



PEASANTS, PEDAGOGY, PRODUCTIVITY -- PARAGUAY

Working Paper 44 - July 1985

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This paper is part of a cross-country study of rural productivity and education and has also been part of a collaboration with the ECIEL study on the same topic.



## **ABSTRACT**

An outstanding characteristic of development efforts in Latin America since the 1950s has been the extension of educational activities to new sectors of the population, in particular to the rural zones. It is unclear what effect these efforts have had, for even from a neo-classical perspective, the empirical evidence on the effect of educational attainment is at best ambiguous.

Paraguay participated in this expansion of education. This paper examines the evidence of its effect in the rural areas, relying primarily upon an extensive small farm survey from the eastern region of Paraguay.

The problem of education and rural development is initially placed in the context of three competing views: the neo-classical which sees its effect through increased farm productivity; the Chayanovian which would see education as peripheral to peasant agriculture; and the social differentiation perspective which would see its contribution in terms of increasing social differentiation in the country.

The empirical results find support for the significance of education in rural Paraguay. It does have a small but significant effect on farm productivity, and more importantly it does contribute to social differentiation in the country.

These conclusions are made more salient by the present fiscal pressures on Latin American countries which imply a real reduction in education expenditures for most of them.

## **RESUMEN**

Una de las características más importantes del desarrollo económico Latinoamericano desde la década de los cincuenta, ha sido la progresiva incorporación al proceso educacional de nuevos segmentos poblacionales y en particular de las zonas rurales. Sin embargo, los efectos de estos esfuerzos no son claros. La evidencia empírica que se desprende de los estudios realizados desde una perspectiva neoclásica, demuestra que los beneficios obtenidos del aumento de la educación son ambiguos.

Paraguay ha participado del proceso de desarrollo educacional. Este estudio examina los efectos de este proceso en las áreas rurales, y se basa principalmente en encuestas realizadas a pequeños predios de la región del este del Paraguay. La relación entre el problema educacional y el desarrollo rural se sitúa en el contexto de tres visiones alternativas: la neoclásica, que entiende sus efectos a través de aumentos en la productividad agrícola; la Chayanovian, que ve a la educación como un elemento periférico al campesinado rural y la perspectiva de diferenciación social, que entiende que la educación contribuye a aumentar la diferenciación social en el país.

Los resultados empíricos avalan la importancia de la educación en las zonas rurales del Paraguay. Esta tiene un pequeño pero estadísticamente significativo efecto en la productividad agrícola y más importante aun, contribuye a aumentar la diferenciación social de las zonas rurales, especialmente entre aquellos con más de seis años de educación.

Estas conclusiones son de especial relevancia cuando se constatan las presiones que actualmente se ejercen sobre el presupuesto fiscal en los países Latinoamericanos, lo que implica una reducción del gasto real en educación en la mayoría de estos países.



Rural development is the central problem for Latin America during the 1980s and beyond. This may have been masked during the 1970s, for the tremendous increase in oil revenues in the oil exporting countries generated a debt-led growth which was concentrated in finance and manufacturing, and which was facilitated by the ability to finance imports of foodstuffs. This period is over, and indeed Latin America may become a net exporter of capital during the 1980s unless new mechanisms are found for stabilizing the financial structure of the core countries and generating new capital flows.

In such a context, the development of domestic resources and the substitution for imports is a margin which must be probed and where policy space can be gained. This requires a renewed focus on the rural sector, its internal viability, and its relations with the rest of the economy. Understanding of the functioning of rural producers, peasants, and the factors which affect their behavior and their relations with the wider economy becomes central. This of course is not a completely unplowed field, but it bears reworking for the additional output it can provide.

Part of the difficulty in such an undertaking is the selection of an entry point into such a complex and perplexing reality. Education serves this function here for several reasons. First, different approaches to peasants and to rural development will differ fundamentally on their view of education, and thus the focus will sharpen the differences among these views. Second, education and its expansion into rural areas was a major policy and commitment of most governments since the 1960s. This is only now coming into question as fiscal pressures cause overt or unspoken cutbacks in government activity. So, on the one hand it is important to assess the impact of the educational attainments, but also such an effort will provide indications of the implications of fewer resources dedicated to education. Finally, the

evidence which exists to-date on the role of education in rural areas is ambiguous at best, providing a fruitful area for additional work and insight from a technical perspective.

### PEASANTS

The main potential for agricultural development in most countries is with the medium to small scale farmer, producing partly for the market and partly for family consumption. As is well-known now, even very simple farm families are heavily involved with the wider economy, exchanging portions of their output for inputs and consumer goods, and offering family labor for additional income--often a substantial portion of the family income in actuality.

Over time a number of perspectives has been developed in dealing with such farm units. Most North American writers take their lead from Theodore Schultz and Sol Tax in treating the peasant as a small businessman, as running a profit maximizing firm which uses a given technology and combines properly priced inputs to produce a product, and all in order to maximize some concept of profits. There are of course many variations on this simple model. The firm is generally multiproduct and so the production decision becomes more complex. In addition the household can be treated as a whole, with the problem the allocation of total household time among alternative uses. Finally, there has been a good deal of work done on the risk aversion of peasant households. But the basic model of the peasant remains that of the profit maximizing firm.

An alternative approach traces its roots back to Chayanov and the Russian analysis of peasant behavior. Although Chayanov's primary interest was a description of peasant production behavior, a model of peasant behavior was developed and it led later writers to conceptualize the peasantry as a separate "mode of production," a form of economic organization which was

governed by its own rules and which exhibited its own particular behavioral regularities. Thus peasants might have a certain target level of income, and once that was reached, they would consume leisure. Thus efforts to increase income might result only in an increase in the amount of leisure.

A third view sees the peasants as rational operators but within a clear social matrix which in many ways dominates their behavior and their results. One version of this argument originates with Georgescu-Roegen who sees the rural utility functions as quite interdependent; thus one's own maximization must take into account its effect on others in the community. Another view from a very different tradition is suggested by de Janvry and Deere. Their view is that the dominant factor in peasant behavior is the mechanism of surplus extraction which the peasant faces. They divide peasant activity into a series of components and isolate the areas in which there is surplus extraction. It is in facing this reality that the peasant must make his or her choices and must use the resources at hand as effectively as possible for satisfying the necessities. In this regard, the peasant is not seen as a separate mode of production, but rather as an unstable class factor which is in tension with capitalist forms of production. Indeed the dominant concern for de Janvry and Deere is the increasing differentiation in the peasant sector, with certain components becoming capitalist farmers and others remaining dominated by various forms of surplus extraction.

All of these views carry with them definite implications for economic policy toward rural development. Two of them have been developed most extensively and carefully for the case of Latin America, the neoclassical or Schultz approach, and the de Janvry-Deere approach. In what follows, primary concentration will be upon them. The first step is to suggest the manner in which education can be included in the two approaches.

PEDAGOGY

The clearest specification of education's role is in the neoclassical model. One of the inputs is the set of farmer abilities: to the extent that education enhances them, then the productivity of the farmer will increase as will the net results of the efforts of the farm household. A number of concerns have arisen in treating education in this manner, most having to do with the operationalization of the constructs, i.e. should the education of the whole family be the concern; are there discontinuities in the impact of education; can the worker-effect of a more productive farmer be separated from the allocative effect of greater organizational ability gained in the educational process. All of these concerns are certainly important, and to them could be added a variety of others.

But the essence of the approach remains unchanged: education can be considered in some fashion a contribution to the production behavior of the peasant firm or farm, it can be taken as a factor in the production function. The expectation is that for a higher level of education, the farm and/or farmer will have a higher productivity.

The role of education in the de Janvry framework is more difficult to ascertain. In his recent book on the agrarian structure of Latin America, de Janvry makes scant mention of education. It does not seem to be one of the activities of the peasant household, nor is it a mechanism whereby the conditions of surplus extraction are altered or modified. Indeed the most that de Janvry can say for education is as follows:

...rapid demographic growth is accompanied by precarious levels of living. This is particularly visible in the levels of health and education of the rural poor...even where free education is available, the cost of education



is high to the peasant household in terms of forgone revenue. (p. 91)

Without denying de Janvry's claims, it would seem that the emphasis given to education in postwar reformist strategies in Latin America suggests that there is a greater significance to education than he grants.

The construct of differentiation may provide the means necessary for integrating education into the de Janvry framework. For the most part, he relies on the size of farm as the indicator and indeed the determinant of the "social stratum" of a particular rural household. Peasants are divided into the landless, smallholders, middle peasants, rich peasants, and farmers, depending upon the size of landholding. At each stratum the mechanism of surplus extraction differs, as does the decision of the household on the allocation of its resources and the selection of its activities. But of course the selection of social strata within capitalism must be much more complex than such a simple differentiation would suggest. One factor in the differentiation, and indeed an important one, may well be education. Thus it will be important for the understanding of education and of the peasant household to investigate this hypothesis. If it is supported by the data, there will be definite implications for the role of education in the rural sector and for economic policy which is aimed toward rural development.

The other main theory of peasant behavior, that of Chayanov, again has no direct linkages with education. In one sense, education might be seen as one of the uses of leisure, so that a growth in the years of education might be taken as an indication of the space provided by attaining higher income. At another level, education might be a means of changing the peasant behavior mode toward more of the modern maximizing mold and thus correlation in this regard might be found. But perhaps the best manner of including education in

this framework is to suggest that education is unlikely to have any impact whatsoever. This hypothesis can be taken as the alternative to the other two suggestions for the role of education, and in the empirical investigation which follows, it will be used in this vein.

### PRODUCTIVITY

There have been a large number of studies of education and its effect on productivity. Lockheed, et. al. surveyed studies based on 37 data sets from Asia, Africa, and Latin America as well as Europe. All used a neo-classical framework which treated education as a contributor to production or productivity.

The results obtained are a good indicator of the general level of success in treating education in this manner. The authors state: "We have hypothesized that education will have a positive effect on farmer efficiency; overall, we find confirmation for this hypothesis... In six of these data sets education was found to have a negative (but statistically insignificant) effect, but, in the remaining 31, the effect was positive and usually significant." A somewhat different interpretation can be given to the results, however. Taking all of the estimates from all of the studies, 25 coefficients are positive and significant at the .05 level, while 20 are either negative or not significantly different from zero. Thus the stability of the relation appears much less than Lockheed would seem to indicate.

In the case of the Latin American countries included, the performance is even less impressive. The coefficients estimated in studies of Brazil and Colombia yielded 4 estimates which were correct, but 9 which were either negative or not significant. There is no basis to claim that education in Latin America has a different role from elsewhere, but the results suggest

that its importance remains to be verified. Let us turn to examine results for Paraguay.

#### PARAGUAY: A NEOCLASSICAL VIEW OF EDUCATION

This section will present a detailed investigation of the relation between education and productivity in Paraguay. The goals are two. First, the production function approach will be used to assess the influence of education on production. As suspected, the relationship is not very strong. Then a broader conceptualization of the process will be suggested in two ways. Initially we will have to ask what are the determinants of education, for they may indeed be mixed in with the broader questions of the role of education in productivity. Next the linkage between education and other components of performance such as the amount of fertilizer or the use of new seeds will be explored. The conclusion of the exercise is that the simple neoclassical approach to education and productivity is not likely to explain the Paraguayan situation with much success. But education does have an important role in the operation of the agricultural sector if a broader perspective is taken on its influence on agricultural processes.

The raw material for this study is an extensive small farm survey of Eastern Paraguay. One thousand fifty-three farms were surveyed and the resultant data set is described in Appendix 1.

A useful starting point is a summary of the relevant variables. Appendix 2 presents the means of the main variables of interest.

The data are relatively self-explanatory. The average years of education is modest as expected (2.6), though the literacy rate is quite high for a rural area (76.5%). The access to technical assistance is quite low (5.2%) as is the general level of farm practice (14% with improved seed).

Access to markets seems relatively good if distance is a valid proxy (11.1 km). The amount of outmigration is not high by Latin American standards (.89 persons per family), and as expected the out-migrants have higher educational attainment than those who remain (4.75 years vs. 2.6). This baseline leads us to the investigation of education and productivity. Let us turn to that question.

In dealing with this question in the case of Paraguay, three concerns are central. First, we will follow earlier studies using a Cobb-Douglas production function which includes an education variable. Second we move beyond this form to a functional form that provides more flexibility, using the translog production function which allows for interaction between education and the various other inputs into production. Finally, and most importantly, the studies have not really dealt with the determinants of education in any meaningful fashion. They have been one equation studies with output as the dependent variable. But obviously a key question in this whole area is why or how a farmer obtains education, or what determines the literacy rate, or what determines access to technical assistance.

We estimate a four equation system, using ordinary least squares since the system is decomposable. The equations are:

1. Education = F(age; sex; distance)
2. Literacy = G(age; sex; distance; education)
3. Technical Assistance = H(education; distance; farm size)
4. Output = K(labor; capital; fertilizer; seed; pesticide; animal;  
education)

The estimates are presented in Appendix 3. We will briefly highlight the main findings.

### 1. The Education Equation

The dependent variable was the number of years of education attained by the farmer. Given the historical development of Latin America, with the tremendous increase in education from the 1960s on, we correctly expected the age of the farmer to affect the number of years of education, older farmers receiving fewer years of schooling. Given the cultural biases of Latin America--and the rest of the world--women were also correctly expected to receive less schooling. And finally, facilities are generally built in places with greater access, and only over time extended to places which are more isolated, but the distance variable was not significant.

But the expectations are in general satisfied, showing the value of asking the determinants of education as a question prior to that of the impact of education on production.

### 2. The Literacy Equation

The logit equation for literacy indicates that the only significant variable is the years of education and it has a positive coefficient as expected.

### 3. The Technical Assistance Equation

Most previous studies have simply taken access to technical assistance as a given, and then have examined its impact on production or productivity. But of course this is not a very helpful rendition of the whole question of the role of technical assistance, for a fundamental question is how the farmer can gain access. The equation uses three variables as determinants of technical assistance: distance from roads, education of the farmer, and the size of the farm.

Both size of the farm and education have positive and significant coefficients. Distance is not a significant factor.

#### 4. The Production Equations

The main concern in the literature has been the production function. We estimated regressions which include both input variables of the ordinary economic sort and education variables, in an attempt to explain production on small farms in Paraguay. Two functional forms were estimated, the usual Cobb-Douglas and the translog which is an approximation function that allows for a series of interactions among input variables.

The results of the estimation are presented in Appendix 4. It can be seen there that there are seven input variables: land, labor, machinery, animals, fertilizer, pesticide, and seed. Land and labor are positive and significant; fertilizer is negative and significant indicating overuse. We also include years of education as a contributor to output. Its sign is correct but it is significant only at the .08 level, indicating a weak relation. A number of other equations were run, omitting some of the input variables or using years of education (not its natural log). The results remain the same. In addition the overall explanatory power of the equation is modest, though an F-test indicates it is significant.

From the estimates of the translog production function, we present only the interaction terms which were significant. The interaction of education and machinery was positive and significant. Beyond that there are a number of interactions, with machinery having the most important interactions with other input variables.

The conclusion again is that education, as measured, plays a role in production, but not a central role. In this sense our results confirm those obtained in earlier studies. This suggests two courses of further research. One would be to continue refinements of this approach which could highlight to a greater degree the role of education. This remains for a later paper.

The second, which comprises the remainder of this paper, is to treat education in a somewhat different fashion, as a factor in social differentiation within the peasantry. To this question we now turn.

#### PARAGUAY: EDUCATION AS A FACTOR IN SOCIAL DIFFERENTIATION

As noted above, if the rural dynamic is viewed not as one of increasing productivity, but rather as dominated by class relations and the struggles among classes, then the role of education is seen in a very different light. The dynamic of the rural area is the social differentiation among rural social strata, ranging from the landless to the smallhold-peasant and finally to the capitalist farmer. The absence of economic progress in rural sectors is a result of the extraction of surplus from peasants at a variety of points in the economic process. De Janvry and Deere distinguish six points of surplus extraction: the home production process, the circulation process, both on supply and demand sides, the wage labor production process, the reproduction process, and finally the differentiation process. Supply and demand are secondary as they are in the monetary circulation process.

Our claim is that education may play an important role in the differentiation process, and it is here that the changes in the rural sector originate and that certain peasants may "progress" and become modern farmers. Some orthodox Marxist writers such as Warren exude a euphoria over the advance of capitalism and the modernizing revolution that it represents. De Janvry and Deere do not show such enthusiasm, but the progressive impulses which emanate from the rural sector as presently organized certainly come from the differentiation process. To the extent that education can affect differentiation, it can play a role in rural change. Let us turn to that question.

The approach which de Janvry and Deere use in supporting their view on social differentiation is to divide their sample into sub-categories, social strata, and then to examine indicators of organization and functioning across groups. Their framework suggests certain patterns across strata, and to the extent that the patterns appear, there is support for their view.

Our approach will be the same. First we will use the social stratification according to the farm size=social fraction. But then we will regroup the data according to the years of education of the head of household, and will examine the patterns that appear. To the extent that there is social differentiation among these new strata, we can conclude that education in the rural area plays a role in the differentiation process.

Let us examine the results in Appendix 5, initially for the strata based on farm size. The first thing to note is that the average years of education do not relate directly to land size. Thus the two variables are not measuring the same thing. Beyond that there is a relatively strong relation between the strata and the variables, in most cases a positive relation. Thus literacy increases, the percent of households which are male headed rises, the number of persons on the farm increases. Variables which might reflect "modernization" also relate to the strata. The percentage with technical assistance rises, as does the percent of the farm which is owned; the percent with consumer credit rises, as does the number of days of labor and the cost of hired labor. These all are trends which indicate a social and economic differentiation. In similar fashion, the quantity of the primary crop increases, the value of animals owned rises, and farm income rises as we move from the landless to the farmers. Only off-farm income and the number of migrants do not exhibit a unilinear relation with the social strata.



The overall results correspond in general to those obtained by de Janvry and Deere in Peru, and their conclusion is that it is necessary to distinguish among the social strata in rural areas to have a clear understanding of the dynamics of rural economic processes. Our results have the same implications.

We then use the years of education to separate the sample into strata, and examine the same variables. Again as might be expected there are differences across strata, but the pattern is more complex. Indeed it appears that the unilinear relation holds through the first three groups, but that the group with more than six years of formal education operates in a very different fashion. A number of variables do not exhibit a strong relation, for example the number of persons on the farm, the percentage of land owned, distance to market. But in others there is a strong relation across the first three groups. For example, the use of technical assistance rises, and the number of migrants falls dramatically. All of the input or output variables follow the pattern: more output of the primary crop, more labor used in the primary crop, greater expenditure on labor, higher agricultural income, higher off farm income, and a greater value of owned animals. So in some sense the farmers with between four and six years of education are the most progressive and successful farmers. This is even clearer when their performance is contrasted with those with more than six years of education. They have the highest outmigration rate, and the greatest percentage of land ownership. They are significantly further from markets. They also have the highest agricultural income and the greatest value of owned animals. But on the other side, they have a low use of technical assistance and a low use of credit. The quantity of the primary crop is less than all but the lowest group, as is the cost of hired labor. And their off-farm income is by far the greatest of

all of the groups. So we find in them a stratum that operates quite differently, or differentially, from the other strata. Their income and activity is apparently more oriented to non-agricultural pursuits.

So there does appear to be some support for the view of education as a factor in social differentiation in the rural sector. Up through six years, education results in an increase in the success of farm operation. Beyond that, it seems to separate out a group whose behavior is quite different from the usual peasant. Such behavior may or may not be quite progressive in the modernization of the rural sector, but in any case it does not fit the peasant mode.

#### CONCLUSIONS

Let us assume for the moment that the current economic difficulties in Latin America, and the concomitant efforts to lower government expenditures, will lead to a reduction in the resources for rural education. Thus fewer persons will receive fewer years of education. Based upon our results, what would be the impact of such a change over time?

The neo-classical production function does suggest that there would be a reduction in the potential production in the rural areas, for additional education does contribute to output, though the statistical significance of the relation is not high.

Interestingly, the approach which is based upon a class analysis has a similar implication. Up through six years of education, there does appear to be a "modernization" impact of education. Perhaps more importantly, continuation beyond six years provides the basis for a much greater degree of social differentiation within the rural sector. While we should be clear that this process will never lead to a successful rural development, in it reside the major progressive changes under contemporary circumstances. Only a change in

class relations and the class base of the rural sector would finally bring about development in the de Janvry-Deere perspective. But in the short run and the absence of such major structural changes, it seems likely that reductions in education expenditures will simply deepen the general stagnation of the rural sector in Latin America, hardly an optimistic scenario for the 1980s.

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## APPENDIX 1

The data are derived from a stratified (by farm size) random sample of farms in the Eastern portion of Paraguay. There are 1053 farms (observations) in the sample and the questionnaire results in 995 data points for each respondent. The main concern of the survey was farm production, both crop and animal, and subsidiary concerns were migration experience and credit. The education information is included as background demographic data or as part of the specification of the farming procedures. As a result, the majority of the information lies on the production side rather than on the education aspect. The survey was carried out during August and September of 1976 and was designed to cover the agricultural year July, 1975-June, 1976.

The survey was done by the Technical Cabinet of the Ministry of Agriculture and Livestock, the Agency for International Development, the University's Agronomy department, and the Paraguayan Center for Sociological Studies. The initial processing after field checking was done in Paraguay, and at least one study was based on additional computer runs in Washington. To the best of our knowledge, there was one major study done using the data in a descriptive mode (Invernizzi, 1979). The data have also been used as a secondary source in other studies (see Oberbeck, 1979). There may be other studies completed or in process that we are unaware of, but experience in other countries indicates that this low level of use for the data would not be uncommon.

## APPENDIX 2

Description of "Education" and Production Variables

Average Years of Schooling	2.6
% with no Schooling	22.5
% with more than six years of Schooling	2.2
% Literate	76.5
% Receiving Technical Assistance	5.2
% Using Contour Plowing	1.1
% Disinfecting Land	6.5
% with Irrigation	22.3
% Using Improved Seed-Main Crop	14.1
% Using Improved Seed-Second Crop	10.7
% with Soil Analysis	.003
Average Distance to Roads	2.0km
Average Distance to Sale Market	11.1km
Average Number of Out-migrants per Family	.89
Average Years of Schooling of Migrant	4.75
% with Credit	29.1
Average number of parcels of land	1.45
Average hectares per farm	11.65
Average number of persons per farm	5.5
% of land owned	36
Average value of main crop	26887.
Farm income	4500.
Off-farm income	30228.

## APPENDIX 3

Regression Results for Education and Logits for Literacy, Technical Assistance

1. Education = a + b Age + c Sex + d Distance + e

	4.0	-.04	.76	-.53
t:	(13.2)	(-9.3)	(4.1)	(.52)

$R^2 = .11$       Level of Significance = .0001

2. Literacy = a + b Age + c Sex + d Distance + f Education + e

	-3.4	-.005	.001	-.019	4.21
Chi square:	(8.5)	(.09)	(0.0)	(.89)	(128.1)

Model Chi Square 1021.0      Level of Significance = .0001

3. Technical Assistance = a + b Distance + c Education + d Farm Size + e

	-3.5	-.003	.13	.0002
Chi square:	(160.2)	(.14)	(5.21)	(3.66)

Model Chi Square 8.56      Level of Significance = .03

## APPENDIX 4

Production Equations

## Cobb Douglas

Variable	Coefficient	t-value	
<u>With Years of Education</u>			
Intercept	5.23	15.6	R <sup>2</sup> = .15
Land	.34	8.6	
Labor	.20	4.2	
Machinery	-.01	-1.2	
Animal Power	-.002	-.6	
Fertilizer	-.02	-2.4	
Pesticide	.004	1.0	
Seed	-.01	-.6	
Education (log)	.01	1.7	

## Interaction Terms of Translog

Education

Machinery and Education	.009	2.3	R <sup>2</sup> = .19
Machinery and Land	.07	2.4	
Seed and Land	.05	1.8	
Labor and Fertilizer	.03	2.3	
Machinery and Fertilizer	-.01	-3.6	
Machinery and Seed	-.05	-1.9	