FARM BENEFITS AND NATURAL RESOURCE PROJECTS IN HONDURAS AND EL SALVADOR

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1. Introduction

Peasant farmers in Central America typically grow subsistence crops -mainly corn and beans- in sloping and marginal uplands. These farmers often use production practices that are highly erosive and as a result the region contains large areas with significantly degraded land (Oldeman *et al*., 1990; Barbier, 2000). The development path on the Central American agriculture has usually involved the migration of poor or landless farmers to public or open-access lands, who then clear forest areas, and cultivate staple crops for a few years, before moving on to clear new plots. As migration increases and the pool of available land declines, farmers use land more intensively. Those unable to purchase agrochemicals face declines in soil fertility and productivity, and farming becomes unsustainable (Neill and Lee, 2001). For many resource-poor farmers, soil degradation exacerbates the continuous struggle for food security.

To respond to this deteriorating situation, local governments and international organizations have undertaken a series of public investments focusing on poverty reduction and the promotion of conservation technologies. A major thrust of these projects has been to foster long-term environmental sustainability by enhancing management capabilities and decreasing vulnerability of communities to natural disasters.

Two of these natural resource management projects that deserve special attention due to their magnitude and scope are: (i) the Environmental Program for El Salvador (PAES); and (ii) the Natural Resource Management Program in the CAJON-Basin, Honduras. PAES is treated as three separate projects, PAES1, PAES2 and PAES3, since each one has been implemented in a different area by a different international consortium. These projects seek to generate both on-site and off-site benefits. The on-site benefits consist of increased household income through improved soil productivity, the adoption of conservation technologies, and product diversification. Off-site benefits are reflected on improved environmental conditions and positive externalities associated with water, soil and forestry resources. The CAJON project has concluded recently, while the PAES project will finish by the end of 2004. Most of the analyses done to examine the performance of these projects have focused on assessing physical targets and institutional aspects (for example, Barbier and Flores, 2003; PNUD, 1999; PAES/IICA2003; PAES/CARE, 2003; PAES/ABT–Winrock, 2001). So far, no attempt has been made to evaluate the off-site impacts of the projects. In turn, Bravo-Ureta *et al*. (2003) have performed an assessment of the on-site benefits, using farm-level data collected among beneficiaries.

The objective of this paper is to measure the success of the poverty reduction strategies promoted by the projects, by studying the relationships among technology adoption, product diversification and household income among participant farmers.

The rest of the paper is organized as follows. The second section presents the data set and the methodological framework. The third section discusses the econometric results and the fourth section summarizes and presents the main conclusions.

2. Data and Methodology

The data used consist of detailed farm-level information obtained from surveys applied to representative samples of project beneficiaries in El Salvador and Honduras. These data were collected and analyzed by Bravo-Ureta *et al.*, (2003), as part of Technical Cooperation # 01-08-01-1-RS between the University of Connecticut and the Inter-American Development Bank. The sampling procedure in Honduras started with a grouping of the 240 communities participating in the CAJON project into three agro-ecological zones according to elevation: High, Medium, and Low. From these communities, 48 (20%) were randomly selected and distributed evenly by agroecological zone. Within each community, four farm households were randomly chosen. Overall, 210 beneficiary *campesinos* were interviewed, of which 35 are also contact farmers or extensionists. In El Salvador, data were gathered by surveying a sample of 530 farm households belonging to 102 communities within the regions of Resbaladero and Texistepeque (PAES1), San Juan Opico and Nueva Concepción (PAES2), and Tenancingo and Guazapa (PAES3). 175 respondents belong to PAES1, 177 to PAES2 and 178 to PAES3. The sample was stratified by region to reflect the geographical distribution of the three projects.

Table 1 includes descriptive statistics of the dependent variables used in the econometric model. The data are presented by project and aggregated for the whole sample. The last column of the table presents the results of an ANOVA test performed to verify whether the observed mean differences among projects are statistically significant. The bold figures indicate statistically significant mean differences at least at the 1% level.

The study of the relationships among technology adoption, product diversification and poverty reduction requires an understanding of the main sources of rural income, including farm and off-farm sources. These relationships can be stylized as a set of functional links, as illustrated in Figure 1, which is based on a framework presented by Minten and Zeller (2000)[1]. In this framework, the household is taken as a single decision-making body; therefore, decisions that affect the way resources are allocated among household members, the so-called intra-household resource allocation, are not taken into account (Ellis, 1998).

The household's set of resources (assets) consists of natural capital (land, livestock, durables and environmental quality), human capital (education, experience, demographic attributes) and social capital (access to social networks and institutions). In addition, the household's decision-making process is also affected by a set of external factors, including the socio-economic and agro-ecological environment, input, output and financial markets, prices, wages and infrastructure. The household's set of resources determines the allocation of labor and effort between farm and off farm activities.

The mapping of assets to household income through both off and on farm activities can conceptually be considered as a production process, with assets corresponding to factors of production and income as the output (Barrett and Reardon, 2000). The allocation of assets to each activity is assumed to maximize household income subject to a set of constrains. Households will allocate assets in a manner that equates the marginal value product across activities or will allocate assets entirely to one

[1] A similar framework can be found in Mbaga-Semgalawe and Fomer (2000).

activity with higher returns. A key feature of this approach is that households simultaneously determine the allocation of assets to different activities (Winters *et al*., 2002).

Moreover, the natural resource management projects under study motivate farmers to adopt soil conservation technologies and to diversify their product mix. These technological changes should improve farm production and productivity and, consequently, should be reflected in a greater household income, which is the sum of farm and off-farm income. Finally, income improvement is considered a necessary condition for sustainability of the changes introduced by the projects. The relationships depicted in Figure 1 are modeled considering that, for a given agricultural year, the household decisions that affect the allocation of labor between farm and off-farm activities, as well as the adoption of conservation practices and output mix, also determine total farm income.

A growing body of research speculates that farmers' land allocation decisions may have a significant influence on the pattern of technology adoption (Moreno and Sunding, 2003; Winters *et al*., 1998; Barbier, 1990; Hopkins *et al*, 1999; Kruseman, 2000). For instance, Murray (1994) argues that farmers are more open to soil conservation measures when they are presented not as the principal component of rural extension, but rather as secondary items in a menu featuring innovations with good short-term income-generating potential.

Accordingly, if technology choice is influenced by the same factors explaining land allocation, then there is a simultaneity problem that must be addressed (Moreno and

Sunding, 2003). In line with this reasoning, it is reasonable to assume that within a period of time, the choice of output mix and soil conserving investments are jointly determined along with the allocation of farm and off-farm income. Therefore, technology adoption and crop diversification are simultaneously estimated along with the income equations. The empirical model can be represented as:

(1) **Staple Income Equation** $Y^S = Y^S\ (NK, HK, SK, ACP, OD, VI)$

(2) **Cash Crop Income Equation** $Y^C = Y^C\ (NK, HK, SK, ACP, OD, VI)$

(3) **Off-Farm Income Equation** $Y^{NF} = Y^{NF}(NK, HK, SK)$

(4) **Conservation Equation** $ACP = f(NK, HK, SK, FV)$

(5) **Diversification Equation** $OD = f(NK, HK, SK, FV)$,

where

ACP = Adopted Conservation Practices;
OD = Number of items produced by the firm (output mix) over and above the subsistence crops (corn and beans);
Y^S = Income obtained from corn and beans;
Y^C = Income obtained from farm output other than corn and beans;
Y^{NF} = Income obtained from off-farm employment;
NK = Natural Capital (total land, tenure, slope, distance from house to parcel);
HK = Human Capital (family size, gender of household head, agricultural experience, age of household head, education, perceives erosion, farmer is extensionist);
SK = Social Capital (access to credit, access to output markets, access to labor markets, participates in social organizations);
PV = Project Variables (adoption of conservation practices and structures, crop diversification, receives extension, receives training, frequency of extension visits, years with project, PAES1, PAES2, PAES3, CAJON); and
VI = Variable Inputs (Total expenditures in variable inputs).

Equation (1) and (2) include the variable ACP as an explanatory variable, i.e., soil conservation practices are inputs in the production of staples and cash crops, as proposed by Thampapillai and Anderson (1994)[2].

Consideration must be given to the fact that the dependent variables staples, cash crops and off-farm income are observed only for a restricted, non-random sample of those farmers who decide to participate in those activities. Therefore, sample selection bias is likely to arise and Heckman's two-stage approach for the estimation of selectivity bias will be employed to address this issue (Heckman, 1976).

A key feature of the framework presented above is that households simultaneously determine the allocation of assets to different income-generating activities. In this context of simultaneity, the possible dependency between regressors and residuals implies that ordinary least squares (OLS) estimates are biased and inconsistent. The standard prescription for correcting such cases is the instrumental variable (IV) technique. If instrumental variables that are correlated with the explanatory variables but uncorrelated with the error terms are available, then IV regression yields consistent estimates (Deaton, 1997). An additional problem that needs to be addressed, given the cross-section nature of the household surveys under study, is the likely existence of heteroskedasticity (Deaton, 1997; Judge *et al*., 1988). Heteroskedasticity affects not the consistency but the efficiency of the IV coefficient estimates. Moreover,

[2] in a cross-sectional sample of households, even without market imperfections, prices can be safely assumed to be constant across sections of farmers and therefore can be ignored (Holden *et al*., 2001; Van Dusen and Taylor, 2003).

the IV estimates of the standard errors are inconsistent, preventing valid inference, since the usual forms of the diagnostic tests for endogeneity and overidentification are invalid. Using heteroskedasticity-consistent or "robust" standard errors can solve these problems and, since the seminal work by Hansen (1982), the Generalized Method of Moments (GMM) has become the standard remedy for heteroskedasticity in virtually every field of applied economics (Baum *et al.* (2003). GMM provides an inference procedure that is robust in the presence of heteroskedasticity (Kieffer and Vogelsang, 2002).

Since several explanatory variables have direct as well as indirect effects on income, it is necessary to calculate marginal effects in order to measure their overall effect on income-generating activities. Therefore, the total effect of an additional unit of a particular explanatory variable x_i is the sum of the direct effect of x_i on the income-generating activities plus the indirect effects on adoption and diversification. In the case of the variable x_i, the total effect $dY/d\, x_i$ is equal to:

$$\begin{aligned} \frac{d\,Y}{d\,x_1} &= \frac{\delta\ staples}{\delta\ x_1} + \frac{\delta\ cashcrops}{\delta\ x_1} + \frac{\delta\ offfarm}{\delta\ x_1} + \\ &\left(\frac{\delta\ staples}{\delta\ P} + \frac{\delta\ cashcropsf}{\delta\ P} + \frac{offfarm}{\delta\ P}\right).\frac{\delta\ P}{\delta\ x_1} + \\ &\left(\frac{\delta\ staples}{\delta D} + \frac{\delta\ cashcrops}{\delta D} f\!\!+ \frac{\delta\ offfarm}{\delta D}\right).\frac{\delta\ D}{\delta\ x_1} \end{aligned} \tag{6}$$

where Y = income, P = practices, and D = diversification. In the case of dummy variables, the partial derivatives do not exist and the marginal effects are simply the value of the corresponding coefficients, since the estimated system does not include any logarithmic or exponential transformations.

We chose a linear functional form because of the presence of zero values in the dependent variables. Widely used alternatives are logarithmic or semi-logarithmic specifications, wherein to avoid the calculation of the logarithm of zero, each observation is transformed by adding a small positive constant. However, this technique precludes the possibility of some households being at a corner solution (Carson and Cameron, 2000). Moreover, there is evidence that the change of zero-values to facilitate the logarithmic transformation is extremely sensitive to the value of the constant chosen (Soloaga, 2000). Recent studies using linear specifications include Wilkins *et al.*, 2001; Finan *et al*., 2004; Winters *et al*., 2002; Taylor and Yúñez-Naude, 2000; de Janvry and Sadoulet, 2001; Dutilly-Diane *et al*., 2003.

3. Results

This section reports the estimation results of the selectivity-corrected five-equation system of conservation practices, farm-output diversification, staple crop income, cash crop income and off-farm income. The results are displayed in Table 3, while Table 4 shows the marginal effects computed using the coefficients from Table 3 and equation (6). Before proceeding with the parametric analysis, we explore the robustness of the results, considering the possibility of endogeneity (Hausman's specification test), heteroskedasticity (White and Breusch-Pagan tests), and the validity of the instruments used in the IV estimation (*J*-statistic or OID).

The Hausman test of endogeneity was performed comparing the coefficients estimated with OLS and 3SLS specifications. The Hausman statistic is significantly different from zero (p-value= <.0001), indicating that a system estimation (IV) is preferred over OLS.

The Breusch-Pagan and White tests of heteroskedasticity show that the hypothesis of homoskedasticity cannot be rejected in the diversification and cash crops equations. Conversely, both tests indicate that the estimation of the conservation practices; staples and off-farm income equations exhibit heteroskedastic residuals. Given the presence of heteroskedastic residuals in three of the five equations, the system is estimated using the GMM procedure.

The test of overidentification (OID) makes it possible to determine if the null hypothesis that the over-identifying instruments are valid. This test is performed using the value of the objective function minimized by the GMM procedure multiplied by the number of observations (*J*-statistic), which is distributed as a chi-squared with r-p degrees of freedom. The value r is the product of the number of instruments (65) times the number of equations (5) and p is the number of parameters in the system (144). The OID test fails to reject the null that the instruments are statistically valid (p-value=0.486).

Entries in Table 3 are the estimated absolute effects of one-unit changes in the corresponding explanatory variables on income-generating activities. Coefficients with a level of significance greater than 90% are indicated in bold. Overall, 68 out of 114 coefficients (60%) are statistically significant. The following discussion will focus mainly on the results regarding the income-generating equations for staples, cash crops and off-farm activities.

Table 3 shows that in all equations the Inverse Mills Ratios are significant except in staples, indicating that self-selection is an important factor in considering the income-generated from a particular activity and failure to control for it would lead to biased results. All significant Mills have negative signs, and a similar pattern can be found in Winters *et al*. (2000).

The coefficients for expenditures on farm inputs, labor and land allocated to the production of staples and cash crops are all significant and, as expected, positive, indicating the presence of well-behaved production functions for both staples and cash crops. Farm size (a proxy for wealth) is positively associated with off-farm income. White (1991) found land-rich households receiving the largest returns from non-farm enterprises in Java. Similar results are reported for Ecuador (Lanjouw and Lanjouw, 2001), El Salvador (Lanjouw, 2000), Mexico (de Janvry and Sadoulet, 2001; Winters *et al*. 2000) and Brazil (Ferreira and Lanjouw, 2001). As Lanjouw and Lanjouw (2001) point out, the relatively disadvantaged appear to face barriers to employment in the most attractive non-agricultural occupations.

Table 4 reports the corresponding marginal effects, wherein the entries are the returns of an extra unit of each explanatory variable on income from staples, cash crops and off-farm. The total income column is the sum of the marginal effects by activity, while the last column shows the marginal effect on total income as percentage of the predicted household income displayed in the last row.

The marginal income effects displayed in Table 4 reveal that, besides the large effect of gender, the greatest gains in household income are associated with activities directly related with the allocation of land. The marginal income value of gender indicates that when the household head is a man, household income is expected to be 80.0% higher than when the household head is a woman. The large income effect of gender is consistent with the findings by Finan *et al*., (2004) among Mexican farmers. The second greatest marginal income effect is land allocated to cash crops (14.8%), followed by diversification (14.0%), conservation practices (13.9%), and land allocated to staples (10.6%).

Output diversification significantly decreases income from staple crops and greatly increases cash crop income. The overall effect on household income of adding one extra production activity to the farm plan is $307.4, or equivalently, a total income gain of 14% (Table 4). These results highlight the strategic role of diversification in fighting rural poverty and are consistent with those reported by Nerlove *et al.* (1996), Delgado and Siamwalla (1997), and Ruben and Clemens (2000). However, the income gain due to a more diversified income portfolio does not occur without cost, since an extra item added to the farm plan implies a reduction in the production of corn and beans (staples) of $135.4. This trade-off between diversification and subsistence food production suggests that switching to a more market-oriented production pattern may increase household food insecurity, especially in environments where institutional or market failures are prevalent (Immink and Alarcón, 2003; Von Braun, 1995; Quiroz and Valdés, 1995).

The marginal income value of conservation practices is $304.9, which amounts to a 13.9% increase over average total income. The practices included in this variable comprise ground-cover technologies such as crop-mulch/residue management, green manure and conservation tillage. Ground cover is increasingly recognized not only as a crucial soil conservation component but also in terms of its potential effects on land productivity. Therefore, technologies emphasizing ground cover are more likely to be profitable (Erenstein, 1999; López-Pereira *et al*., 1994). As in the case of output diversification, conservation practices have a positive association with cash crops but negative with staples. In sum, the adoption of conservation practices and output diversification are positive correlated and denote a switching away from more traditional staple production.

The positive association between conservation practices and income contrasts sharply with the effects of conservation structures. The marginal income effect of an additional conservation structure is -$184.3, or equivalently, an 8.4% drop in household income. A substantial body of literature contains empirical evidence of poor private economic returns associated with conservation structures (Erenstein, 1999; Wiggins, 1981; Blaikie and Brookfield, 1987). It is increasingly recognized that structures are expensive to build and maintain whereas they add little to the productivity of the land in the short run (Shaxson *et al*., 1989; Douglas, 1993). Lutz *et al*., 1994 reports several case studies in Central America and the Caribbean where physical structures seemingly lessen the available area for cultivation. Examples include construction of cutoff drains in Costa Rica and terraces in Guatemala that reduced the effective cultivation area by 14%, and 15%, respectively. Such drawbacks may clearly affect the profitability of these conservation technologies. Further, terracing often entails movements of earth that brings unproductive soil to the surface (Erenstein, 1999; de Graaff, 1996). McIntire (1994) reviewed 20 conservation techniques in Mexico and found that cultivation and cropping practices, including vegetative barriers, were superior to structures in terms of profitability. On the other hand, a combination of diversion ditches and live barriers in Guatemala appears to be substantially more profitable than terraces, even if much less effective to control erosion (Lutz *et al.*, 1994).

Surprisingly, farmer experience exhibits a negative association with household income. However, as shown in Table 3, most of the coefficients measuring experience are not significantly different from zero. Similar results regarding farmer experience can be found in Taylor and Yúñez-Naude (2000).

Education plays a significant and positive role in all income-generating activities. Other things being equal, an extra year of average household schooling is associated with a gain of $107.7 or 4.9% in total household income. This result is in line with the apparent robustness of the evidence on the returns to education at the micro-economic level. Estimates for developing countries find that each additional year of schooling is associated with a 6-10% increase in earnings and similar patterns are found in developed countries (Besley and Burgess, 2003; Krueger and Lindhal, 2001). In Latin America, a one-year increase in the average education of the adult population can lead to increases of 3-5% in real GDP (Lau *et al.*, 1990; Glewwe, 1996).

The returns from schooling are the highest in cash crop production ($45.5) followed by off-farm activities ($40.4), and the lowest in food staple production ($21.8). These returns to education by source of income are consistent with other findings in the rural development literature (Finan *et al*., 2004; Winters *et al*., 2000; López and Romano, 2000; López and Thomas, 2000; Ellis, 1998). As Taylor and Yúñez-Naude (2000) affirm "farm households may reap rewards from schooling by abandoning one activity (e.g., traditional agriculture, in which returns from schooling may be limited), in favor of a new activity (e.g., modern agriculture or non-crop production, in which the returns are high" (p. 288). Our results are fully compatible with this observation.

In addition to schooling, several variables representing human capital have a significant and positive association with household income. These variables are erosion perception, training, years with extension, and frequency of extension visits.

4. Summary and Conclusions

A model of conservation adoption, diversification and household income, including farm and off-farm sources was formalized, wherein households simultaneously allocate assets to different activities. The mapping of assets to household income through both off and on farm activities can conceptually be considered as a production process, with assets corresponding to factors of production and income as the output. Either adoption of conservation technologies and farm output diversification are influenced by participation in natural resource management programs. Therefore, these technological improvements should foster farm production and productivity and, consequently, should be reflected in a greater household income,. Finally, household income improvement is considered a necessary condition for sustainability of the changes introduced by the projects.

Overall, the results indicate that the variables more directly reflecting land allocation, such as area with staples and cash crops, output diversification and conservation practices are associated with the greatest gains in household income. Output diversification significantly decreases income from staple crops and greatly increases cash crop income. These results reaffirm the strategic role of diversification in fighting rural poverty. However, gains stemming from a more diversified income portfolio do not occur without cost, since an extra item added to the farm plan implies a reduction in the production of corn and beans (staples). This trade-off between diversification and subsistence food production suggests that switching to a more market-oriented production pattern may increase household food insecurity.

The marginal income value of conservation practices is $304.9, which amounts to a 13.9% increase over average total income. The practices included in this variable comprise ground-cover technologies such as crop-mulch/residue management, green manure and conservation tillage. Ground cover is increasingly recognized not only as a crucial soil conservation component but also in terms of its potential effects on land productivity. Therefore, technologies emphasizing ground cover are more likely to be profitable. As in the case of output diversification, conservation practices have a positive association with cash crops but negative with staples. Seemingly, the diffusion of conservation practices and cash crops mark a switching away from more traditional staple production.

Contrasting with the positive association between conservation practices and income we found evidence of poor economic performance of conservation structures such as terraces, stonewalls and drainage ditches. The income effect of an additional conservation structure is equivalent to an 8.4% drop in household income. This finding is consistent with a substantial body of literature that recognizes that structures are expensive to build and maintain, they add little to land productivity in the short run and reduce the available area for cultivation. Such drawbacks may clearly affect the profitability of these conservation technologies.

Human capital, measured by erosion awareness, average education level, training, years of participation with rural extension, and frequency of extension visits, have a significant and positive association with household income. Education plays a significant and positive role in all income-generating activities. An extra year of average household schooling is associated with a 4.9% gain in total household income. The returns from schooling are the highest in cash crop production and off-farm activities and the lowest in food staple production. These returns to education by economic activity suggest that farm households may reap rewards from schooling by abandoning traditional agriculture, where returns from schooling are limited, in favor of modern agriculture or non-crop production, in which the returns are higher.

Off-farm income is positively associated with farm size. Seemingly, the relatively disadvantaged appear to face barriers to employment in the most attractive non-agricultural occupations.

Table 1. Descriptive Statistics of Household Income, Output Diversification and Soil Conservation Technologies.

	ALL PROJECTS	**PAES1**	**PAES2**	**PAES3**	**CAJON**	**Test of Mean Differences**
Household Income						
Annual Farm Income (US $)	1646.0	1502.5	1781.0	1357.1	1878.6	0.395
Staples (US $)	807.3	814.2	1040.8	847.2	576.0	**0.000**
Cash Crops (US $)	838.7	688.3	740.1	509.9	1302.6	**0.028**
Off-Farm Income (US $)	592.3	525.6	639.0	559.9	631.9	0.763
Off-Farm Income: 1 if member receives off-farm	57.0	53.0	51.0	51.0	70.0	**0.000**
Crop Diversification						
Diversification (#)	1.17	0.92	0.96	1.12	3.28	**0.000**
Entropy	0.13	0.10	0.09	0.11	0.21	**0.008**
Adoption of Conservation Technologies						
Number of Structures (#)	2.10	2.34	2.15	2.83	1.29	**0.000**
Number of Practices (#)	1.78	1.50	1.69	1.68	2.17	**0.000**
Adoption of Conservation Practices (%)						
Live Barriers	70.0	62.0	69.0	70.0	76.0	**0.034**
Crop Residue Mulching	84.0	90.0	89.0	75.0	82.0	**0.001**
Green Manure	3.0	0.0	2.0	1.0	9.0	**0.000**
Minimum Tillage	15.0	0.0	0.0	0.0	50.0	**0.000**
Adoption of Conservation Structures (%)						
Live Fences	71.0	59.0	76.0	86.0	64.0	**0.000**
Forest Plantations	82.5	79.6	82.8	91.6	77.1	**0.002**
Stone Walls	8.0	2.0	2.0	1.0	24.0	**0.000**
Terraces	34.0	42.0	37.0	60.0	3.0	**0.000**
Ditches	27.0	48.0	10.0	27.0	23.0	**0.000**
Number of Observations	**719**	**167**	**175**	**167**	**210**	

Table 2. Descriptive Statistics of Farm, Farmer and Project Characteristics.

	ALL PROJECTS	PAES1	PAES2	PAES3	CAJON	Test of Mean Differences
Farm Characteristics						
Land: (Manzanas)	5.88	5.67	4.83	3.85	8.54	**0.003**
Tenure: 1 if owner (%)	74.0	79.0	75.0	80.0	65.0	**0.002**
Slope: 1 if average slope is greater than 15% (%)	61.0	54.0	59.0	50.0	77.0	**0.000**
Credit: 1 if farm uses credit (%)	18.0	5.0	11.0	15.0	38.0	**0.000**
Distance: Distance from house to parcel (Kms)	1.18	1.25	1.22	0.77	1.41	**0.004**
Farmer Characteristics						
Family Size: (#)	5.52	5.20	5.06	5.41	6.23	**0.000**
Education: Average household education (Years)	3.52	3.23	3.38	4.06	3.44	**0.005**
Gender: 1 if household head is a man (%)	86.0	87.0	78.0	83.0	96.0	**0.000**
Age: age of household head (Years)	47.80	48.78	48.83	48.34	45.74	**0.107**
Contact Farm: 1 if also an extension agent (%)	12.0	5.0	11.0	15.0	17.0	**0.006**
Erosion: 1 if perceives erosion as a problem (%)	88.0	84.0	86.0	87.0	93.0	**0.056**
Communal: 1 if member of a communal organization	64.0	47.0	54.0	56.0	94.0	**0.000**
Project Characteristics						
Years w/project	3.16	2.50	2.91	2.91	4.08	**0.000**
Extension: 1 if received extension visits (%)	88.0	80.0	82.0	88.0	98.0	**0.000**
Frequency of extension visits (#)	1.98	1.88	1.86	1.92	2.17	**0.018**
PAES1: 1 if belongs to PAES1 (%)		0.23				
PAES2: 1 if belongs to PAES2 (%)			0.24			
PAES3: 1 if belongs to PAES3 (%)				0.23		
CAJON: 1 if belongs to CAJON (%)					0.29	
Number of Observations	**719**	**167**	**175**	**167**	**210**	

1 *Manzana*=0.7 Hectare

Figure 1. Relationship among Resource Management Projects, Household Income and Sustainability

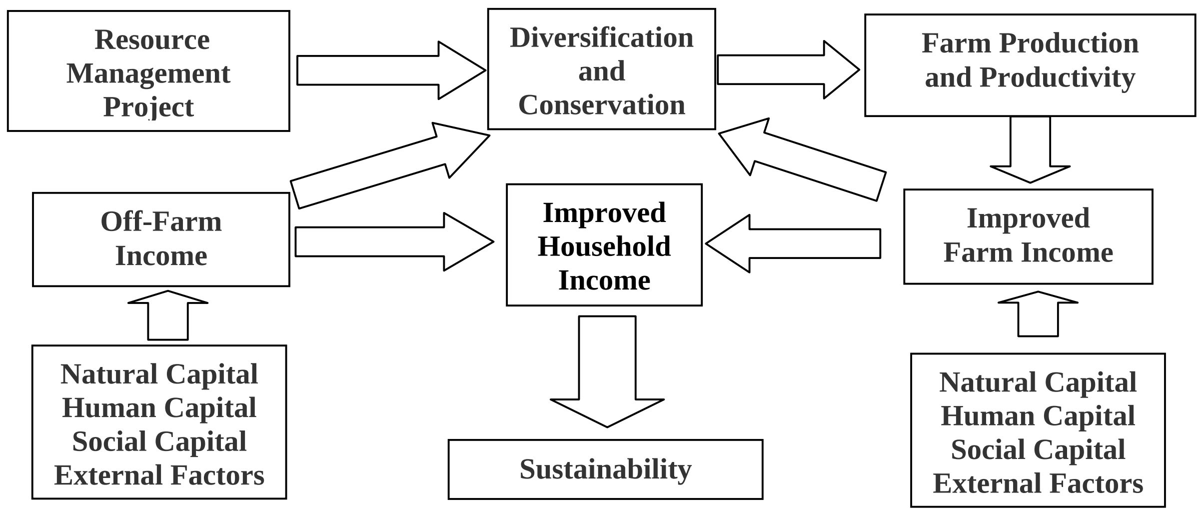

Table 3. Selectivity-Corrected System Estimates of Conservation, Diversification and Income-Generating Equations

	Practices		**Diversification**		**Staples**		**Cash Crops**		**Off-Farm**	
	Estimate	P-value	Estimate	P-value	Estimate	P-value	Estimate	P-value	Estimate	P-value
Practices					**-94.11**	**0.00**	**399.05**	**0.00**		
Structures					9.86	0.30	**-194.12**	**0.00**		
Diversification					**-135.36**	**0.00**	**442.77**	**0.00**		
Expenditures Staples					**0.69**	**0.00**				
Expenditures Cash Crops							**0.93**	**0.00**		
Labor Staples					**3.43**	**0.00**				
Labor Cash Crops							**1.08**	**0.00**		
Land w/Staples					**232.03**	**0.00**				
Land w/Cash Crops							**325.68**	**0.00**		
Farm size	**0.00**	**0.00**	**0.01**	**0.00**					**16.24**	**0.00**
Tenure	0.02	0.55	**0.24**	**0.00**	25.10	0.38	**-153.95**	**0.01**	-76.53	0.17
Education	-0.04	0.18	0.04	0.31	**52.95**	**0.00**	0.21	1.00	29.66	0.29
Education^2	0.00	0.55	-0.01	0.55	**-9.18**	**0.00**	**15.24**	**0.06**	3.05	0.64
Experience	**-0.04**	**0.00**	-0.01	0.47	8.86	0.15	23.71	0.11	-20.17	0.12
Experience^2	0.00	0.16	0.00	0.43	-0.09	0.27	**-1.06**	**0.00**	-0.14	0.42
Family size	0.01	0.43	0.02	0.16	-5.68	0.28	**-32.15**	**0.01**	2.54	0.79
Age	**0.03**	**0.00**	0.01	0.54	-5.81	0.38	**16.27**	**0.30**	**30.72**	**0.01**
Gender	**-0.74**	**0.00**	**0.79**	**0.00**	-58.95	0.49	**1628.88**	**0.00**	167.24	0.16
Hire Labor	**-0.08**	**0.03**	**0.14**	**0.07**					**109.17**	**0.03**
Market access	**-0.10**	**0.00**	-0.01	0.82					**-122.75**	**0.00**
Perception	**0.13**	**0.05**			**-84.32**	**0.03**	**202.23**	**0.03**	18.26	0.81
Credit	0.00	0.36	**0.00**	**0.00**	**0.02**	**0.00**	**0.06**	**0.00**		
Distance	-0.01	0.62	0.01	0.71					5.93	0.59
Slope	-0.04	0.29	0.03	0.62					**121.78**	**0.00**
Social	-0.02	0.64	0.00	0.96					-48.65	0.32
Contact Farm	**0.15**	**0.00**	0.08	0.47					**-89.42**	**0.07**
Training	**0.18**	**0.00**	0.05	0.56						
Years w/extension	**-0.23**	**0.01**	**0.19**	**0.02**						
Years w/extension^2	**0.09**	**0.00**	**-0.06**	**0.06**						
Visit frequency	**0.04**	**0.01**	-0.02	0.38						
PAES1	**-0.71**	**0.00**	**-1.12**	**0.00**	**-516.35**	**0.00**	**3060.77**	**0.00**	**144.64**	**0.04**
PAES2	-0.04	0.53	**-1.87**	**0.00**	-85.02	0.13	**2047.25**	**0.00**	**369.48**	**0.00**
PAES3	**-0.27**	**0.00**	**-1.23**	**0.00**	**-206.08**	**0.00**	**2157.55**	**0.00**	**153.76**	**0.03**
Mills	**-1.48**	**0.00**	**-1.56**	**0.00**	102.72	0.24	**-477.03**	**0.00**	**-978.90**	**0.00**
Constant	**2.68**	**0.00**	**1.74**	**0.00**	**487.24**	**0.00**	**-4483.15**	**0.00**	218.40	0.39
White Test for Heteroskedasticity		0.020		0.035		<.0001		0.263		0.000
Breusch-Pagan Test for Heteroskedasticity		0.020		0.035		<.0001		0.263		0.000

J-Statistics (OID): 209.6265 (p-value= 0.48623); Hausman's Test of Endogeneity: 226.6 (p-value= <.0001)

Number of Observations = 695; Coefficients with a level of significance greater than 90% are indicated in bold.

Table 4. Marginal Effects on Income-Generating Activities (US $)

	Staples	Cash Crops	Off-Farm	Total Income	% of Total Income
Gender	-96.8	1685.2	167.2	1755.7	80.0
Land with Cash Crops		325.7		325.7	14.8
Divers	-135.4	442.8		307.4	14.0
Practices	-94.1	399.0		304.9	13.9
Land with Staples	232.0			232.0	10.6
Perception	-96.1	252.2	18.3	174.4	7.9
Hire Labor	-11.3	29.4	109.2	127.3	5.8
Slope	-0.9	-0.9	121.8	120.0	5.5
Education	21.8	45.5	40.4	107.7	4.9
Training	-23.4	93.3		69.8	3.2
Age	-10.2	33.4	30.7	53.9	2.5
Years w/extension	-6.3	26.6	0.0	20.2	0.9
Farm size			16.2	16.2	0.7
Distance	-0.4	0.9	5.9	6.4	0.3
Visit frequency	-0.7	6.2	0.0	5.4	0.2
Labor Staples	3.4			3.4	0.2
Labor Cash Crops		1.1		1.1	0.0
Expenditures Cash Crops		0.9		0.9	0.0
Expenditures Staples	0.7			0.7	0.0
Credit	0.0	0.0	0.0	0.1	0.0
Contact Farm	-24.5	93.8	-89.4	-20.2	-0.9
Family size	-8.8	-21.3	2.5	-27.6	-1.3
Experience	8.6	-32.6	-25.7	-49.6	-2.3
Social	1.4	-6.3	-48.6	-53.6	-2.4
Tenure	-9.7	-37.8	-76.5	-124.1	-5.7
Market access	11.4	-46.2	-122.7	-157.6	-7.2
Structures	9.9	-194.1		-184.3	-8.4
PAES1	-298.8	2284.6	144.6	2130.5	97.1
PAES2	172.0	1202.4	369.5	1743.9	79.5
PAES3	-13.6	1502.9	153.8	1643.1	74.9
Predicted Household Income	807.1	811.7	576.0	2194.7	

5. References

Abt-Winrock, 2000. "Tipo de Incentivos que Aplican para Desembolsos de la Partida 02.02.05 y Aspectos Estratégicos de la Partida 02.02.04". Proyecto PAES-Abt-Winrock, Ministerio de Agricultura, El Salvador.

Anderson, J.R. and J. Thampapillai. "Soil Conservation In Developing Countries: Project and Policy Intervention". Washington, D.C.: World Bank, 1990.

Arellanes P. and D.R. Lee. "The Determinants of Adoption of Sustainable Agriculture Technologies: Evidence From The Hillsides Of Honduras". Proceedings of the 25th International Conference of Agricultural Economists, Durban, South Africa. August, 2003.

Barbier E.B. "Farm Level Economics of Soil Conservation: the Uplands of Java". *Land Economics* 66 2 (1990): 199-211.

Barbier, B and J. C. Flores. *Evaluación de las Actividades del Programa El CAJON*. CIAT, 2001.

Barbier, E. "Rural Poverty and Natural Resource Degradation." López, R. and A. Valdés (ed.) *Rural Poverty in Latin America*. Baltimore: The Johns Hopkins University Press, 2000.

Baum, C., M. Schaffer and S. Stillman. "Instrumental Variables and GMM: Estimation and Testing". in Boston College Working Papers No 545, Boston College, Department of Economics, 2003.

Besley, T. and R. Burgess. "Halving Global Poverty." *Journal of Economic Perspectives* 17 (2003): 3-22.

Blaikie, P. and H. Brookfield. *Land Degradation and Society*. Methuen, London, 1987.

Bravo-Ureta, B.E., H. Cocchi, D. Solís and T.E. Rivas. "Análisis del Impacto Económico de Tres Proyectos de Manejo de Recursos Naturales en América Central." Technical Cooperation 01-08-01-1-RS University of Connecticut – Inter-American Development Bank, August, 2003.

CARE(a). *Metodología y Estrategia de Extensión*, Subcomponente de Conservación de Suelo y Agroforestería, Proyecto PAES-CARE, Ministerio de Agricultura, El Salvador.

CARE(b) *Metodología de Manejo de Incentivos PAES/CARE*, Proyecto PAES-CARE, Ministerio de Agricultura, El Salvador.

Carson, R.T. and R. Cameron. "Public Preferences Towards Environmental Risks: The Case of Trihalomethanes". Department of Economics, University of California, San Diego. Discussion Paper No. 21, August 2000.

Conroy, M. E., D.L. Murray and P. Rosset. A Cautionary Tale: Failed U.S. Development Policy in Central America. Boulder, Colorado: Lynne Rienner Publishers, 1996.

de Graaff, J. "The Price Soil Erosion: An Economic Evaluation Of Soil Conservation And Watershed Development". Mansholt studies No. 3, Wageningen University, 1996.

de Janvry, A. and E. Sadoulet (a). "Concepts for an Approach to Rural Development in Mexico and Central America: Regional Development and Economics Inclusion". Paper prepared for the IDB regional workshop: *"Desarrollando la economia rural de Puebla a Panamá"*, Guatemala City, March 5-7, 2001.

de Janvry, A. and E. Sadoulet (b). "Income Strategies Among Rural Households in Mexico: The Role of Off-farm Activities". *World Development* 29 (3) (2001): 467-480.

de Janvry, A. and E. Sadoulet. "Geography of Poverty, Territorial Growth, and Rural Development". Paper presented at the 14th Annual Bank Conference on Development Economics (ABCDE). Washington, D.C., 29 - 30 April 2002.

de Janvry, A., M. Fafchamps and E. Sadoulet. "Peasant Household Behavior with Missing Markets: Some Paradox Explained". *Economic Journal* 101(1991):1400-1417.

Deaton, A. *The Analysis Of Household Surveys.* Baltimore: Johns Hopkins University Press, 1997.

Delgado, C. and A. Siamwalla. "Rural Economy and Farm Income Diversification in Developing Countries." Market and Structural Studies Division, IFPRI Discussion Paper No. 20, October 1997.

Douglas, M.G. "Making Conservation Farmer-Friendly". In N. Hundson and R.J. Ceatle (eds.), *Working With Farmers for Better Land Husbandry.* Ankeny, Iowa, Soil And Water Conservation Society 4-15 (1993).

Dutilly-Diane, C., E. Sadoulet and A. de Janvry. "Household Behaviour under Market Failures: How Natural Resource Management in Agriculture Promotes Livestock Production in the Sahel". *Journal of African Economies* 12 3 (2003): 343-370.

El Cajon. *Evaluación Técnica del Proyecto* (PNUD-HON/97/003/A/01/99). Program de Manejo de los Recursos Naturales Renovables de la Cuenca del Embalse El CAJON, Gobierno de Honduras, Diciembre, 1999.

El Cajon. *Informe de Avance Proyecto El CAJON (1996-2000)*. Program de Manejo de los Recursos Naturales Renovables de la Cuenca del Embalse El CAJON, Administración Forestal del Estado (AFE/COHDEFOR), Diciembre, 2001.

Ellis, F. "Household Strategies and Rural Livelihood Diversification". *Journal of Development Studies* 35 1 (1998): 1-38.

Erenstein, O.C. "The Economics of Soil Conservation in Developing Countries: The Case of Crop Residue Mulching". Mansholt Studies 14. Wageningen University, 1999.

FAO(a). *The State of the World's Forests*. Rome, 2003.

FAO(b). "Workshop on Tropical Secondary Forest Management in Africa: Reality and Perspectives". Nairobi, Kenya, Proceedings: Rome, Italy, 2003.

FAO. "Fact sheet: Women, Agriculture and Rural Development in El Salvador". www.fao.org/waicent/faoinfo/sustdev/WPdirect/WPre0037.htm 1999.

Ferreira, F.H.G. and P. Lanjouw. "Rural Nonfarm Activities and Poverty in the Brazilian Northeast" *World Development* 29 (3) (2001): 509-528.

Finan, F., E. Sadoulet, and A. de Janvry. "Measuring the Poverty Reduction Potential of Land in Mexico". *Journal of Development Economics* (2004).

Glewwe, P. "The Relevance of Standard Estimates of Rates of Return To Schooling for Education Policy: A Critical Assessment". *Journal of Development Economics* 51 2 (1996): 267-290.

Greene, W. *Econometric Analysis*. Prentice Hall. New Jersey, 1997.

Hansen, B.E. *Econometrics.* Madison, WI: ssc.wisc.edu/~bhansen/notes/notes.htm, 2003.

Hansen, L. P. "Large Sample Properties of Generalized Method of Moments Estimators." *Econometrica* 50 (1982): 1029-1054.

Heckman, J. "Sample Selection Bias as a Specification Error". *Econometrica* 47 (1976) 153-161.

Holden, S., B. Shiferaw and J. Pender. "Market Imperfections and Land Productivity in the Ethiopian Highlands". EFTD Discussion Paper No. 76, IFPRI, Washington D.C., 2001.

Hopkins, J., D. Southgate, and C. González-Vega. "Rural Poverty and Land Degradation in El Salvador." Selected paper for Presentation at the American Agricultural Economics Association. Annual Meeting, August 8-11, 1999. Nashville, Tennessee.

IDB. *El Salvador Environmental Protection Program*. Loan Proposal (ES-0024), 1995.

IDB. *Program for Management of the Renewable Natural Resources in the Watershed of the El CAJON Reservoir*. Loan Proposal (HO-0035), November, 1993.

Immink, M. D.C. and J. A. Alarcon. **"**Household Income, Food Availability, and Commercial Crop Production by Smallholder Farmers in the Western Highlands of Guatemala**"**. *Economic Development and Cultural Change* 41 2 (1993): 319-42.

Judge, G. G., R. Carter Hill, W. E. Griffiths, H. Lütkepohl, and T-C. Lee. *Introduction to the Theory and Practice of Econometrics*, Hardcover, 1988.

Kieffer, N.M., and Vogelsang T.J. "A New Asymptiotic Theory for Heteroskedasticy-Autocorrelation Robust Test". Department of Economics and Statistical Science, Cornell University, 2002.

Krueger, A. B. and M. Lindahl. "Education for Growth: Why and for Whom?" *Journal of Economic Perspectives* 39 (2001): 1101-1136.

Kruseman, G. "Bio-economic Household Modelling for Agricultural Intensification" Ph.D Dissertation, Wageningen University, 2000.

Lanjouw J. O. and P. Lanjouw. "The Rural Non-Farm Sector: Issues and Evidence From Developing Countries". *Agricultural Economics* 26 (2001): 1-23.

Lanjouw, P. "Rural Nonfarm Employment and Poverty in Latin America: Evidence from Ecuador and El Salvador" In *Rural Poverty in Latin America,* R. López and A. Valdés, (eds.). St. Martin Press, LLC, New York, 2000.

Lau, L., D. Jamison and F. Louat. "Education and Productivity in Developing Countries: An Aggregate Production Function Approach". World Bank, Washington, D.C., 1990.

López, R. "Agricultural Intensification, Common Property Resources and the Farm-Household". *Environmental And Resource Economics,* 11(3-4) (1998): 443-458.

López, R. "Structural Models of the Farm Household that Allow for Interdependent Utility and Profit-Maximization Decisions". In *Agricultural Household Models: Extensions, Applications and Policy*. Singh, I., L. Squire and J. Strauss (eds.). Baltimore: Johns Hopkins University Press, 1986.

López, R. and A. Valdés. *Rural Poverty in Latin America*. Baltimore: The Johns Hopkins University Press, 2000.

López, R. and C. Romano. "Rural Poverty in Honduras: Asset Distribution and Liquidity Constraints" en *Rural Poverty in Latin America,* R. López and A. Valdés, eds., St. Martin Press, LLC, New York, 2000.

López, R., and T. Thomas. "Rural Poverty in Paraguay: The Determinants of Farm Household Income." In López, R. and A. Valdés (ed.) *Rural Poverty in Latin America*. Baltimore: The Johns Hopkins University Press, 2000.

López-Pereira, M., J. Sanders, T. Baker y P. Preckel. "Economics of Erosion-Control and Seed-Fertilizer Technologies for Hillside Farming in Honduras." *Agricultural Economics* 11(1994): 271-288.

Lutz, E., S. Pagiola, y C. Reiche. "The Costs and Benefits of Soil Conservation: The Farmer's Viewpoint." *The World Bank Research Observer* 9(1994): 273-295.

Mbaga-Semgalawe, Z. and H. Fomer. Household Adoption Behaviour of Improved Soil Conservation: The Case of the North Pare and West Usambara Mountains Of Tanzania". *Land Use Policy* 17(2000): 321-336.

McIntire, J. 'A Review of the Soil Conservation Sector in Mexico". In Lutz, E., S. Pagiola and C. Reiche, eds., *Economic and Institutional Analyses of Soil Conservation Projects in Central America and the Caribbean*. *World Bank Environment Paper N. 8*. Washington, D.C., 1994.

Minten, B. and M. Zeller. *Beyond Market Liberalization. Welfare, Income Generation And Environmental Sustainability In Rural Madagascar.* Ashgate, Aldershot, 2000.

Moreno, G. and D. L. Sunding. "Simultaneous Estimation of Technology Adoption and Land Allocation". Paper presented at the American Agricultural Economics Association Annual Meeting, Montreal, Canada, July 27-30, 2003.

Murray, G. Technoeconomic, Organizational, and Ideational Factors as Determinants of Soil Conservation In The Dominican Republic". In *Economic and Institutional Analyses of Soil Conservation Projects in Central America and the Caribbean*, E. Lutz, S. Pagiola, and C. Reiche, eds. World Bank Environment Paper Number 8. Washington, D.C.: World Bank, 1994.

Neill, S**.** P**.** and D**.** R**.** Lee**.** "Explaining the Adoption and Disadoption of Sustainable Agriculture: The Case of Cover Crops in Northern Honduras." *Economic Development and Cultural Change* 49 (2001): 793-820.

Nerlove, M., S. Vosti and W. Basel. "Role of Farm-Level Diversification in the Adoption of Modern Technology in Brazil." International Food Policy Research Institute, Research Report No. 104, 1996.

ODI. "Options for Rural Poverty Reduction in Central America". Overseas Development Institute Briefing Paper. odi.org.uk/publications/briefing/bp_jan03.pdf. January 2003

Oldeman, L. R., V. W. P. van Engelen and J. H. M. Pulles. "The Extent of Human-Induced Soil Degradation." Anexo 5 en *World Map of the Status of Human-Induced Soil Erosion: An Explanatory Note*, 2da edición, L. R. Oldeman, R. T. A. Hakkeling and W. G. Sombroek, eds. Wageningen, Holanda: International Soil Reference and Information Centre, 1990.

PAES/ IICA. *Informe Técnico Final*. 2003

PAES/ABT–Winrock. "Informe Annual de Labores, 2001.

PAES/CARE. *Informe Financiero Final*. 2003.

PAESa. *Informe Anual 2000-2001*. IICA-CATIE-CRS-UCA, PAES, Ministerio de Agricultura y Ganadería, San Martín, El Salvador, Noviembre, 2001.

PAESb. *Informe Anual de Labores, 2000-2001*. Abt-Winrock, PAES, Ministerio de Agricultura y Ganadería, El Salvador, Noviembre, 2001.

PAESc. *Informe Anual 2000-2001*. CARE, PAES, Ministerio de Agricultura y Ganadería, El Salvador, Noviembre, 2001.

PNUD. "Evaluación Técnica del Proyecto. Programa Manejo de los Recursos Naturales Renovables de la Cuenca del Embalse de Cajón." PNUD-HON/97/A/01/99. Government of Honduras/PNUD, December 1999.

Quiroz, J. A. and A. Valdés. "Agricultural Diversification and Policy Reform". *Food Policy* 20 3(1995):245-255.

Ruben, R. and H. Clemens. 'Rural Off-Farm Employment and Food Security in Honduras", In *Agrarian Policies in Central America*, W. T. Pelupessy and R. Ruben, eds., MacMillan, Houndsmills, 2000.

Shaxson, T.F., N.W. Hudson, D.W. Sanders, E. Roose, and W.C. Moldenhauer. *Land Husbandry: A Framework for Soil and Water Conservation*. Ankeny, Iowa, Soil And Water Conservation Society, 1989.

Skoufias, E. "Using Shadow Wages to Estimate Labor Supply of Agricultural Households," *American Journal of Agricultural Economics* 76 (1994): 215-227.

Soloaga, I. "The Treatment of Non-Essential Inputs in a Cobb-Douglas Technology: An Application to Mexican Rural Household-Level Data". Working Paper No. 2499, World Bank, Washington D.C., 2000.

Taylor, J.E. and I. Adelman. "Agricultural Household Models: Genesis, Evolution and Extensions." *Review of Economics of the Household* 1 (2003):35-38.

Taylor, J.E., and A. Yúñez-Naude. "The Returns from Schooling in a Diversified Rural Economy" *American Journal of Agricultural Economics* 82(2000): 287-297.

Thampapillai, D.J. and Anderson, J.R. "A Review of the Socio-Economic Analysis of Soil Degradation Problems for Developed and Developing Countries". *Review of Marketing and Agricultural Economics* 62 2 (1994): 291-315.

UNDP-European Commission (EC)-World Bank. "Linking Poverty Reduction and Environmental Management. Policy Challenges and Opportunities.", 2002.

Van Dusen, M. E. and J. E. Taylor. "Missing Markets and Crop Diversity: Evidence from Mexico." Center on Rural Economies of the Americas and Pacific Rim Working Papers, University of California Davis. Available at iga.ucdavis.edu/working.html. February 2003.

von Braun, J. "Agricultural Commercialization: Impacts On Income And Nutrition And Implications For Policy". *Food Policy* 20 3 (1995): 187-202.

White, B. "Economic Diversification and Agrarian Change in Rural Java". Alexander, P.; Boomgaard, P; White, B., [Eds.] (1991): In the Shadow of Agriculture: Non-Farm Activities in the Javanese Economy, Past and Present Royal Tropical Institute, Amsterdam, 1991.

Wiggins, S.L. "The Economics of Soil Conservation in the Acelhuate River Basin, EL Salvador". In Morgan**,** R.P.C. (ed.), *Soil Conservation: Problems and Prospects*. John Wiley & Sons, 1981.

Wilkins, N. A. Yurekli, and T. Hu. "Economic Analysis of Tobacco Demand". World Bank, Washington, D.C., 2001.

Winters, P., B. Davis and L. Corral. "Assets, Activities and Income Generation in Rural Mexico: Factoring in Social And Public Capital. *Agricultural Economics* 27 (2002): 139-156.

Winters, P., P. Espinosa, P. and C.C. Crissman, C.C. "Resource Management in the Ecuadorian Andes: An Evaluation of CARE's PROMUSTA Program. International Potato Center (CIP), 1998.