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THE USE OF ACTION VARIABLES IN DETERMINING RECOMMENDATION DOMAINS

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INTRODUCTION

Many students of agricultural development in the 70's felt that the FSRD approach would be the alternative to the traditional research methodology. FSRD was considered in the late seventy's - early eighties as the only hope for small farmers. As Norman (1980) indicated then FSR methodology gave the small farmer for the first time, a "voice" in tailoring research priorities both in technology development and evaluation to his needs. Farmer's opinions and experiences could form part of the research process. The small farmer then became the central figure in the research process.

Today, many observers are rather skeptical of the FSRD methodology because it has failed to provide the level of accelerated success originally anticipated. Information needed to help solve the problems of small farmers at the policy level is still lacking in many countries where FSRD has been institutionalized. FSRD is criticised with its slowness in providing results because too much time has been spent by researchers at the diagnostic stage, during which large amounts of data were collected, but were seldom presented in a form for policy decision making. Farmers were classified and reclassified into homogeneous groups or recommendation domains but the variables used were mainly descriptive, and could not be acted upon to foster change in the operational environment of the small farmer. In this paper an effort is made to show how a few variables, exogeneous to the farming system can be used to classify farmers objectively into homogeneous groups, based on their levels of input use, and an intended level of food self-sufficiency.

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RECOMMENDATION DOMAIN

In order to effectively conduct FSR farmers have been classified into homogeneous groups based on the observed farming system practiced. These homogeneous groups of farmers are usually called recommandation domains (Shaner et al 1982, Collinson 1980). Recommendation domain is considered as a group of farmers with roughly similar practices and circumstances for whom a given recommendation will be broadly appropriate. It is a stratification of farmers, not area. Socio-economic criteria may just be as important as agroclimatic variables in delineating domains Thus resulting domains are often not amendable to geographical mapping because farmers of different domains may be interspersed in a given area (Byerlee etal 1980). Perrin etal (1976) conceived the notion of recommendation domains as an aid to researchers for targeting the development of technologies to specific audiences. The notion was expanded later to include various applications among which was policy decision making.

Wotowcic etal (1986) argued that domains should be delineated and refined throughout the process of on-farm adaptive research. It has been stressed that an increase in the efficiency of farming systems research and extension activities could be obtained through focusing upon specific relatively homogeneous groups.
Collinson (1979, 1980) Gilbert etal (1980) and Franzel 1985 advocated exante delineation of recommendation domains based on secondary data and preliminary surveys, followed by a formal survey to refine the domain boundaries. Even after the boundaries are defined in a process of investigative research there should be a review of the criteria used for defining the recommendation domains.

Efficiency in allocating resources to a particular group of homogeneous farmers can only be gained if there is evidence as to the factors used to differentiate them from others. For instance, if farmers are classified based on a certain common denominator, their level of well being or their degree of food self-suficiency, which could

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result from technical efficiency gained by use and combination of a given level of input, (X, = Z (X2, X3, X4, X5/X6...X10)

Where X1 = out put
X2... x X5 = measurable inputs
X6... x 10 = practices

Then researchers can study how and why certain of these factors, X2... x 10, can be manipulated to modify the lot of the farmer. These variables which can be manipulated can be considered as "Action variables".

The methods previously used in determining recommendation domains have been purely descriptive. Farmers were categorized based on their use of inputs and other sociological factors and not a combination, of inputs, outputs or technical efficiency. (Inputs here include a certain quantity of measurable factors of production plus the presence or absence of certain cultural practices).

A classification of individuals into groups according to their use of inputs, level of production and technical efficiency might be more relevant to policy makers than a grouping based on qualitative subjective evaluation. In this paper an attempt is made to use cluster plus discriminant analysis to categorize farmers into similar groups. Production level, and a few "action variables" are used for that purpose.

METHODOLOGY

Data were collected from 335 heads of farm farmily household within the research area of the FSR team of the Ziguinchor region of Senegal during the 1983/1984 agricultural year. Information on area planted, yield, use of inputs, cultural pratices, food consumption and marketing and revenue from non-agricultural activities. Farmers were classified, using SAS 1982 progromming, into groups of levels of self-sufficiency.

1) LMSUSISF -LESS than self-sufficient-<100/Kg per capital of cereal per year
2) MSUSISF-AVERAGE self-sufficiency 100 <200/Kg cereal per capita per year.
3) SUSISF-Self - sufficiency - 200Kg area per capita per year.

4) SUPLF-Surplus producing farmers-more than 200 kg cereal per capita per year.

The level of self-sufficiency was determined by the FAO standard of 200 kg per capita per year, and was based on cereals produced on the farm, plus total revenu earned from the sale of cash crops, plus other sources, converted to cereals (the purchase of rice)[1]

Cluster and discriminant analysis were used to classify farmers based on their level of (TARACT) total revenue per active labour unit from sources other than agriculture, (ENGRAIS), level of fertilizer used in kilograms, (LABRIZ) the absence or presence of use of animal traction for ploughing rice-fields, (HERBICID), the presence or absence of use of herbicides(LABMIL), the presence or absence of animal traction used for ploughing millet fields and (TSUPACT) the total area cultivated per active labor unit. The data were not standardized for various reasons-see Everitt (1977).

RESULTS AND DISCUSSION

From table 1, the differences in cluster means and standard deviations fo each variable can be seen. There is a striking difference between clusters for total revenue, other than agriculture, with cluster 3, having the highest average revenue from, non-agricultural activities. Cluster 3 has the highest average fertilizer use while cluster 2 has the highest ratio of area planted per active labor unit. On table 2, we see that 75.52 per cent of all farmers were classified in cluster 1, with 69.17 per cent, being less than self-sufficient, 17.79 per cent being average, 5.53 being self-sufficient and 19.0 per cent being able to generate a surplus. Cluster 2 showed 86.36 per cent of farmers producing a surplus whereas 100 per cent of farmers in cluster 3 produced a surplus. Cluster 4 was similar to cluster 1 in that farmers at all levels of self-sufficiency were found in this groups. The Chi-square was 147.505, = 001 (DF = 9).

1. Farmers in this region usually purchase rice when their cereal stock is depleted.

TABLE 1 REGRESSION
CANONICAL DISCRIMINANT ANALYSIS OF FOODCAPS
FASTCUL PROCEDURE*

CLUSTER MEANS

CLUSTER	TARACT	ENGRAIS	LABRIZ	HERBICID	TSUPACT
1	1582.8	0-9	0-4	0-1	49.7
2	52599.9	0-2	0-9	0-0	176.2
3	116902.8	1-3	0-7	0-0	130.2
4	17484.2	1-1	0-9	0-1	128.2

CLUSTER STANDARD DEVIATIONS

CLUSTER	TARACT	ENGRAIS	LABRIZ	HERBICID	TSUPACT
1	2412.83	2.11	0.88	0.30	72.29
2	12521.17	0.75	0.35	0.00	134.70
3	9373.43	2.31	0.58	0.00	59.03
4	6329.92	1.81	1.64	0.29	138.05

DISTANCES BETWEEN CLUSTER MEANS

CLUSTER	1	2	3	4
1	.	51017.3	115320.0	15901.6
2	51017.3	.	64302.9	35115.8
3	115320.0	54302.9	.	99418.6
4	15901.6	35115.8	99418.6	.

* Data colected from survey in the Ziguinchor region of Senegal 1983-1984.

TABLE 2 REGRESSION
CANONICAL DISCRIMINANT ANALYSIS OF FOODCAPS

TABLE OF CLUSTER BY FOODCAPS

CLUSTER	FOODCAPS				
FREQUENCY PERCENT ROW PCT COL PCT	LMSUSISF	MSUSISF	SUSISF	SUPLF	TOTAL
1	175 52.24 69.17 90.67	45 13.43 17.79 68.18	14 4.18 5.53 53.85	19 5.67 7.51 38.00	253 75.52
2	1 0.30 4.55 0.52	1 0.30 4.55 1.52	1 0.30 4.55 3.85	19 5.67 86.37 38.00	22 6.57
3	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	3 0.90 100.00 6.00	3 0.90
4	17 5.07 29.82 8.81	20 5.97 35.09 30.30	11 3.28 19.30 42.31	9 2.69 15.79 18.00	57 17.01
TOTAL	193 57.61	66 19.70	26 7.76	50 14.93	335 100.00

STATISTIQUE FOR 2-WAY TABLES

CHI-SQUARE 147.505 DF = 9 PROB = 0.0001
PHI 0.664
CONTINGENCY COEFFICIENT 0.553
CRAMER'S V 0.383
LIKELIHOOD RATIO CHISQUARE DF = 9 PROB = 0.0001

Figure 1 was drawn, using data from table 1 in appendix . Here it can be seen that the data is lumped into four different clusters with cluster 4 and 1 being very similar and cluster 2 and three being disimilar to cluster 1 or 4. The graph shows that we can classify farmers distinctly based on their levels of input and output.

How can the classification of farmers into these four groupings help researchers and policy makers ? Since a natural typology has been produced (the number of clusters being specified by the researcher) researchers can now try to place the farmers based on their average use of certain inputs and then objectively group them in recommendation domains . That is farmers can be placed into certain recommendation domains. Researchers can now study why each farmer is grouped in Cluster 1, 2, 3 or 4 and why he is different from other farmers in another group. Insight miaht be gained into certain relationships between input use output and farmer cultural practices. For example labor per area cultivated is the lowest in cluster 3 which has the highest level of farmers producing a surplus (tables 1 and 2).

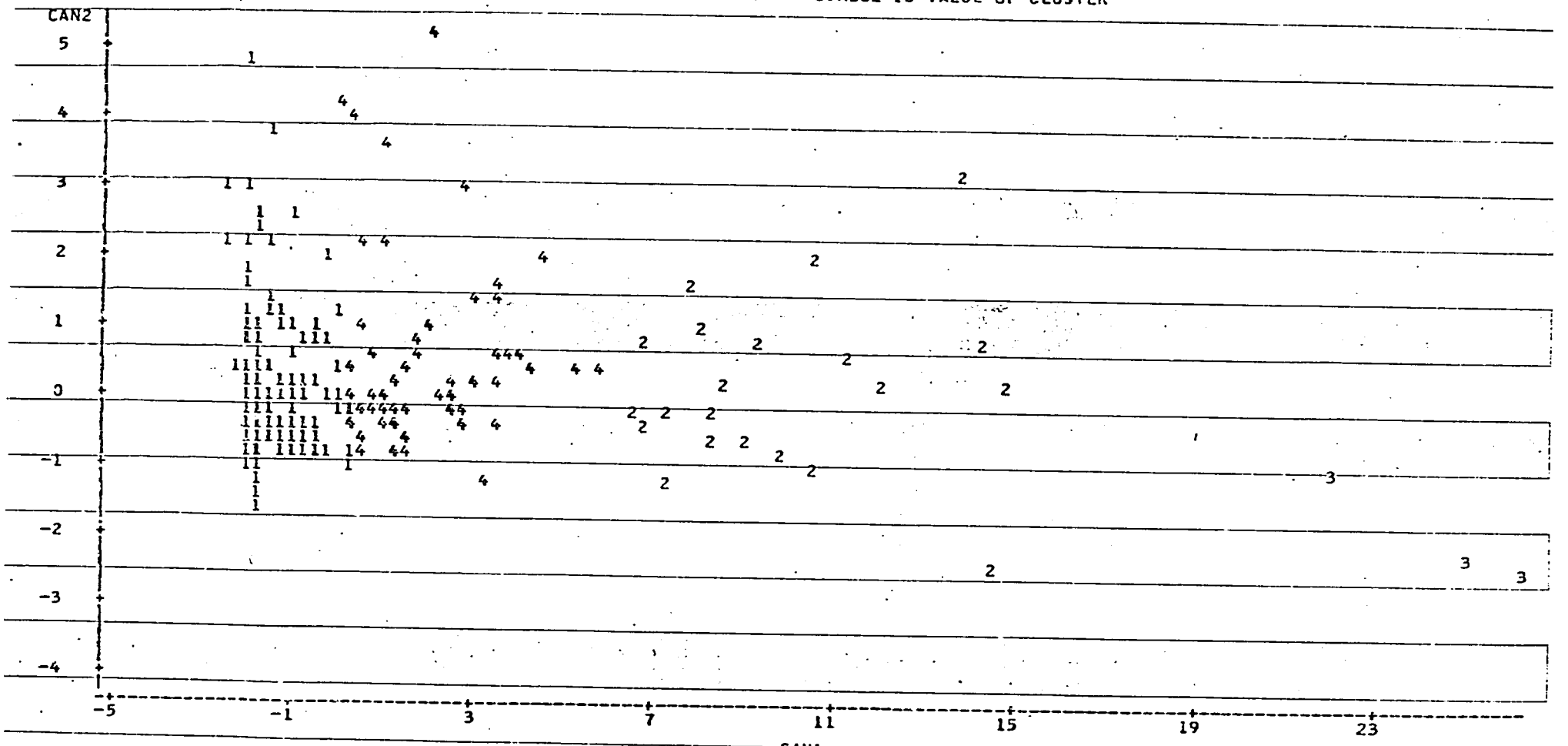
These groups of farmers have the highest mean average fertilizer use. This information can not only be used by researchers for further research, but also by policy makers for determinings fertilizer distribution programs.

This study provides some indications of the relevancy of certain variables in classifying farmers into similar groups. It also shows how action variables can be used objectively in categorizing farmers into recommendation domains.

Fig 1 REGRESSION

PLOT OF CANONICAL VARIABLES IDENTIFIED BY CLUSTER

PLOT OF CAN2*CAN1 SYMBOL IS VALUE OF CLUSTER



NOTE: 1 OBS HAD MISSING VALUES 176 OBS HIDDEN

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APPENDIX

TABLE 1 REGRESSION
CANONICAL DISCRIMINANT ANALYSIS OF FOODPCAP

CANONICAL DISCRIMINANT ANALYSIS

TOTAL CANONICAL STRUCTURE			
	CAN 1	CAN 2	CAN 3
TARACT	0.99	0.05	-0.00
ENGRAIS	-0.03	-0.01	0.92
LABRIZ	0.17	0.58	0.30
HERBICID	-0.08	-0.01	0.39
TSUPACT	0.33	0.82	-0.16
BETWEEN CANONICAL STRUCTURE			
	CAN 1	CAN 2	CAN 3
TARACT	0.99	0.01	-0.00
ENGRAIS	-0.41	-0.05	0.90
LABRIZ	0.69	0.70	0.11
HERBICID	-0.91	-0.06	0.39
TSUPACT	0.80	0.59	-0.03
WITHIN CANONICAL STRUCTURE			
	CAN 1	CAN 2	CAN 3
TARACT	0.97	0.18	-0.01
ENGRAIS	-0.01	-0.01	0.92
LABRIZ	0.04	0.57	0.31
HERBICID	-0.02	-0.01	0.39
TSUPACT	0.09	0.86	-0.17
STANDARDIZED CANONICAL COEFFICIENTS			
	CAN 1	CAN 2	CAN 3
TARACT	3.91	-0.41	0.06
ENGRAIS	0.00	0.10	0.86
LABRIZ	-0.03	0.50	0.24
HERBICID	-0.02	-0.26	0.25
TSUPACT	-0.21	0.92	-0.15
RAW CANONICAL COEFFICIENTS			
	CAN 1	CAN 2	CAN 3
TARACT	0.00	-.00	0.00
ENGRAIS	0.00	0.05	0.43
LABRIZ	-.04	0.59	0.28
HERBICID	-.09	-.91	0.90
TSUPACT	-.00	0.00	- 00
CLASS MEANS ON CANONICAL VARIABLES			
CLUSTER	CAN 1	CAN 2	CAN 3
1	-1.52	-0.11	-0.01
2	9.71	0.18	-0.24
3	24.36	-1.87	0.47
4	1.38	0.52	0.11