

OPERATIONAL RESEARCH AND COMMUNITY DEVELOPMENT

PEDRO R. ACIERTO

March 8, 1973

Data about selected social, personal, and work characteristics of a sample of community development fieldworkers were subjected to two complementary computer analyses. The results were then tested for congruence with certain policies of the agency employing the workers, and discussed in terms of their implications for national rural community development programs.

The success of any rural ameliorative-developmental program such as community development (CD) rests primarily on the efforts of a trained group of CD workers.¹ Program administrators invariably recruit these staff members having in mind a constellation of personal and social traits considered closely associated with high levels of work performance. However, this model has yet to be examined for empirical validity.

There is a dearth of research studies on the characteristics of change agents.² The discussions in the literature are generally educated guesses or, worse yet, armchair speculations by program administrators and their academician-advisers (Polson 1958; Shields 1967). Based on a comparison of what is *speculated* and what is *empirically validated*, a recent study showed that (1) while it is generally desired that CD workers possess a certain constellation of characteristics, (2) there is considerable disagreement as to the number and kind of traits for each of the various constellations, and (3) unanimity is found on only a few elements (Acierto 1971: 18-22).

In the spirit of positive curiosity, this paper focuses attention on operational research results and organizational dicta, using as the point of departure a specific operational research study and an organizational policy. Its basic theoretical orientation is that the greater the degree of congruence between the two, the better will be the performance of an organization.

An Illustrative Operational Research Study

Through various policy statements, a national rural CD agency emphasizes a set of personal and social characteristics which its fieldworkers must possess. These may be summarized as follows: male, graduate of a four-year collegiate course (preferably vocational-technical, with selected social sciences), at least 21 years of age but not over 45, physically fit, with high moral character and selected attitudinal-aptitudinal-intellectual abilities, of rural background, and with relevant experiences and characteristics (CDC 1958, 1961a, 1961b; Kelsey 1958; and PACD 1958, 1961, 1962, 1966).

Methodology

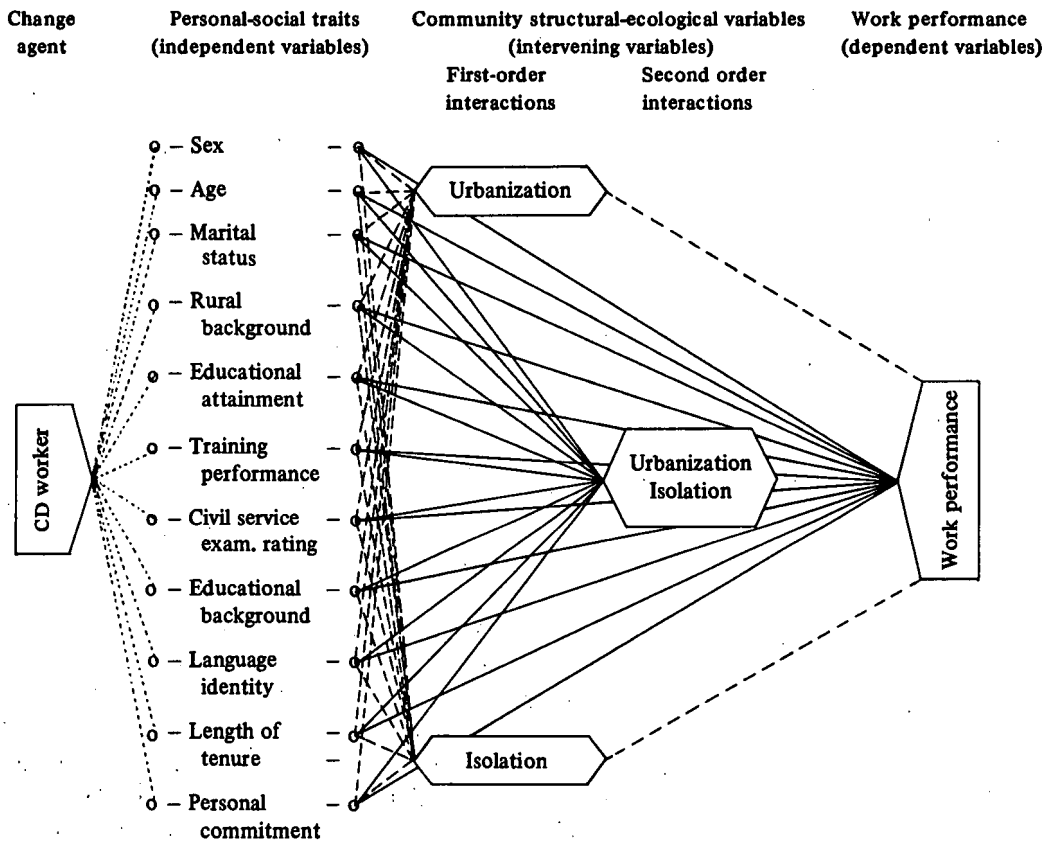
Data gathered during the early part of 1970 from office records and from questionnaires sent to a stratified-purposive sample (N = 153) of CD workers were subjected to two complementary computerized statistical analyses, namely, the statistical analysis system, or SAS (Barr and Goodnight 1970) and multiple classification analysis, or MCA. Based on a least-squares analysis-of-variance technique using regression procedures, SAS provides variance ratios for main and interaction effects.³ A correlative technique, MCA, provides eta coefficients for each determinant. Both procedures provide the effect of any determinant on the dependent variable, with the values of all other determinants held constant, including those of any level of interaction for SAS.⁴

Figure 1 represents a heuristic model for understanding the nature of the statistical analyses conducted. Examined were the effects on work performance of each of 11 traits (sex, age, marital status, rural background, educational attainment, training performance, civil service examination rating, educational background, personal commitment, speaking the same mother tongue as the people to whom one is assigned, and length of tenure). Selected interaction effects between each of these traits and two community characteristics (urbanization and isolation) were also studied.

The values of all determinants were transformed into "dummy" or "zero-one" variables.⁵

The values of work performance were generated from seven closely related items using Guttman scaling procedures.⁶ Similar procedures were used to obtain the values of two independent variables (rural background and personal commitment) and the two intervening variables from their respective indicators.⁷

The hypothesis tested was that CD workers who were male, older, married, with greater rural background/bias, graduated from preferred collegiate courses, with higher average pre-service training performance, with a higher rating in civil service examinations, with higher personal commitment, speaking the language of the place of assignment, and with longer tenure



Note: Dotted connecting lines indicate description of CD worker in terms of his personal and social characteristics; broken connecting lines indicate suppressed first-order interactions; solid connecting lines indicate empirical relationships being examined.

Fig. 1 – Heuristic model for relationships among personal-social traits of CD workers, community structural-ecological characteristics, and levels of work performance.

would exhibit significantly higher levels of work performance.

Results

SAS procedure. Table 1 shows the overall effect on work performance of all the determinants (personal-social traits, community characteristics, and selected interactions). The variance ratio obtained is highly significant. The value for the coefficient of determination (R^2) suggests that only 25 percent of the variation

in the dependent variable is accounted for by its presumed linear dependence on the determinants. The value for the multiple correlation coefficient (R) suggest only a fair degree of association between determinants and dependent variable. However, the following personal-social traits are significantly related to work performance: educational attainment, sex, training performance, personal commitment, and length of tenure (Table 2).

Table 1

Least-squares analysis of variance of work performance for the personal-social traits and their selected second-order interactions with urbanization and isolation^a

Source of variation	df	Sum of squares	Mean sum of squares	F value
Model	24	305.8460	12.7436	2.4725 ^b
Error	128	659.7376	5.1541	
Corrected total	152	965.5836		

^a $R^2 = 0.2529$; $R = 0.5029$

^bSignificant at the 0.01 level.

Table 2

Least-squares analysis of variance (individual degrees-of-freedom test) of work performance for each personal-social trait

Source of variation	df	Mean sum of squares	F value
Sex	1	27.01794	5.2420 ^a
Age	1	7.23021	1.4028
Marital status	1	0.00206	0.0004
Rural background	1	11.35146	2.2024
Educational attainment	1	42.21129	8.1898 ^b
Training performance	1	22.01432	4.2712 ^a
Civil status exam. rating	1	1.04010	0.2018
Educational background	1	3.33378	0.6467
Personal commitment	1	21.10358	4.0945 ^a
Language identity	1	9.81758	1.9048
Length of tenure	1	29.02393	5.6312 ^a
Degree of urbanization	1	11.26692	2.1860 ^c
Degree of isolation	1	42.32674	8.2122 ^{b, c}

^aSignificant at the 0.05 level.

^bSignificant at the 0.01 level.

^cNot of interest in the present analysis.

Table 3 provides the means and other pertinent information for each of the categories of all independent variables. Significantly higher in work performance than their opposites are CD workers of the following description: male, low in educational attainment (at least two years of college work but not graduated from any four-year collegiate course), higher average preservice training performance, lower score on personal commitment, and longer tenure.

MCA analysis. Table 4 shows the eta coefficients for each of the independent variables. Those with high coefficients are educational

attainment, length of tenure, sex, training performance, and personal commitment. The value for the coefficient of determination (R^2) suggests that only 5 percent of the variation in the dependent variable is accounted for by its presumed curvilinear dependence on the determinants. The value for the multiple correlation coefficient (R) equally suggests a very low degree of association between determinants and dependent variable.

Brief discussion

A direct comparison was made between re-

Table 3

Summary of relevant information about personal-social characteristics of CD workers and work performance

Characteristic	Category ^a	Sample size		Mean work performance of category ^b	Difference between categories
		Number	%		
Sex	Male	104	68	3.9231	0.6374 ^c
	Female	49	32	3.2857	
Age	Old	74	48	3.9324	0.4134
	Young	79	52	3.5190	
Marital status	Married	115	75	3.7130	0.0328
	Single	38	25	3.7368	
Rural background	High	75	49	3.8077	0.1810
	Low	78	51	3.6267	
Educational attainment	High	104	68	3.5577	0.5035 ^d
	Low	49	32	4.0612	
Training performance	High	73	48	3.9863	0.5113 ^c
	Low	80	52	3.4750	
Civil service examination rating	High	75	49	3.6000	0.2333
	Low	78	51	3.8333	
Educational background	Technical-agricultural	46	30	3.7609	0.0600
	Others	107	70	3.7009	
Personal commitment	High	83	54	3.4271	0.6497 ^c
	Low	70	46	3.9502	
Language identity	Similar	113	74	3.5310	0.4192
	Different	40	26	3.9502	
Length of tenure	Long	72	47	4.3472	1.1867 ^c
	Short	81	53	3.1605	

^aFor each pair the top category is generally preferred in recruiting CD workers.

^bThe highest possible value for work performance is 8.0 (a value generated from seven items by the Guttman scaling procedure). The overall mean value is 3.7190; the standard deviation, 2.2855.

^cSignificant at the 0.05 level.

^dSignificant at the 0.01 level.

Table 4

Summary of eta coefficients (correlation ratios) for each of the personal-social characteristics^a

Personal-social trait	Eta ²	Eta
Educational attainment	0.7456	0.8634
Length of tenure	0.6868	0.8287
Sex	0.6210	0.7880
Training performance	0.5930	0.7700
Personal commitment	0.5254	0.7248
Rural background	0.4078	0.6386
Language identity	0.0585	0.2419
Age	0.0551	0.2348
Educational background	0.0168	0.1295
Civil service exam. rating	0.0163	0.1278
Marital status	0.0104	0.1020

^aR² = 0.0502; R = 0.2242

levant SAS and MCA data.⁸ The data in Table 5 show that the rank-order patterns of the values for variance ratios and eta coefficients are almost exactly alike. The observed discrepancies in the decreasing magnitude of the variances and coefficients probably reflect processual

factors, such as those inherent in either SAS or MCA computer-packaged programs (Langley 1967; Wampler 1970), and artifactual factors, such as the nature of the data processed (Acierto 1971:51-53, 110). The low values of the coefficients suggest strongly that investigators should look elsewhere for more fruitful determinants of work performance, perhaps even entirely outside the personal dimensions of change agents.

Empirical Data and Policy Compared

We can now make a simple test of the congruence of the study findings and accepted policy. Of the 11 traits examined, only five (45 percent) were validated. Moreover, in two of the five instances where a significant variable was found, the finding was contrary to the policy position: *undergraduates* (not college graduates) and those with *low* (not high) *personal commitment* make better CD workers (Table 6). Add to this the fact that among the six nonvalidated traits there are three which the CD agency considers of critical importance, namely, rural background or bias, educational background, and civil service examination rating.

Implications

The low degree of congruence between the

Table 5

Rank-order patterns of variance ratios (SAS) and eta coefficients (MCA)

Personal-social characteristic	Variance ratio		Eta coefficient	
	Value	Rank	Value	Rank
Educational attainment	8.1898	1	0.8634	1
Length of tenure	5.6312	2	0.8287	2
Sex	5.2420	3	0.7880	3
Training performance	4.2712	4	0.7700	4
Personal commitment	4.0945	5	0.7248	5
Rural background	2.2024	6	0.6386	6
Language identity	1.9048	7	0.2348	8
Age	1.4028	8	0.2419	7
Educational background	0.6467	9	0.1295	9
Civil service exam. rating	0.2018	10	0.1278	10
Marital status	0.0004	11	0.1020	11

Coefficient of determination (R²) 0.2529
 Multiple correlation coefficient (R) 0.5029

0.0502
 0.2242

Table 6

*Policy-based personal-social characteristics of CD
workers and their empirical validation*

Personal-social characteristic	Whether empirically associated with higher work performance
Educational attainment	Yes (inversely)
Length of tenure (experience)	Yes
Sex	Yes
Training performance (implied)	Yes
Personal commitment	Yes (inversely)
Rural background	No
Language identity	No
Age	No
Educational background	No
Civil service exam. rating	No
Marital status	No

results of the operational study and the corresponding organizational policy dramatizes the need for comprehensive research and evaluation regarding ameliorative-developmental programs.⁹ It also suggests the advisability of synthesizing such studies so as to help solve particular problems.¹⁰ Data thus obtained should provide administrators with a wealth of empirically-based ideas and insights relative to their programs.

There is obviously no substitute for empirical data as a basis for decision-making (Castillo 1971: 22), yet factual studies of an operational nature have been strangely neglected. This situation is deplorable, considering how little we know about the process of rural uplift (Castillo 1965: 423). Beyond this, the gap in knowledge emphasizes the need for closer cooperation between committed scientists and enlightened administrators. Only through such a partnership can we hope to lay a broad and strong foundation for the planning, operating, and evaluating of rural action programs.

Various kinds of study suggest themselves. One such category is the macroscopic study, concerned with "the interaction and interdependence between the larger society and the particular village or villages one is looking at"

(Castillo 1965: 13). Another is the microscopic, focusing on single villages and revealing the social conditions there in depth (Dasgupta 1964).

One urgently needed emphasis is *experimentation*, in the form of pilot projects, or "initial, way-finder sorts of activity," and demonstration projects, or "projects devoted primarily to the purposeful testing of practices and procedures believed to be capable of helping gain desired ends" (Raper 1956: 30). The projects and activities that may be undertaken in these studies offer scientists, administrators, and rural dwellers alike rich opportunities "to learn about the development process, to generate enthusiasm, insights, a sense of direction and a feeling that one is part of something which is developing" (Castillo 1971: 20). A noted authority suggests that development agencies should accordingly allocate resources for

... projects involving controlled experimentations with respect to controlled variables... It is amazing... that no more such controlled experimentation has been undertaken. Instead, *debates around conference tables result in one decision or another about how to begin, and emphases and method are continued or dropped as programs proceed on the basis of administrative judgments untested by experimental comparison of the results of... alternatives* (Mosher 1962: 90-91; italics added).

Experimentation as a "way of life" (Mosher 1967: 38-41) has yielded great dividends for the rice industry. For example, years of patient research led to the development of the now internationally famous "miracle" rice (Anderson 1968; Deutschmann 1969). Perhaps an equivalent strategy can be followed in development programs, to produce a "strain" to withstand empirical scrutiny.

Scientists and practitioners in rural development might take a cue from the drug industry. The strategy it uses is simple enough. It manufactures and sells medicines that satisfy the end-users' beliefs and tastes (Coleman *et al.* 1966). A similar approach might also work in rural development, if talents were pooled to adapt innovations and develop innovative procedures that satisfied rural dwellers. But this is the crux of the problem since what people consider satisfying is not known. In fact the farmer "is the least understood of all the elements in development" (Castillo 1965: 423). A wide gap thus separates what should be known and what is being done to guide action toward success (Staley 1961).

All this accentuates the need for empirical data with which to formulate credible answers to problems about rural development programs. Too often these programs, after being planned through debates and conferences, are implemented through improvisation, the result being "prestige" or "compliance" community projects and activities which are abandoned soon after completion. Thus well publicized "model" barrios unceremoniously return once more to their "nonmodel" origins.

"An essential condition of finding a solution" to this dilemma, Nair asserts (1961: 197), "is that the problem be first recognized, understood and faced squarely, in all its aspects and implications, however much these may conflict with existing theories and preconceptions."

Notes

This is the revised version of a paper read at the National Convention of the Philippine Sociological Society, held January 20-21, 1973, Bocobo Hall,

University of the Philippines, Diliman, Q.C. At the time he presented this paper, Dr. Acierto was acting chief, Research and Evaluation Staff (RES), Presidential Arm on Community Development (PACD) and professorial lecturer, Institute of Social Work and Community Development, University of the Philippines. He received the Ph.D. degree in sociology from Louisiana State University (1971) and the M.A. degree in the same field from the University of Hawaii (1963). He wishes to express his gratitude to Dr. Cristina P. Parel, Dean, U.P. Statistical Center, for comments on an early draft; to Bernardita Q. Tandoc, Staff Researcher, RES/PACD, and Tita L. Tan, Clerical Staff, RES/PACD, for editorial and secretarial assistance, respectively.

1. Probably Farrington (1915) was the first to use the term "community development" formally. He was followed by Lindeman (1921) who discussed nine steps of the CD process, which Taylor (1956) finally reduced to five. However, it was the 1957 conference held at Hartwell House, Aylesbury, Buckinghamshire, England, which popularized the term (Her Majesty's Stationery Office 1958).

2. A recent study (Acierto 1971) reviews the limited number of empirical research studies directly concerned with the social and personal qualifications of CD workers and other similar change agents. The wide variation in the results of these studies suggests the existence of biases with respect to time, culture, type of program, type of personnel, purpose of study, empiricalization of concepts, and the like.

3. Harvey (1960: i, 1-2) gives a rationale for the use of this technique, as follows: (a) it provides unbiased estimates for unequal subclasses, (b) it tests the effects of one independent variable on the dependent variable, while holding constant the effects of all other independent variables, and (c) it allows for relative ease in generalizing results. For selected recent discussions of this method, see Balestra (1970), Langley (1967) and Wampler (1970).

In this particular analysis only selected second-order or three-factor interactions were considered, namely, those involving each of the personal-social traits (independent variables) and both community structural-ecological characteristics (intervening variables). This is probably the first time these characteristics have been explicitly included as determinants of the dependent variable. All analyses previously made that included "intervening" variables were of the "partial" association type.

4. Theoretically, one can analyze any number and level of interactions in the SAS, depending on the needs of a particular study and the type and model of a given computer unit. Similarly, one can suppress any number and level of interactions, as was done in this analysis.

5. Blalock (1960: 149-152) considers dichotomized data as proportions, assigning "one" or

"zero" according to which is discriminated against (to which is assigned the "zero" value) and treating them as interval scales. David and Tomek (1965) discuss the same idea as "dummy" variables.

6. The indicators of work performance are given in the order of their scalability: awards received while employed with PACD (such as citations, medals, and prizes for exemplary work), funding of CD projects (with or without financial-material assistance external to the communities served by a worker) during a four fiscal-year period (1966-67 through 1969-70), present position with the rural CD agency, project score (sum of scores assigned to projects completed in the worker's place of assignment during the same four fiscal-year period), average of efficiency ratings received during the same four-year period, promotion score (sum of scores of any promotions earned while employed with the CD agency; the promotion may be either in rank or in salary or both), and number of years served with the CD agency when the first promotion was earned.

The concept of work performance and the search for empirical indicators owe much to Ghiselli (1966: 22-23, 113) in his discussion of the *multifacetedness* of success in any job: "For any given job, success is likely to be reflected in different aspects of performance . . . each of them measures some important and pertinent phases . . . So typically these . . . are combined into a single overall criterion." He also suggests (*ibid.*, 113) that "For proficiency criteria to be meaningful, records of performance on the job have to be obtained for periods covering many months or even years. The individual's performance of short periods of time is likely not to be a representative measure of his job proficiency."

7. In spite of Guttman's (1949) dictum that a minimum of 10 items should be included in any attempt to analyze the scalability of dichotomized data, his scaling procedure was used nonetheless because it requires the fewest arbitrary decisions as compared to other methods of data summarization. As Aurbach (1955: 142) puts it, when forced to decide in a similar situation, what is needed is "a scale score which is meaningful and unambiguous, and thus eliminates the necessity of assigning artificially derived weights to individual items."

8. Both SAS and MCA are concerned with relationships. However, the basic assumption in SAS is that a linear relationship exists, while the basic assumption in MCA is that a curvilinear relationship exists.

9. See Acierto (1972) for a discussion of needed research and evaluation studies for programs concerned with general rural development. Two categories of program are distinguished: those "in need of urgent action" and those "in need of urgent deliberation."

10. This type of synthesizing is illustrated in the

excellent work of Castillo (1971) and Mercado *et al.* (in progress). Both integrate the results of studies about rural development programs, projects, and activities in the Philippines in language that a layman can easily understand.

References

- Acierto, Pedro R.
1971 The community development worker in the Philippines: A study of selected personal-social traits and differential levels of work performance. Unpublished Ph.D. dissertation, Louisiana State University.
1972 Research and rural community development. Paper presented at the Third World Congress for Rural Sociology, Baton Rouge, Louisiana, August 22-27. (Mimeo.)
- Anderson, Jack
1968 A food miracle. *Parade Magazine* 20(2): 1-7.
- Aurbach, Herbert
1955 A Guttman scale for measuring isolation. *Rural Sociology* 20(2): 142-45.
- Balestra, Pietro
1970 On the efficiency of ordinary least-squares in regress models. *American Statistical Association Journal* 65(331): 1330-37.
- Barr, Anthony J., and James H. Goodnight
1970 *Statistical analysis system: A computer manual*. Raleigh, North Carolina State University Press.
- Bennis, Warren G., *et al.*
1962 *The planning of change: Readings in the applied behavioral sciences*. New York, Holt, Rinehart and Winston.
- Blalock, Hubert M.
1960 *Social statistics*. New York, McGraw-Hill.
- Castillo, Gelia T.
1965 Toward understanding the Filipino farmer. *The Philippine Agriculturist* 29(6-7): 423-37.
1971 How to modernize the rural areas. *Solidarity* 6(7): 13-25.

- Coleman, James, *et al.*
 1966 Medical innovation: A diffusion. Indianapolis, Bobbs-Merrill.
- CDC (Community Development Center)
 1958 Minutes of the evaluation and planning conference on pre-service and in-service training. College, Laguna, February 27.
 1961a Excerpts from the deliberations of the group session attended by area development officers and regional supervisors. College, Laguna, July 8. (Mimeo.)
 1961b Final report of the workshop on pre-service and orientation training. College, Laguna, July 8. (Mimeo.)
- Dasgupta, Samir
 1964 Life in a Bengal village. *Economic Development and Cultural Change* 13(1): 115-17.
- David, Shaul Ben, and William B. Tomek
 1965 Allowing for slope and intercept changes in regression analysis. *Agricultural Economics Research Bulletin*, no. 179. Ithaca, N.Y., Cornell University Agricultural Experiment Station.
- Deutschmann, Paul
 1969 More and better rice for Asia's hungry millions. *Reader's Digest* 13(75): 33-37.
- Farrington, Frank
 1915 Community development: Making the small town a better place to live and a better place in which to do business. New York, Ronald Press.
- Ghiselli, Edwin E.
 1966 The validity of occupation aptitude tests. New York, John Wiley.
- Guttman, Louis
 1949 The basis of scalogram analysis. *In* Measurement and prediction, Samuel Stoufer, *et al.* Princeton, Princeton University Press.
- Harvey, Walter R.
 1960 Least-squares analysis of data with unequal subclass numbers. Beltsville, Maryland, U.S. Dept. of Agriculture.
- Her Majesty's Stationery Office
 1958 Community development. London, Her Majesty's Stationery Office.
- Kelsey, Lincoln D.
 1958 The community development worker in the Philippines. College, Laguna, College of Agriculture, University of the Philippines.
- Langley, James
 1967 An appraisal of least-squares programs for the electronic computer from the point of view of the user. *American Statistical Association Journal* 62(319): 819-41.
- Lindeman, Edward
 1921 The community: An introduction to the study of community leadership and organization. New York, Association Press.
- Mercado, Cesar, *et al.*
 n.d. Communication and attitude change in community development. Quezon City, Community Development Research Council, University of the Philippines. (In progress.)
- Mosher, Arthur T.
 1962 Research and rural development. *In* Development of the emerging countries: An agenda for research, Robert E. Asher, *et al.* Washington, D.C., Brookings Institution.
 1967 Administrative experimentation as a 'way of life' for development projects. *International Development Review* 9.
- Nair, Kusum
 1961 Blossoms in the dust: The human factor in Indian development. New York, Praeger.
- Polson, Robert A.
 1958 Theory and methods of training for community development. *Rural Sociology* 23(1): 34-42.
- PACD (Presidential Assistant on Community Development)
 1958 Recruitment of trainees for community development in non-Christian provinces. General Memorandum. Manila, March 21.
 1961 Announcement for a civil service examination for community development workers for Fiscal Year 1962. Memorandum. Manila, September 18.
 1962 Enlisting active participation of all fieldworkers in recruiting prospective community development trainees under the "each-one-recruit-one" method. Circular No. 14, Series of 1962. Manila, July 17.

1966 The Philippine community development program. Manila.

Raper, Arthur F.

1956 The role of pilot and demonstration projects in community development work. *Community Development Bulletin*. September.

Rogers, Everett, and Lynn Svenning

1969 Modernization among peasants: The impact of communication. New York, Holt, Rinehart and Winston.

Shields, James J., Jr.

1967 Education in community development:

Its function in technical assistance. New York, Praeger.

Staley, Eugene

1961 The future of underdeveloped countries: Political implications of economic development. New York, Praeger.

Taylor, Carl

1956 Community development programs and methods. *Community Development Review*. December.

Wampler, Rey H.

1970 A report on the accuracy of some widely used least-squares computer programs. *American Statistical Association Journal* 65(330): 49-65.