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Assessment of Organizations as Catalysts for Community Development: An Application of the Multinomial Logit Model

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Abstract: Agrarian Reform Communities or ARCs are clusters of land reformed barangays primarily composed and managed by Agrarian Reform Beneficiaries who are willing to be organized and undertake the integrated development of an area and/or their organizations/cooperatives. Organizations serve as channel for support services such as credit, marketing support, and training programs. To measure the level of development of ARCs, the Department of Agrarian Reform developed a quantitative assessment tool known as the ARC Level of Development Assessment (ALDA). This paper used the data drawn from a survey of cooperatives in the ARCs in selected provinces of MIMAROPA, Bicol Region, Western Visayas, Eastern Visayas, and Western Mindanao. The key variables analyzed in the model are the ALDA rating, knowledge and practice scores, which served as the proxy variable for the functionality of the organizations, the proportion of inactive members in the organization, and the total number of members. The estimates of the multinomial logit model showed

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that the level of functionality of the organizations significantly influences the level of community development. Specifically, the better is the functionality of the organization, the higher is the likelihood that the ARC will have a higher ALDA rating.

Keywords: *agrarian reform communities, organizational maturity assessment, agrarian reform beneficiaries, ARC level of development assessment, multinomial logit*

INTRODUCTION

The Comprehensive Agrarian Reform Program (CARP) is one of the most significant development interventions designed by the government to address social justice and promote rural development. In the earlier years of implementation, the Department of Agrarian Reform (DAR), which is the key agency of the government mandated to implement CARP, adopted the Strategic Operating Provinces (SOP) approach. This was basically a strategy to focus implementation in 43 provinces, where the total estimated scope of CARP was concentrated.

However, in the early 1990s, DAR adopted the Agrarian Reform Communities (ARC) approach to CARP implementation (Gordoncillo, Escueta, Peñalba, & Javier, 2003). In this strategy, a barangay or cluster of barangays where there is a critical mass of agrarian reform beneficiaries (ARBs) are organized as an ARC. ARC development has been identified as a strategic approach to address the development requirements of the farming communities because it harnesses the internal and external resources of various stakeholders to create impact on the lives of the farmers. The ARC is a people-centered and area-focused strategy to show concrete results and impact.

In 1996, the DAR developed guidelines and procedures to determine whether the interventions focused on achieving the end goals of ARB empowerment, which is increasing agricultural productivity and household have been achieved in the ARC. ARC Level of Development Assistance or ALDA is a composite index to assess the status of the ARCs, of which organizational maturity (OM) is one of the key result areas (KRA) together with the areas of land tenure improvement (LTI), economic and physical infrastructure support services (ECOPISS), farm productivity and income (FPI), basic social services (BSS), and gender and development (GAD).

Thus, it is not surprising that one of the key requirements for the creation of an ARC is the presence of a Peoples' Organization (PO), which can be a farmers' organization or a cooperative. Some of these organizations may eventually be organized into a cooperative or remain as farmers' organizations. The basic argument is that, the PO/cooperative in each ARC will serve as the conduit for all support services under CARP post interventions for land tenure improvement. At the same time, the PO will serve as the convergence point of all interventions coming from the Overseas Development Assistance (ODA). The organizations are contributing to the growth and development of their respective agrarian reform communities. Some of these have been awarded as Outstanding Agrarian Reform Cooperatives both at the local and national levels. Thus, this paper is an attempt to establish the link between the performance or functionality of the peoples' organizations or the cooperative in the ARC and the overall development of the agrarian reform community.

METHODOLOGY

Data and Sources

The data set used in this study was drawn from a survey of about 185 POs from ARCs spread across 13 provinces in five regions. The survey was part of the benchmark study for the implementation of the Agrarian Reform Communities Project 2 funded through a loan from the Asian Development Bank (ADB).

The Variables

ARC Level of Development Assessment (ALDA). It is a composite index to measure the socio-political, economic and environmental development in the ARC brought about by concerted effort and synergy of various stakeholders within and outside the ARC. The key result areas (KRA) of ALDA are as follows: 1) land tenure improvement (LTI); 2) organizational maturity (OM); 3) economic and physical infrastructure support services (ECOPISS); 4) farm productivity and income (FPI); 5) basic social services (BSS); and 6) gender and development (GAD). The weighted average of each KRA used in computing the ARC level of development is shown below:

Land Tenure Improvement (LTI)	—	0.0928
Organizational Maturity (OM)	—	0.1941
Economic and Physical Infrastructure Support Services (ECOPISS)	—	0.2404
Farm Productivity and Income (FPI)	—	0.1669
Basic Social Services (BSS)	—	0.1929
Gender and Development (GAD)	—	0.1130

The weights were obtained using statistical methods that account for many factors including, stability of data for the KRA, overlap among the KRAs in terms of explaining Sustainable Rural Development, among others. The KRAs exhibited some degree of association. Hence, the correlations among KRAs are used in the rational distribution of weights to the KRAs to augment statistical methods (DAR, 2001).

Organizational Maturity Assessment (OMA). As defined in DAR Memorandum Circular 03-01, OMA is an assessment of the outputs and outcomes of the intervention under the Organizational Building and Strengthening (OBAS) KRA. This KRA deals with the assessment of the organizational functionality and financial viability of the ARB organizations in the ARCs. Specifically, this KRA is composed of 27 indicators, covering four major aspects namely: (a) organizational management; (b) resource management; (c) social enterprises operations; and (d) linkages and alliance building or involvement in local governance. The organizational management aspect looks at the organizational structure, membership and leadership management, functionality of board of directors and committees, level of participation of leaders and members, and training provided. The resource management aspect defined the generation of internal resources of the ARB organization, which include: capital build-up generation, savings mobilization, and employment of core management staff. The social enterprises operations and management aspect is focused on: (a) installation of financial and operational policies, systems and procedures (PSP); (b) projects implemented and services provided by the ARB organization; and (c) financial performance. The local governance and alliance building aspect pinpoints the extent of representation and collaborative work between ARB organizations and the local government units (LGUs) where the ARC is situated.

The OMA has five levels of maturity threshold: Level 1 - Low level of development (<57.33); Level 2 - Lower medium level of development (57.34-62.96); Level 3 - Medium level of development (62.97-68.61); Level 4 - Higher medium level of development (68.62-74.29); and Level 5 - High level of development (74.30 and above).

Knowledge and Practice Score (KP). Conventionally, institutional performance indicators are designed to solicit information in order to generate quantitative measures of performance. This is often measured in terms of financial stability, cost effectiveness, and efficiency, among others. However, experience showed that soliciting financial information is very tedious, expensive and in most cases, unreliable. Each qualitative response variable is designed to solicit a positive or negative response. For each positive response, the subject is given one point. Hence, the composite score is simply the ratio of the positive responses to the total number of qualitative binary-response variables.

In this particular study, the functionality of the ARC-based cooperative was measured with the composite score as the proxy variable composed of qualitative binary-response questions, for example: Is the Cooperative registered?; Is the subscribed capital fully paid up?; Are the staff of the cooperative able to use computers?; and Is the cooperative linked to a secondary level umbrella organization?

Years of existence post registration of the organization to the CDA. This refers to the number of years the organization has been registered with the Cooperative Development Authority.

Proportion of inactive members. This refers to the proportion of members who have not attended meeting nor

participated in the activities of the farmers' organization or cooperative at the time of the survey.

Ratio of female to male members. This refers to the proportion of female to male members of the organization.

The Multivariate Regression Model

To determine the relationships between the OMA and the other predictor variables, the following multivariate regression model was estimated:

$$OMA = \alpha_0 + \alpha_1 KP + \alpha_2 YEARS + \alpha_3 SRATIO + \alpha_4 INMEM + \varepsilon i$$

where:

OMA - Organizational maturity assessment rating
KP - Composite knowledge and practice score
YEARS - Number of years the organization has been in existence
SRATIO - Ratio of the number of female members to male members
INMEM - Ratio of inactive members to the total number of members

The Multinomial Logit Model

To determine the relationship between the level of development of the community and the functionality of the organization and the other attributes, the standard OLS estimation cannot be performed because ALDA, which is the available measure of the level of development is qualitative. To address this issue, the logit model was employed to measure the relationship between ALDA and the attributes of the cooperative.

To illustrate this, the ALDA rating can be simplified as binary variable representing either a developed or an undeveloped ARC. Hence the probability function of the likelihood that a cooperative is developed is represented by a logistic function as illustrated by Gujarati (1988). Suppose the symbol P represents the likelihood that the organization is developed, then the logistic function is:

$$P_i = \frac{1}{1 + e^{-Y_i}} \qquad 1]$$

where:

P_i - is the probability that the ARC is developed

E - is the natural log constant

$$Y_i = \beta_0 + \sum_1^n \beta_i X_i \qquad 2]$$

However, equation 1] has serious estimation problems because it is non-linear both in the variables and in the parameters. The way out of this predicament is a simple algebraic manipulation.

If the probability that the ARC is given by

$$P_i = \frac{1}{1 + e^{-Y_i}} \qquad 3]$$

then, the probability that the ARC is underdeveloped is

$$1 - P_i = 1 - \frac{1}{1 + e^{-Y_i}} \qquad 4]$$

By algebraic manipulations, equation 4] can be expressed as

$$\frac{P_i}{1 - P_i} = e^{Y_i} \qquad 5]$$

Taking the natural logarithm of 5] yields

$$\ln(\frac{P_i}{1-P_i}) = \beta_0 + \sum_1^n \beta_i X_i \qquad 6]$$

Equation 6] can now be estimated because it is linear in both the variables and the parameters. One only needs to bear in mind, in the interpretations, that the dependent variable is now the natural logarithm of the ratio of the odds of the ARC being developed as against the odds of the ARC being undeveloped, which is now linearly associated with the attributes of the cooperative.

For the purpose of estimating the relationship between the level of community development and the attributes of the organization, equation 6] is still not applicable because the ALDA is a 5-level categorical variable, which is a rating from 1-5: with 1 being the lowest and 5, the highest. Fortunately, the derivation of the logit model based on a binary qualitative response outlined above can be easily expanded to a multinomial model provided that one specifies the reference category.

RESULTS AND DISCUSSIONS

Descriptive Analysis

The total number of ARCs covered in the study was 185 (Table 1). The highest number was in the Eastern Visayas Region, which accounted for 33 percent of the total ARCs, closely followed by Western Mindanao with 32 percent. Of the 185 organizations, 88 percent are registered with the Cooperative Development Authority (CDA).

The data indicate that the knowledge and practice score was higher for those registered with the CDA. For instance, the

mean OMA rating for registered organizations was 64.50 compared to 46.39 for those that were not registered with the CDA (Table 2). A similar pattern emerges when the KP scores are examined. The mean KP score for the registered cooperatives was more than twice the KP score of non-registered cooperatives.

The higher the ALDA rating, the higher was the KP score. For the CDA-registered cooperatives/organizations, the KP scores consistently increased as the ALDA rating got higher. For instance, when the ALDA rating was 1, the mean KP score for the registered organization was 24, then increased to 32 of an ARC with a rating of 2 (Table 3). For the unregistered organizations, the KP score ratings were not consistent as the ALDA rating of the ARC increased. For instance, the mean KP score was 25.00 for an ARC with an ALDA rating of 2 then dropped to a mean KP score of 13.25 for an ARC with an ALDA rating of 3.

There seemed to be no relationship between ALDA rating of the ARC and the ratio of female to male members of the cooperative/organization (Table 4). Similarly, there was no relationship for ALDA rating of the ARC and the proportion of inactive members of registered and non-registered organizations (Table 5) and years of existence of registered and non-registered organizations (Table 6).

Inferential Analysis

For the inferential analysis, there were two models estimated. The first model was estimated to determine the factors that influenced the organizational maturity of the cooperatives. Specifically, the estimated model was:

$$OMA = \beta_o + \beta_1 KP + \beta_2 PIM + \beta_3 FMR + \beta_4 YER + \beta_5 CDA + \varepsilon_i$$

where:

OMA - Organizational maturity assessment rating
KP - Knowledge and practice score
PIM - Proportion of inactive members
FMR - Ratio of female members to male members
YER - Years of existence
CDA - A binary variable: 1 if registered, 0 if otherwise

Table 7 shows the estimated parameters for the OMA model. The variables that showed significant influence to the organizational maturity of the cooperatives were KP score, Female/ Male Member Ratio, and CDA registered. The KP score coefficient conformed to the a priori expectations that the higher the functionality of the cooperative, the higher was the OMA rating, and the parameter estimate was highly significant as indicated by the alpha (probability) value of 0.000. The estimated parameter of the FMR variable, which measures the ratio of female member to male members showed a negative sign, which indicated that the higher the proportion of male members, the higher was the OMA rating of the cooperative. The parameter estimate of the FMR variable was also highly significant given the probability value of about 0.004. Finally, the binary variable, which was designed to capture the difference between a registered and non-registered cooperative, was highly significant and had a positive coefficient. This was consistent with the theoretical expectation that cooperatives registered with the CDA would have higher OMA rating.

The second model estimated was the multinomial logit, which was designed to determine the effects of selected attributes of the cooperatives to the overall development of the community through the ALDA rating of the ARC.

The estimated multinomial logit is of the form:

$$\ln(\frac{P_i}{1-P_i}) = \beta_0 + \beta_1 KP + \beta_2 PIM + \beta_3 FMR + \beta_4 YER + \beta_5 CDA + \varepsilon_i$$

where:

P_i - The probability that the PO would have the i^{th} ALDA rating
KP - Knowledge and practice score
PIM - Proportion of inactive members
FMR - Ratio of female members to male members
YER - Years of existence
CDA - A binary variable: 1 if registered, 0 if otherwise

Table 8 shows the parameter estimates of the ordered logit model. The probability values of the threshold estimates indicate that as ordered there was a significant differentiation of the odds ratio except for the case of the values estimated between ARCs with ALDA rating of 2 and below and 3 and above (ALDA=2). In terms of the explanatory variables, the significant estimates were for knowledge and practice, ratio of female to male members, and whether or not the PO was registered with the Cooperative and Development Authority. For instance, as KP increased, the odds ratio in its natural logarithm increased by 0.029, which was significant at 0.002.

The marginal effects are the estimated first order conditions of the logit function (Greene, 2012) for each category minus the 5^{th} category (ALDA=5). For instance, as KP rating increases by one unit, the probability that the ARC will likely be in the upper category increases by 0.25. The threshold values are analogous to an intercept in ordinary regressions, so the marginal

effects are based on the single coefficient per predictor, because the logit procedures assumes that the effects will be the same for the logit function for each category.

The ordered multiple logit estimates a single model for all categories, consequently some of the characters of the differentiation are lost. Hence a non-ordered logit was also estimated. Table 9 shows the estimated parameters of the unordered multinomial logit model with the ALDA rating as the dependent variable. In the multinomial logit model, the first category (level 1) was used as the reference point.

In the model, the parameter estimates of the specific attributes of the organizations such as PIM, FMR, YER, and CDA did not significantly influence the general level of community development as measured by the ALDA. However, the overall functionality of the organization as measured by the KP score has consistently shown significant influence on the likelihood of the organization being classified into a higher rating referenced from the lowest rating (level 1). For instance, as the knowledge and practice score of the cooperative increases, the ratio of the likelihood that the community being rated level 1 increases by about 1.14, and the level of significance by about 13 percent.

It is interesting to note that as the multinomial logit procedure moved up the ALDA rating, the level of influence as well as the level of significance were increasing. From 13 percent between ALDA 1 and ALDA 2, the level of precision increased to 5.3 percent between ALDA 1 and ALDA 3, 2 percent between ALDA 1 and ALDA 4, and the level of precision was highest at 0.05 percent between ALDA 1 and ALDA 5. Similarly, the coefficient for the KP score – variable was increasing across the ALDA rating: from 0.04 between ALDA 1 and ALDA 2; the level of precision increased to 0.05 between ALDA 1 and ALDA 3; 0.06 between ALDA 1 and ALDA

4; and the level of precision was highest at 0.08 between ALDA 1 and ALDA 5. This shows that the effect of the functionality of the organization to the level of development of the community intensifies as the level of development increases.

Similarly, the marginal effects are the computed first order conditions of the logit function for each category. However, in this section, the estimates are for an unordered logit; hence, the reference is for the first category (ALDA=1). For instance , in the second category, the marginal effect was estimated at 0.28, which means that as the KP scores increased by one unit, the probability that the ARC would have ALDA=2 relative to ALDA=1 increased by 0.28. As in the ordered logit, there was only one parameter estimate for each predictor variables because of the assumption that the influence of the predictor variables in the probability function was the same for each category.

CONCLUSIONS

The descriptive analysis provided the discernable pattern that there is a relationship between the OMA rating and the selected attributes of the organizations, and that the knowledge and practice scores of the organizations is associated with their overall level of development.

The estimated models provided the more quantified measures of the relationships between OMA and ALDA as against the selected attributes of the organizations. The estimated model for the OMA showed that the functionality of the organization as measured by the KP score, the demographic attributes of the membership, and the legal status of the organization had significant influence on the OMA rating. The multinomial logit procedure showed that the overall level of development of the community through the ARC was significantly influenced by the functionality of

the organization. This has significant implication to the implementation of the CARP because as a matter of strategy, CARP uses the organization as the main conduit of interventions to the community through the ARC. Further, the study also established that the influence of the functionality of the organization intensified as the cooperative increased its level of development.

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TABLES

Table 1. Distribution of ARCs by region and by status

REGION		CDA REGISTERED		TOTAL
		Yes	No	
Bicol Region	Count	26	1	27
	% Column	16%	4.5%	14.6%
MIMAROPA	Count	21	0	21
	% Column	12.9%	0%	11.4%
Central Visayas	Count	16	0	16
	% Column	9.8%	0%	8.6%
Eastern Visayas	Count	45	16	61
	% Column	27.6%	72.7%	33%
Western Mindanao	Count	55	5	60
	% Column	33.7%	22.7%	32.4%
Total	**Count**	**163**	**22**	**185**
	% Column	**100%**	**100%**	**100%**

Table 2. OMA rating and KP score for ARCs registered and not registered with CDA

CDA REGISTERED	OMA	KP SCORE
Yes	64.50	39.15
No	46.39	15.64
Total	**62.35**	**36.36**

Table 3. ALDA rating of ARCs by KP score of registered and non -registered cooperatives

ALDA RATING	KP SCORE		
	CDA registered		
	Yes	No	Total
1.00	24.00	10.75	19.58
2.00	32.14	25.00	30.88
3.00	37.19	13.25	32.84
4.00	38.87	13.20	35.31
5.00	43.19	27.00	42.76
Total	**39.15**	**15.64**	**36.36**

Table 4. ALDA rating and ratio of female to male members of registered and non-registered organizations

ALDA RATING	MALE:FEMALE RATIO OF MEMBERS		
	CDA registered		
	Yes	No	Total
1.00	0.82	1.92	1.19
2.00	1.44	1.41	1.44
3.00	1.61	1.28	1.57
4.00	0.91	1.00	0.92
5.00	1.11	0.85	1.11
Total	**1.21**	**1.33**	**1.22**

Table 5. ALDA rating and proportion of inactive members of registered and non-registered organizations

ALDA RATING	PROPORTION OF INACTIVE MEMBERS		
	CDA registered		
	Yes	No	Total
1.00	39.73	16.00	31.10
2.00	22.00	14.33	20.65
3.00	20.10	11.13	18.47
4.00	17.98	23.60	18.81
5.00	22.87	27.50	23.00
Total	**21.99**	**16.77**	**21.34**

Table 6. ALDA rating and mean years of existence of registered and non-registered organizations

ALDA RATING	YEARS OF EXISTENCE AS OF REGISTRATION		
	CDA registered		
	Yes	No	Total
1.00	9.63	12.00	10.42
2.00	10.50	12.00	10.76
3.00	10.28	12.00	10.59
4.00	8.35	12.00	8.86
5.00	10.03	12.00	10.08
Total	**9.79**	**12.00**	**10.05**

Table 7. Estimated parameters of the OMA model

PARAMETERS	UNDERSTANDARDIZED COEFFICIENTS			
	B	Std. Error	t	Sig.
(Constant)	43.519	4.123	10.556	0
KP Score	0.422	0.006	6.393	0
Proportion of Inactive Members	-0.019	0.048	-0.397	0.692
Female:Male Member Ratio	-2.242	0.772	-2.906	0.004
Years of Existence	-0.007	0.170	-0.040	0.968
CDA Registered	7.165	3.684	1.945	0.054

Table 8. Estimated parameters for the ordered logit of ALDA and the selected explanatory variables

PARAMETER ESTIMATES		ESTI-MATE	STD. ERROR	SIG.	ODDS RATIO (Exp)B	MARGINAL EFFECTS
Threshold	[alda = 1.00]	-1.598	0.586	0.006	0.202	
	[alda = 2.00]	-0.525	0.551	0.341	0.591	
	[alda = 3.00]	0.897	0.556	0.106	2.453	
	[alda = 4.00]	1.764	0.566	0.002	5.833	
Location	KP	0.029	0.009	0.002	1.030	0.257
	FMR	-0.176	0.103	0.085	0.838	0.208
	PIM	-0.002	0.006	0.716	0.998	0.249
	YER	-0.023	0.023	0.314	0.977	0.244
	CDA	0.768	0.488	0.116	2.155	0.467

Link function: Logit.

Table 9. Estimated parameters of the un-ordered multinomial logit model with the ALDA rating as the dependent variable

PARAMETER ESTIMATES					
ALDA Rating(a)		**B**	**SIG.**	**EXP(B)**	**MARGINAL EFFECT**
2	Intercept	-0.541	0.686	1.985	
	KP	0.047	0.139	1.149	0.286
	FMR	-0.002	0.995	2.706	0.533
	PIM	-0.008	0.572	1.771	0.409
	YER	-0.015	0.844	2.325	0.489
	CDA	0.198	0.849	2.337	0.490
3	Intercept	0.276	0.815	2.259	
	KP	0.056	0.053	1.055	0.263
	FMR	0.008	0.976	2.654	0.528
	PIM	-0.012	0.338	1.402	0.341
	YER	-0.033	0.620	1.859	0.423
	CDA	0.349	0.699	2.012	0.446
4	Intercept	0.872	0.481	1.618	
	KP	0.068	0.020	1.020	0.255
	FMR	-0.437	0.207	1.230	0.304
	PIM	-0.016	0.252	1.287	0.317
	YER	-0.086	0.212	1.237	0.306
	CDA	0.110	0.910	2.483	0.508
5	Intercept	-0.815	0.535	1.707	
	KP	0.081	0.005	1.005	0.251
	FMR	-0.225	0.445	1.560	0.371
	PIM	-0.007	0.566	1.761	0.407
	YER	-0.056	0.386	1.471	0.354
	CDA	1.420	0.184	1.202	0.298
a	The reference category is: 1.00				