.00	***									
Labor^2	-0.91	0.34		-2.34	0.01	***									
Fert^2	0.01	0.00	***	0.00	0.00	***									
Seed^2	0.00	0.95		-0.03	0.11										
Pest^2	45.26	0.11		51.40	0.00	***									
Herb^2	-92.97	0.05	**	-224.09	0.00	***									
lnLand							0.61	0.00	***	0.19	0.62		0.29	0.44	
lnLabor							-0.08	0.51		-0.36	0.42		-0.02	0.96	
lnFert							0.33	0.00	***	-0.06	0.82		-0.14	0.56	
lnSeed							-0.04	0.73		0.15	0.75		0.39	0.34	
lnPest							-0.05	0.63		-0.04	0.89		-0.41	0.10	*
lnHerb							0.27	0.03	**	-0.06	0.85		0.29	0.35	
land_labor				104.93	0.00	***							0.03	0.00	***
land__herb				667.05	0.00	***									
labor_fert				-0.80	0.00	***							0.00	0.00	***
labor_seed													0.00	0.01	***
labor_herb				46.48	0.00	***							0.02	0.01	**
fert_seed				0.07	0.00	***							0.00	0.00	***
fert_herb				1.55	0.00	***									
seed_her				-7.41	0.00	***									
Age				-24.35	0.01	***	0.02	0.00	***	0.01	0.02	**	0.01	0.03	**
Experience				35.92	0.00	***									
Micro	910.04	0.01	***							0.27	0.08	*			
Irri	909.78	0.00	***	923.58	0.00	***									

The neoclassical production function is expressed as:

$$Output = -148.91 + 210.34Land + 66.11Labor - 2.58Fert + 1.42Seed - 284.37Pest + 601.61Herb^{*} + 308.82Land^{2***} - 0.91Labor^{2} + 0.01Fert^{2***} - 0.002Seed^{2} + 45.26Pest^{2} - 92.97Herb^{2***} + 910.04Micro^{***} + 909.78Irri^{***} \quad (2)$$

Equation 2 implies that client-farmers were producing 910.04 kg higher than non client-farmers or 23% higher. This is a close estimate with the actual production of client over non-client farmers which is 1,045.5 kg (26% higher) or 579.85 kg/ha (27% higher) using per hectare analysis. Moreover, it also suggests a 909.78 kg (23 % higher) higher production for irrigated farms compared to non-irrigated farms.

The elasticity analysis (Table 4) showed that output is most responsive (0.60 elasticity (E)) to land with 1,350.66 kg/ha increase. This is followed by the use of fertilizer (0.18 E) with 3.03 kg/kg increase, labor use (0.14 E) with 26.01 kg/man-day increase, herbicide use (0.12 E) with 263.01 kg/L increase, seed use (0.02 E) with 0.97 kg/kg increase and pesticide use (0.00 E) with 5.21 kg/L decrease. This implies that increasing the use of inputs except pesticide will increase rice production.

Table 4: Elasticity Analysis for the Neoclassical Production Function

Variables	Elasticity	Mean	10% Change in input	Change in output (kg)	Productivity	
Land (ha)	0.60	1.85	0.18	249.37	1350.66	kg/ha
Labor (man-days)	0.14	21.92	2.19	57.00	26.01	kg/man-day
Fertilizer (kg)	0.18	252.11	25.21	76.27	3.03	kg/kg
Seed (kg)	0.02	98.11	9.81	9.51	0.97	kg/kg
Pesticide (L)	0.00	3.08	0.31	-1.61	-5.21	kg/L
Herbicide (L)	0.12	1.82	0.18	47.90	263.01	kg/L

Hence, it can be concluded that empirical findings revealed that access to agriculture microfinance improved production by 23% in the case of rice farming in San Francisco, Agusan del Sur, Philippines. Although it positively impacts production, the prevalence of those availing these services was relatively low. Only 34% of the respondents had experienced availing loans from financial institutions while only 18% took advantage during the 2nd season of 2010 rice production. The reasons why farmers did not avail of the microfinance were as follows; they perceived microfinancing as not vital to farm operations (53%) while others were risk-averse (35%) and some (6%) complained of high interest rates.

The low rate of patrons availing formal microfinance was attributed to the peculiarities in the rural and agriculture sector. As discussed by Llanto (2008), this could involve information asymmetry, geographic dispersion, hetero-geneity of the population, covariant risks, insecure property rights, and the absence of insurance markets and risk-reducing institutions among others.

In many cases, farmers availed from informal credits. Around 65% of client-farmers and 72% of non-clients had history of availing loan from informal credits. These loans, however, were intended for emergency purposes, education, and household expenditures and not for agricultural use. Even agricultural loans from formal institutions were also used for other purposes in some cases. Consumer loans were easier to avail compared to agricultural loans. Either of these loan types, the personal needs were addressed while at the same time, the needs of the farm were not sacrificed making microfinance from the two sources effective.

Conclusion

This study attempts to address the question “Does access to microfinance improve rice farm production?” Using 95 respondents in San

Francisco, Agusan del Sur, Philippines, client farmers were producing 27% more than the non-client farmers. Using econometric modeling, it was empirically shown that access to microfinance significantly improved farm production by 23%. However, there is still a wide gap existing in the study area since only 18% of the respondents availed microfinance loan during 2nd cropping season of 2010 while only 34% had history of availing microfinance.

The following are the recommendations arrived in the course of this study. (1) Microfinance institutions and local government units should widely promote and disseminate the benefits of adding agriculture microfinance in the production system. (2) Improve formal microfinance credit services by providing less stringent application procedure. In addition, formal institutions should provide mechanism on how to ensure that agricultural loans are used for farm improvements. (3) Further studies on microfinancing should be conducted with focus on the proliferation of informal credit providers and its implications to farm profitability. (4) Finally, include in future research the effect of microfinancing in farming efficiency, income, improvement of standard of living, quality of work life, nutrition, education, and empowerment of women. This will give a holistic assessment of the impact of microfinancing.

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