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PROYECTO COOPERATIVO DE INVESTIGACION SOBRE TEGNOLOGIA AGROPECUARIA EN AMERICA LATINA "PROTAAL"

TECHNOLOGICAL CHANGE AND PEASANTS IN LATIN AMERICA

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OFFICE OF THE ASSOCIATE DEPUTY DIRECTOR GENERAL FOR RURAL DEVELOPMENT

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BACKGROUND INFORMATION ON THE PROTAAL PROJECT

The Cooperative Research Project on Agricultural Technology in Latin America (PROTAAL) aims to develop a series of research efforts dealing with the nature of the agricultural technological change process in the region. This work is being carried out with the cooperation of the Inter-American Institute of Agricultural Sciences (IICA), which acts as the executive agency, the Ford Foundation, the United Nations Development Programme (UNDP), and the International Development Research Centre (IDRC) of Canada.

The Project views the process of generation and transfer of technology as a phenomenon endogenous to the society in which it develops. Through an integrated analysis of the process, research efforts aim to provide information that will improve the understanding of the technological problem and, consequently, the definition of policies, organizational models and actions that will contribute to technological progress and the development of the agricultural sector.

Project activities began on January 1, 1977 and organizationally, they developed for the most part with the participation of research teams in a number of countries on the continent.

Within the same general framework, the PROTAAL Project has also conducted a special research project entitled "National Agricultural Research Systems in Latin America: A comparative analysis of human resources in selected countries", which received funding from the Rockefeller Foundation and IICA.

Finally, in May 1980, a second phase of the Project (PROTAAL II B: "Technical Change in the Small Farm Sector") began with special funding from the Government of Holland. It aims to intensify the analysis of the technological process in the campesino farm sector. Case studies for this new phase are expected to take place in Brazil, Peru, Ecuador, Colombia and Costa Rica, and provide information that will facilitate better management of the technological variable in rural development programs and projects.

In order to disseminate the research findings, and to generally improve the exchange of information, the Project publishes the following three types of papers and monographs:

- a. Papers on methodologies and on empirical research findings resulting from central Project activities.
- b. Papers dealing with activities related to the Project.
- c. Papers written by Project staff, and eventually by other authors involved in Project activities, which prove useful to the development of the Project.

Inasmuch as the papers are not usually published in final form, critical comments are welcome.

PROYECTO COOPERATIVO DE INVESTIGACION SOBRE TECNOLOGIA
 AGROPECUARIA EN AMERICA LATINA
 (PROTAAL)

List of Publications^{1/}

PIÑEIRO, M., TRIGO, E. y FIORENTINO, R. El proceso de generación, difusión y adopción de tecnología agropecuaria en América Latina. Colombia, Instituto Interamericano de Ciencias Agrícolas, 1977. 58 p. (Documento PROTAAL N° 1.; Publicación Miscelánea N° 163).

_____, y TRIGO, E. La transferencia de ciencia y tecnología y la educación agrícola. Colombia, Instituto Interamericano de Ciencias Agrícolas, 1977. 36 p. (Documento PROTAAL N° 2).

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_____. y TRIGO, E. La planificación de la investigación agrícola a partir de programas por productos: algunos comentarios críticos. Colombia, Instituto Interamericano de Ciencias Agrícolas, 1977. 26 p. (Documento PROTAAL N° 4. Publicación Miscelánea N° 150).

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a) Informe Técnico N° 39 Programa de Estudios Agroeconómicos. División de Estudios Socioeconómicos. Instituto Colombiano Agropecuario. Bogotá, Julio de 1977.

1/ Publications appearing on this list can be obtained from: Secretaría de PROTAAL, Subdirección General Adjunta de Desarrollo Rural, Instituto Interamericano de Cooperación para la Agricultura (IICA), Apartado 55 - 2.200 Coronado, Prov. de San José, Costa Rica. Publications not listed as "agotada" (out of stock) will be photocopied at cost for parties so requesting.

b) Seminario sobre Producción Animal en Areas de Agricultura Tradicional. Facultad Agronómica, Universidad de Nariño, Colombia, Instituto Interamericano de Ciencias Agrícolas, Pasto, Mayo de 1977.

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PIÑEIRO, M., TRIGO, E. y FIORENTINO, R. La generación y transferencia de tecnología agropecuaria. Notas sobre la funcionalidad de los Centros Nacionales de Investigación. Reunión preparatoria de la Conferencia Internacional sobre potencial para la cooperación entre Sistemas Nacionales de Investigación Agrícola. Bellagio, Italia, octubre 17-21/1977. Colombia, Instituto Interamericano de Ciencias Agrícolas, 1977. 145 p. (Documento PROTAAL N° 9, Adendum al Documento N° 6; Serie de Informes Cursos y Reuniones N° 138).

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PROYECTO COOPERATIVO DE INVESTIGACION
SOBRE TECNOLOGIA AGROPECUARIA EN AMERICA LATINA
(PROTAAL)

TECHNOLOGICAL CHANGE AND PEASANTS IN LATIN AMERICA

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INTER AMERICAN INSTITUTE FOR COOPERATION ON AGRICULTURE
OFFICE OF THE ASSOCIATE DEPUTY DIRECTOR GENERAL FOR RURAL DEVELOPMENT

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TECHNOLOGICAL CHANGE AND PEASANTS IN LATIN AMERICA *

Alain de Janvry
Luis Crouch

Technological change in agriculture has been looked at as both the salvation and the doom of peasants. Schultz, for example, argues that peasants are poor, but efficient, and that production and welfare increases in traditional agriculture consequently require technological change as a prerequisite. The gradualistic technological modernization of peasant production systems as the key to economic development has subsequently been argued by a host of writers including Mosher, Wortman and Cummings, Lele, Coombs and Ahmed, Stevens, Norman, Hardwood, and Weitz among many others. In absolute contrast to this position, technology has been denounced as accelerating the elimination of peasants by analysts of the social consequences of the Green Revolution such as Griffin, 1975, Byres, Feder, Scobie and Posada, and Whittenbarger and Havens. Salvation or doom. The objective of this paper is to dwell on this issue. We take, as a departing postulate, the observation that technology (its rate and bias) is a social product and that the economic and social impact of technology and, in particular, its impact on peasants is also fundamentally determined by the institutions of particular societies. Hence, whether peasants, and which peasants, are helped or hurt by technological change is not technologically determined but a social choice. And it is because the nature and impact of technological change are social choices that it is important to investigate the relationships between technology and peasants.

We cannot embark in a discussion on peasants without first clarifying the term "peasants" since there has been so much controversy on its definition among anthropologists. Thus, some have defined peasants by opposition to "primitives" in that they are involved in cash and market relations (Geertz). Others have defined them by their unequal links with broader society in terms of "part-society with part-culture" (Kroeber), the "Little Tradition" within the "Great Tradition" (Redfield), and the opposition between village and city (Foster). Others, yet, have defined peasants in terms of the objective of satisfying subsistence needs and

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not seeking profit making. As Diaz explains, "the peasant's economic goal is to use his resources to maintain his family directly, rather than to use the products of his labor as an investment for a money return" (Diaz, p. 51). More importantly, peasants have been defined in terms of surplus transfers to the benefit of other social groups. Thus, for Shanin, "the political economy of peasant society has been, generally speaking, based on expropriation of its 'surpluses' by powerful outsiders, through corvee, tax, rent, interest, and terms of trade" (Shanin, 1971).

Similar, for Wolf, "peasants are rural cultivators whose surpluses are transferred to a dominant group of rulers" (Wolf, pp. 3 and 4).

There are, in our opinion, two difficulties with these alternative definitions. One is that they fail to appreciate that there is great heterogeneity within the peasantry itself and that what is consequently important is not to define peasants in a global sense but to distinguish among types of peasants and to establish the relations existing among them (Mintz). The other is that, by failing to use the concepts of mode of production and class and fractions of class, they cannot account for the nature of the external relations to which peasants are subjected. We, consequently, propose to:

1. Define specific types of peasants in terms of three sets of characteristics:
 - a. the organization of the household as a unit of production and reproduction
 - b. the patterns of surplus extraction among fractions of classes and classes
 - c. the class position of peasants and, in particular, the dynamic patterns of social differentiation.

This three-tier characterization of peasants is retaken (in reverse order) in Parts III, IV and V of this report.

2. Establish typologies of peasants based on the concepts of mode of production, class, and fraction of class. These typologies are not meant to create a static map of peasants but, to the contrary, to follow their dynamic transformations through their shifting among categories.

At this stage, we need to place limits to the term peasants under capitalism in order to establish the boundaries of future typologies. For us, the upper limit of peasant is the rural bourgeoisie which defines itself by the net hiring of labor power. The lower limit is the rural proletariat which defines itself by the sale of labor power as the only source of income. The peasantry is, thus, located between these two essential classes of the capitalist mode of production and includes from

the petty bourgeoisie at the upper end to the semiproletariat at the lower end. Under other modes of production like feudalism and communal societies, the peasantry forms one of the essential classes of these modes. Under capitalism by contrast, the peasantry is in a contradictory class location (Wright) which explains both its economic instability and political ambiguity.

We start this report by characterizing, empirically, the changing structural, economic, and social position of peasants in Latin America. In Part II, we identify the arguments put forward by contenders to the debate on the permanence or elimination of peasants. We then analyze the logic of peasant economic systems, especially in relation to technological change at each of the three definitional levels identified above: social differentiation, surplus extraction, and organization of the household. In Part VI, we discuss some of the experiences with integrated rural development where attempts were made to accelerate technological change in peasant agriculture. In Part VII, finally, we extract from our analysis a number of questions for research on the relationship between technology and peasants.

I THE CHANGING CONDITIONS OF PEASANTS IN LATIN AMERICA

There seems to be a fairly widespread opinion in the literature dealing with agrarian change in Latin America that the peasantry is, in some sense, disappearing as a result of an increasing polarization of rural inhabitants into proletarians or semiproletarians and capitalists. In this section we argue that, although we believe this decomposition is taking place, the data which demonstrate it are not readily available for most countries and the data usually used to either defend or attack this position are not fit for that purpose. We then proceed to show the types of data necessary for the purpose and give several examples to defend our belief in the decomposition of the commodity-producing peasantry.

Typically, for example, arguments are based on the number of farms or their average size. If we look at these data (Table 1), we see that there is great variability in the structural transformations of different countries. Nevertheless, with the exception of small countries and of those with no significant peasantries, we see that there is a trend toward more farms of smaller average size. A contrast between this phenomenon and the case of the United States where the development of capitalism has led to a dramatic decrease in the number of farms and an increase in their average size may suggest that there has not been a similar process of capitalist development in Latin America.

TABLE 1

Changes in Total Number of Farms, Area Covered By All Farms, and Average Size, 1940-1971

Country	Period	Number of farms (base period = 100)	Area of farm (base period = 100)	Average farm area (base period = 100)
Mexico (private)	1940-1970	82	86	92
Dominican Republic	1950-1970	92	117	127
Costa Rica	1950-1973	94	172	184
El Salvador	1950-1971	156	97	63
Guatemala	1950-1964	120	93	78
Honduras	1956-1966	114	96	84
Nicaragua	1952-1971	204	209	104
Panama	1950-1971	106	174	164
Venezuela	1937-1961	144	111	a/
Chile	1936-1965	125	111	88
Colombia	1954-1971	128	112	87
Ecuador	1954-1968	184	116	63
Peru	1961-1971	162	119	73
Brazil	1940-1950	259	149	57
Argentina	1952-1969	101	103	102
Uruguay	1951-1970	91	97	108
United States	1950-1969	44	86	197

a/ Not available.

Source: U. S. Economic Research Service, "Agriculture in the Americas: Statistical Data," 1976 (mimeographed).

At the same time, while in the United States the decrease in the number of farms and the increase in average size from census to census is predictably monotonous, in almost no Latin American country is there a really discernible trend in the average size of the farms (Table 2 and Figure 1). Moreover, in Latin America not only is there no real trend but, in some countries, there is first an increase in the average size of the farms and then a decrease, while in others there is first a decrease and then an increase. It is unlikely that these trends reflect anything that is happening in reality, not to say anything important. To the contrary, it is more than likely that these strange, capricious alterations in the direction of powerful social trends are more apparent than real and that these appearances are due to changing concepts and definitions in the censuses, as well as to varying quality of census-taking. To mention only one case: In the Dominican census of 1960, plots, not farms, were counted. Since, at least in the Dominican Republic, it is the largest farms that have more plots, i.e., that are most fragmented, it is clear that focusing on plots understates the average size of the "operation" and underestimates the inequality of the measures of distribution, such as Lorenz curves or Gini coefficients. Then, for the 1970 census, only farms large than 0.5 hectare were counted even though it was clear from the 1960 census that approximately 20 percent of all farms were under 0.5 hectare in size. The 1970 average farm size, therefore, was overestimated by approximately 20 percent; and, curiously enough, the average farm size estimated for 1970 happens to be about 22 percent greater than that for 1960. Thus, a very good argument could be made that most of the difference in farm size observed between 1960 and 1970 was probably due to a changing definition of farms and to a changing idea of which farms were worth enumerating. For other countries, there probably are changes similar to these, as well as changes in the type of land considered farmland, and varying competence of the census planners and takers. In short, we claim that the data on average farm sizes do not really support any claims about trends in Latin America agrarian structures.

However, even if there were reason to suppose that the data are good, and if they uniformly reflected a monotonous decline in average farm size, there would be no reason to claim that the peasantry is not disappearing, by contrast to the United States situation, where the increasing average farm size clearly correlates with a decline of the family farm (or forces a continuous and apologetic redefinition of the concept). The trend for decreasing farm size could simply be a result of the fragmentation (and intensification of cropping on those fragments) of the old semifeudal latifundia. Indeed, in the country where the average size has declined most systematically, Brazil, the role of the large latifundia appears to be eroding. Whereas in 1940 farms greater than 500 hectares in size were 3.1 percent of the total farms and occupied 59.2 percent of the land, by 1970 they constituted only 1.8 percent of the farms and held 50.5 percent of the land. In Guatemala, farms larger than 1,000 hectares occupied 41 percent of the land in 1950 and only 27 percent in 1964. For Costa Rica, the figures were 35 percent in 1950 and 25 percent in 1970.

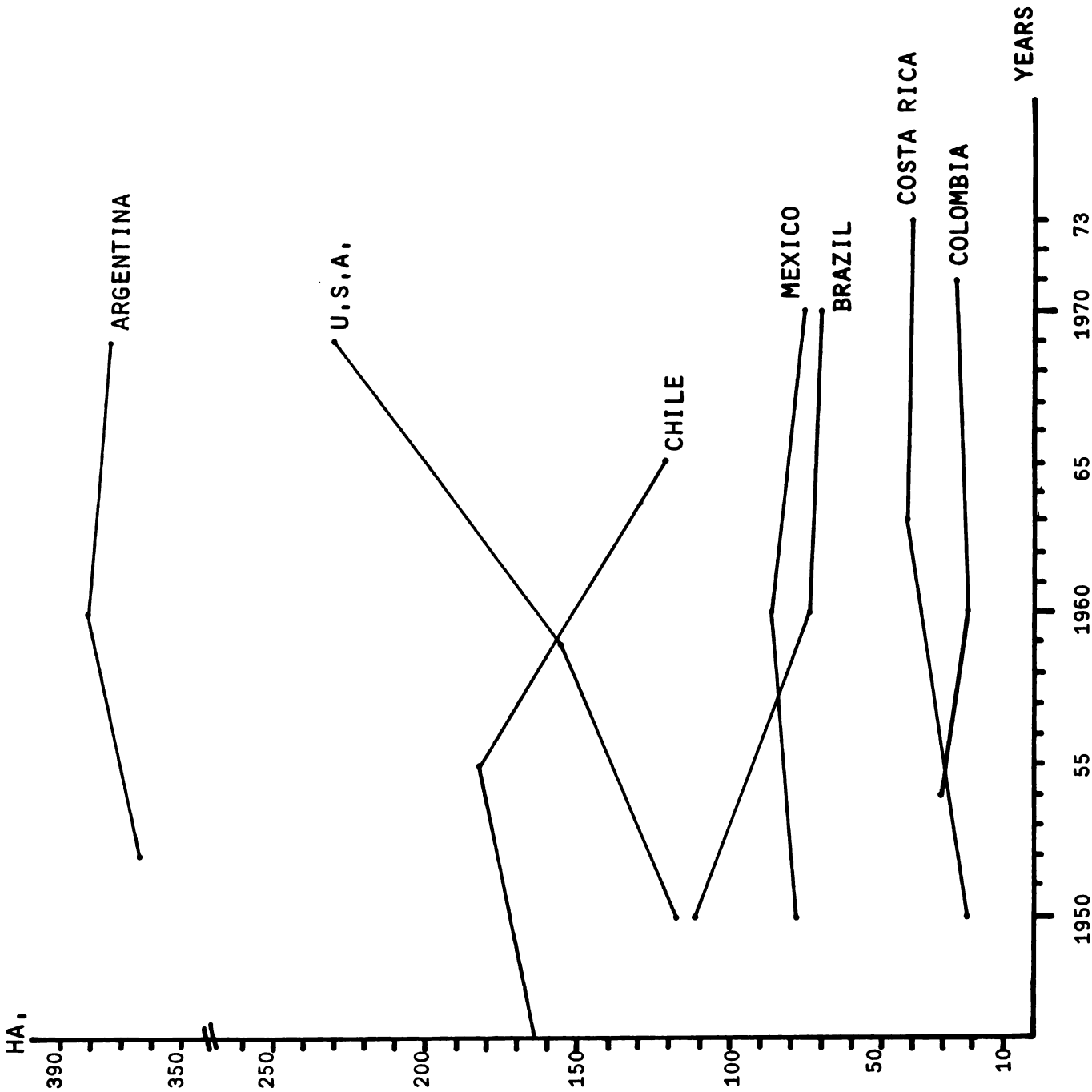
TABLE 2
Number of Farms and Average Size

Country and years	Number of farms thousands	Average size hectares
<u>United States</u>		
1950	5,388	117.4
1959	3,708	157.3
1969	2,390	230.7
<u>Mexico</u>		
1950	1,366	78.1
1960	1,346	86.1
1970	994	75.7
<u>Costa Rica</u>		
1950	82	22.0
1963	64	41.3
1973	79	40.5
<u>Chile</u>		
1936	202	136.8
1955	151	183.6
1965	253	120.9
<u>Colombia</u>		
1954	919	30.2
1960	1,209	22.6
1971	1,176	26.3
<u>Brazil</u>		
1950	2,064	112.5 ^{1/}
1960	3,337	74.9
1970	4,932	59.4
<u>Argentina</u>		
1952	546	366.2
1960	457	383.1
1969	549	374.1

Source: U. S. Economic Research Service, "Agriculture in the Americas: Statistical Data," 1976 (mimeographed).

1/ Does not include farms exclusively oriented at production for home consumption.

CHANGE IN THE AVERAGE SIZE OF FARM OVER TIME BY COUNTRY



Thus, it is entirely possible that both the old-style latifundia and the peasantry could be disappearing in favor of a more dynamic group of middle-to-large-size entrepreneurs. It seems reasonable, therefore, to look specifically at the fate of peasant farms^{1/} as a special category.

When we do so (Table 3), we again find a rather ambiguous situation. While in several of the countries surveyed the average size of the "peasant farms" decreased, only in some of the countries surveyed did the number and the area occupied by those farms, relative to all farms, decrease. We find for the United States that there was an unambiguous and sharp decline in all of these categories for "peasant farms". Thus, in conjunction with the decreasing total number of farms and increasing average size, for the United States this bespeaks a disappearance of the peasantry; but for Latin America the record is far more ambiguous. Here, we find in some of the countries surveyed that the total, absolute number of "peasant farms" seems to have increased, while in other countries this number decreased without any apparent logic. Generally wherever the number of "peasant farms" increased, so did the area of the peasant farms as a proportion of the total farmed area. The average size of the "peasant farm", however, appears to change without relation to the other categories. In countries where there is an apparent "peasantization" in terms of number of "peasant farms", such as in Brazil, there was nevertheless a decline in the average size of the "peasant farms", although only a small decline. In countries where there has been, in terms of numbers, an apparent "depeasantization", such as in Venezuela, on the other hand, the average "peasant farm" size is remarkably stable. Thus, no broad generalizations are possible on the basis of census data about the fate of the small farms, with the possible exception of Mexico, which is the only country where the depeasantization process closely mirrors that of the United States.

To summarize this section, we conclude that it is hardly possible to generalize systematically about the development of capitalism in Latin America on the basis of farm-level census data about surface area and numbers of farms, even if we believe the data.

A. Changing Importance of the Peasant Farm in Food Production

We will now argue that the way to get a less ambiguous understanding about the disappearance or permanence of the peasantry is to look at the changing role of peasants in commodity production, which we

1/ Here we call farms smaller than 5 hectares "peasant" farms. Evidently, this is totally incorrect from the point of view of a materialist analysis as it ignores social relationship. We develop this idea more fully below. When we use "peasant farms" with quotation marks, it signifies merely an abbreviation for farms smaller than 5 hectares.

TABLE 3

Average Size and Number and Percent of Total Peasant Farms and Area

Country and year	Peasant farms					
	Farms considered "peasant farms"	Number	Percent of total farms	Percent of total farm area	Average size	Percentage difference in average size
	hectares	thousands	percent		hectares	percent
Mexico (private)						
1950	< 10	1,366	73.6	1.3	2.1	-19
1970	< 10	522	52.4	1.3	1.7	
Costa Rica						
1950	< 5.6	12	27.9	1.1	1.7	0
1973	< 5	35	45.5	1.8	1.7	
El Salvador						
1950	< 10	141	81.0	17.1	1.1	9
1970	< 10	237	86.9	19.6	1.2	
Guatemala						
1950	< 7	266	76.2	9.0	1.3	0
1964	< 7	313	75.1	11.6	1.3	
Honduras						
1952	< 4	89	57.0	8.1	2.3	9
1966	< 4	120	67.4	12.4	2.5	
Venezuela						
1950	1-5	112	50.7	1.2	2.4	0
1970	1-5	70	31.6	2.9	2.4	
Colombia						
1954	< 5	919	54.9	3.3	1.8	-9
1970	< 5	1,176	59.5	3.7	1.6	
Brazil						
1950	< 5	459	22.2	0.5	2.5	-12
1970	< 5	1,801	36.6	1.3	2.2	
Chile						
1955	< 10	56	37.1	0.3	1.4	21
1965	< 10	123	48.6	0.7	1.7	
United States						
1950	< 4	484	9.0	0.2	2.0	-30
1969	< 4	162	5.9	0.05	1.4	

(Continued on next page.)

TABLE 3--continued.

Sources:

U. S. Economic Research Service, "Agriculture in the Americas: Statistical Data," 1976 (mimeographed).

For Mexico, see Secretaría de Industria y Comercio, Dirección General de Estadística, IV. Censo Agrícola-Ganadero y Ejidal, Mexico, 1965; also, idem, V. Censo Agrícola-Ganadero y Ejidal, Mexico, 1975.

For Costa Rica, see Dirección General de Estadística y Censos, Censo Agropecuario de 1950, San José, 1953; also, idem, Censos Nacionales de 1973, Agropecuario, San José, 1974.

For El Salvador, see Dirección General de Estadística y Censos, Segundo Censo Agropecuario 1961, San Salvador, 1967; also, idem, Tercer Censo Nacional Agropecuario, 1971, Vol. II, San Salvador, 1975.

For Guatemala, see Dirección General de Estadística, Censo Agropecuario, 1950, Tomo I. Guatemala, 1954; also, idem, Censo Agropecuario, 1964, Tomo II and Tomo III, Guatemala, 1971.

For Honduras, see Dirección General de Estadística y Censos, Primer Censo Agropecuario, 1952, San Salvador, 1954; also, idem, Segundo Censo Nacional Agropecuario, 1965-1966.

For Venezuela, see Ministerio de Fomento, Dirección General de Estadística y Censos Nacionales, Censo Nacional de 1950, II. Censo Agropecuario, Vol. I, Venezuela; also, idem, III. Censo Agropecuario, 1961, Resumen General de la Republica, Parte B, and IV. Censo Agropecuario, 1971, Total Nacional, Venezuela.

For Colombia, see Departamento Administrativo Nacional de Estadística, Directorio de Explotaciones, Agropecuarias (Censo Agropecuario), 1960, Resumen Nacional (Segunda Parte),

For Brazil, see Fundacao Instituto Brasileiro de Geografia e Estadística, Censo Agropecuario do Brazil, Serie Nacional, Volume III, 1970.

For Chile, see Dirección de Estadística y Censos, III. Censo Nacional Agrícola Ganadero, 1955, Tomo VI, Santiago, 1960; also, idem, IV. Censo Nacional Agropecuario, Ana Agrícola, 1964-1965, Resumen del País, Santiago, 1966.

For the United States, see U. S. Department of Commerce, Statistical Abstract of the United States, 1957 and 1972.

approximate by looking at their role in the production of agricultural commodities. The reason we believe this is a superior approach to the problem is quite simple: "land" is not a homogeneous thing. Even if, for example, in a certain country the number of peasant farms has doubled and so has the average size of those farms, it is entirely possible that this expansion has occurred on almost completely marginal lands as peasants are driven away from the most privileged areas. If "land" is not a homogeneous thing, however, the products of the land, if expressed in terms of money, are homogenous; and, even expressed in physical terms, a given commodity produced on a peasant farm is more closely similar to the same commodity produced on a capitalist farm than is the land used in either farm.

The first step is to establish that there is a division of crops between peasant producers and capitalist producers: Some crops are almost exclusively produced by one group of producers and others, while not exclusively produced by capitalists or by peasant, are dominated by one or the other. Some crops, of course, are produced by either one (Table 4). In Costa Rica, for example, it is clear that large plantations dominate the production of bananas and large farms dominate the production of rice, while large farms barely produce manioc or beans. In Colombia, large farms dominate rice and sugar production (although the latter data are distorted by the inclusion of panela), while peasants specialize in manioc, beans, and corn. Similar patterns can be seen for most other countries. Using the only rigorous data we have on this social division of labor -that is, those data that directly characterize social relations- where the peasant farms are those using largely family labor, we can see that, in the Dominican Republic, rice and tomatoes are capitalist crops, while corn, sweet potatoes, and manioc are more peasant-dominated (Table 5).

In dynamic terms, we see that those crops which are capitalist-dominated seem to be increasingly so through time. In Table 4, for example, we observe that in Venezuela, where rice is capitalist-produced, the participation of capitalist over time has increased, whereas it has decreased (although apparently only slightly) for the peasant-produced crops. Somewhat similar tendencies can be observed in Costa Rica and Guatemala. In Figure 2 we observe that, for those crops dominated by capitalist farms, not only is the proportion of production coming from large farms increasing but the overall concentration of production is increasing. The opposite trend is true for crops dominated by peasants. Furthermore, in countries where this division of labor is clearest (Venezuela, for example), the difference at a given point in time on the degree of concentration of production of different crops is most remarkable.

When we turn to the growth records for the different crops, we see that it generally is those whose production is capitalist-dominated and, in the Gini sense, increasingly concentrated in which we have the higher growth trends (Table 6 and Figure 2). For example, in Venezuela,

TABLE 4

Share of large farms in total production and mean area harvested per farm, 1950-1971.

	Rice	Corn	Beans	Manioc	Coffee	Sugar	Cotton	Bananas	Wheat
Costa Rica									
Share farms > 70 hectares, 1950 (percent)	51	40	37	46	58	48 ^a		85	
Share farms > 100 hectares, 1970 (percent)	67	21	13	10	26	57 ^a		95	
Mean area, 1950 (hectares)	5.9	5.9	4.8	2.0	6.6	3.6			
Mean area, 1970 (hectares)	4.3	1.7	1.4	0.7	2.6	4.1			
El Salvador									
Share farms > 100 hectares, 1961 (percent)	17	27	12	b	46 ^a	46	69		
Share farms > 100 hectares, 1971 (percent)	28	21	16		40 ^a	33	73		
Mean area, 1961 (hectares)	0.5	1.7	0.7		3.8	26.8	1.4		
Mean area, 1971 (hectares)	0.7	1.7	0.6		3.6	21.4	2.1		
Dominican Republic									
Mean area, 1950 (hectares)	1.1	0.5		0.3					
Mean area, 1970 (hectares)	2.7	0.8		0.6					
Honduras									
Mean area, 1952 (hectares)	0.7	1.6	0.8		1.7			9.1	
Mean area, 1965 (hectares)	0.7	2.2	1.2		3.1			1.8	
Panama									
Mean area, 1950 (hectares)	0.9	0.8	0.4	0.3		0.7			
Mean area, 1960 (hectares)	1.3	1.1	0.5	0.1		0.8			
Guatemala									
Share farms > 90 hectares, 1950 (percent)	20	18	13		94	75 ^a			
Share farms > 90 hectares, 1964 (percent)	30	15	13		87	75 ^a			
Mean area, 1950 (hectares)	0.7	2.1	1.2			2.8			
Mean area, 1964 (hectares)	1.2	0.9	1.3			2.2			
Venezuela									
Share farms 100 hectares, 1950 (percent)	50	22			46 ^a	46	69		
Share farms > 100 hectares, 1960 (percent)	55	19	13	14					
Share farms > 100 hectares, 1970 (percent)	70	37	12	11	50 ^a	53	73		
Mean area, 1950 (hectares)	2.5	2.3	1.2	1.1	5.4	1.4	26.8		
Mean area, 1970 (hectares)	15.3	4.2	1.7	1.0	5.0	2.1	21.4		
Colombia									
Share farms > 100 hectares, 1959 (percent)	53	21	18	15	9	32		8	10
Mexico									
Share private farms > 5 hectares, 1960 (percent)	35	43	47		62	49	65		65
Share private farms > 5 hectares, 1970 (percent)	29	30	33		27		53		67
Share ejido sector, 1960 (percent)	63	47	49		27	48	35		33
Share ejido sector, 1960 (percent)	70	64	64		72		47		32

(Continued on next page.)

Table 4—continued.

^aShare of total area instead of total production.

^bBlanks indicate data not available.

Sources:

- For Costa Rica: Dirección General de Estadística y Censos, Censo Agropecuario de 1950, San José, 1953.
Idem, Censos Nacionales de 1973, Agropecuario, San José, 1974.
- For Dominican Republic: Dirección General de Estadística, Oficina Nacional del Censo, IV. Censo Nacional Agropecuario, 1950.
Secretariado Técnico de la Presidencia, Oficina Nacional de Estadística, VI. Censo Nacional Agropecuario, 1971, Vol I.
- For El Salvador: Dirección General de Estadística y Censos, Segundo Censo Agropecuario 1961, San Salvador, 1967.
Idem, Tercer Censo Nacional Agropecuario, 1971, Vol II, San Salvador, 1975.
- For Honduras: Dirección General de Estadística y Censos, Primer Censo Agropecuario, 1952, San Salvador, 1954.
Idem, Segundo Censo Nacional Agropecuario 1965-1966.
- For Mexico: Secretaría de Industria y Comercio, Dirección General de Estadística, IV. Censo Agrícola-Ganadero y Ejidal, Mexico, 1965.
Idem, V. Censos Agrícola-Ganadero y Ejidal, 1970, Mexico, 1975.
- For Panama: Dirección General de Estadística y Censo, Censos Nacionales de 1950, Primer Censo Agropecuario, Vol I, Panama, 1957.
Idem, Censos Nacionales de 1960, Segundo Censo Agropecuario, Vol I, Panamá, 1963.
- For Colombia: Departamento Administrativo Nacional de Estadística, Directario de Explotaciones, Agropecuarias (Censo Agropecuario), 1960, Resumen Nacional (Segunda Parte).
- For Venezuela: Ministerio de Fomento, Dirección General de Estadística y Censos Nacionales, Censo Nacional de 1950, II. Censo Agropecuario, Vol I.
Idem, III. Censo Agropecuario 1961, Resumen General de la República, Parte B.
Idem, IV. Censo Agropecuario 1971, Total Nacional.

TABLE 5
Indices of Capitalist Development, By Crop

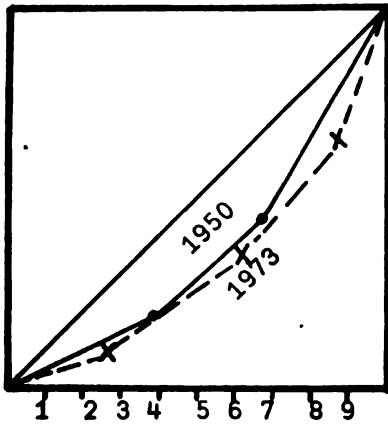
Crop	Proportion of production from capitalist farms ^{a/}	Proportion of hired labor in total labor
	percent	
Corn	.30	.44
Manioc	.17	.25
Beans	.26	.50
Tobacco	.37	.47
Sweet potato	.28	.30
Tomato	.33	.88
Rice	.67	.80
Cocoa	.24	.63
Coffee	.42	.59
Sugar	<u>b/</u>	

a/ Farms using more than 70 percent hired labor of total labor force.

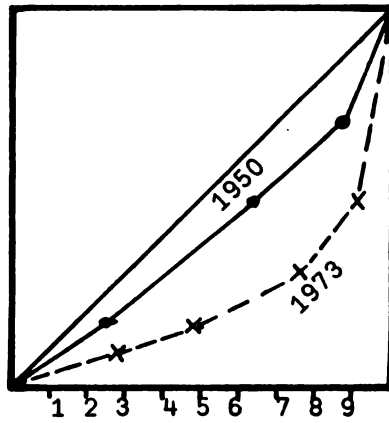
b/ Blanks indicate data not available but close to 100 percent.

Source: U. S. Agency for International Development/Secretariat of Agriculture of the Dominican Republic, Sample Survey of Dominican Agriculture, 1975.

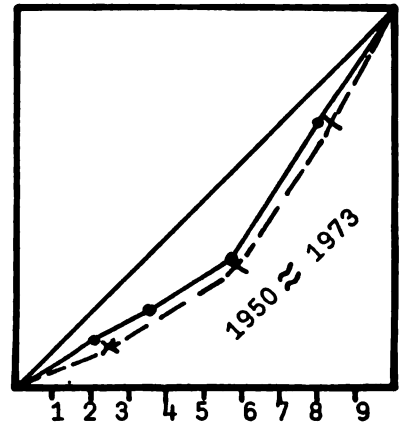
FIGURE 2
DISTRIBUTION OF PRODUCTION BY CROPS AND FARM SIZES OVER TIME



CORN - 2,1

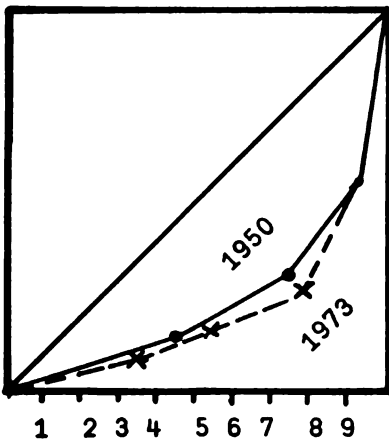


RICE - 4,8

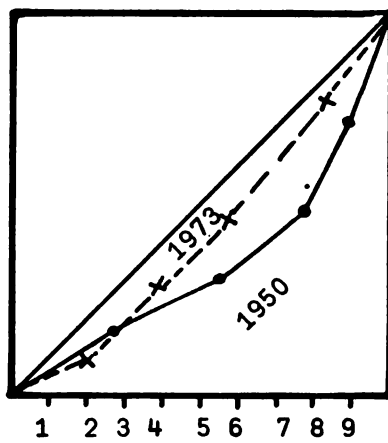


BEANS - 3,8

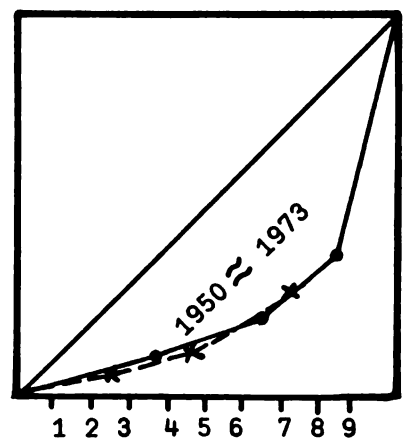
COSTA RICA



BOVINES - 7,1

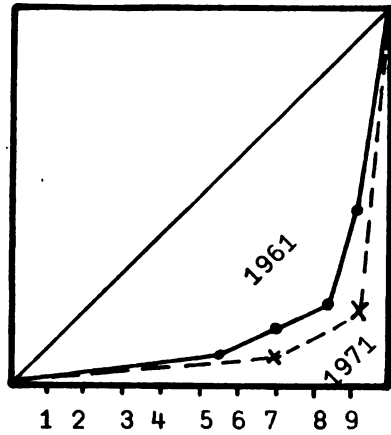


MANIOC - 2,2

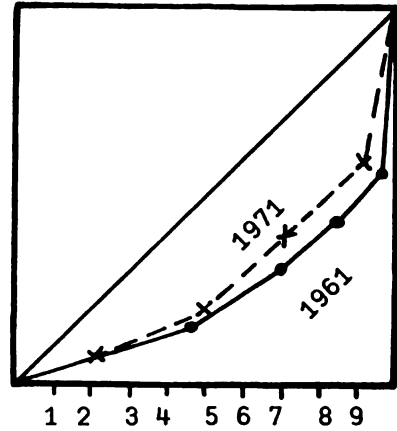


COFFEE - 6,4

FIGURE 2 (CONTINUED)

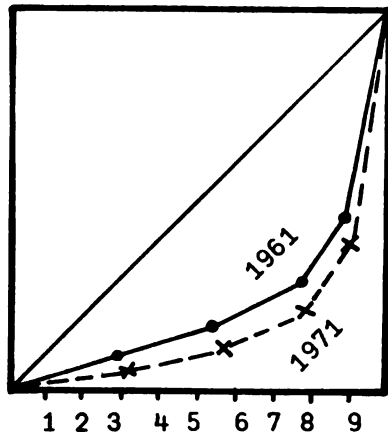


COTTON - 20,9

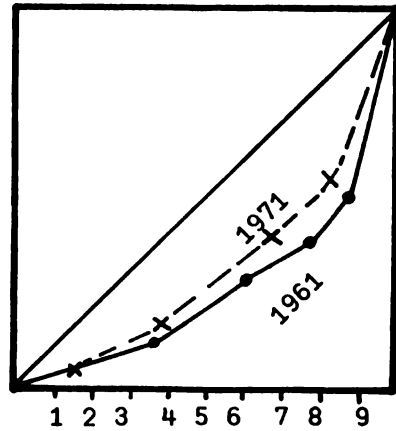


CORN - 2,3

EL SALVADOR

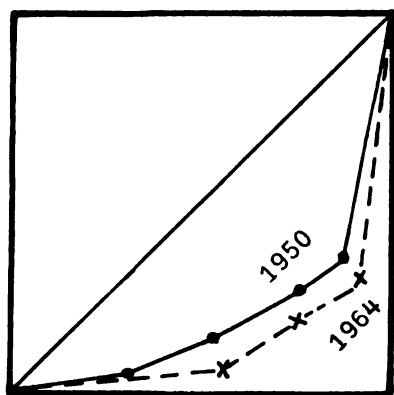


SUGAR CANE - 4,6

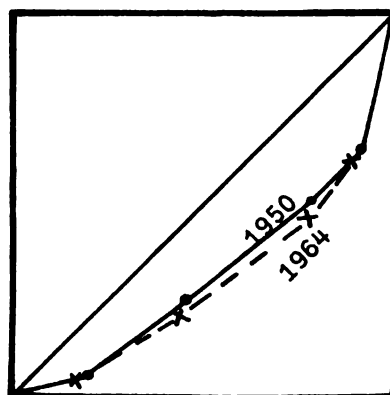


BEANS - 0,3

FIGURE 2 (CONTINUED)

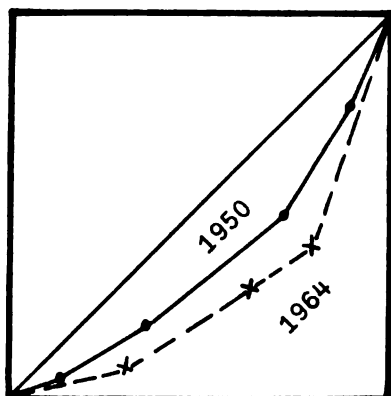


SUGAR CANE - 8,3

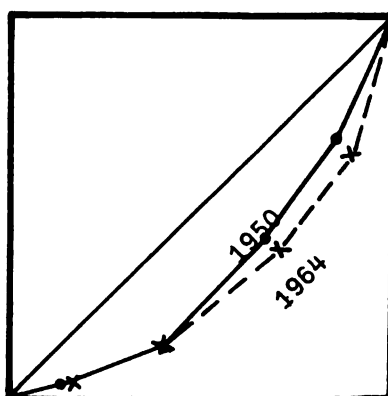


CORN - 2,3

GUATEMALA

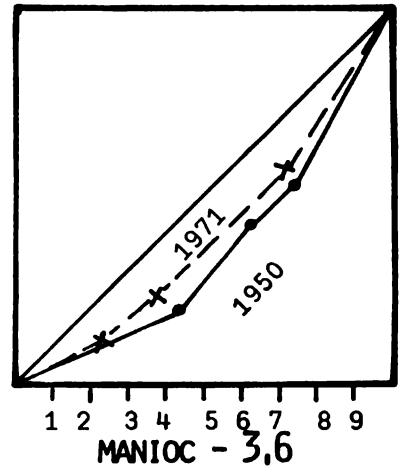
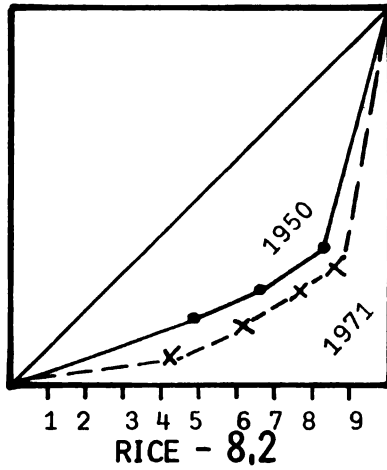
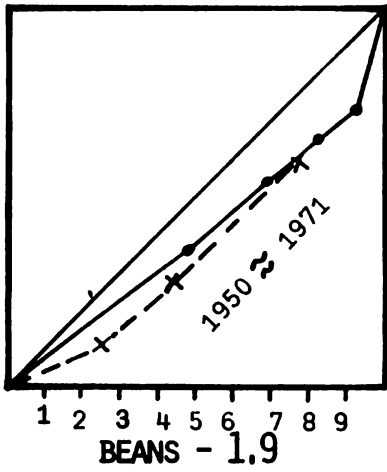


RICE - 4,0



WHEAT - 2,3

FIGURE 2 (CONTINUED)



VENEZUELA

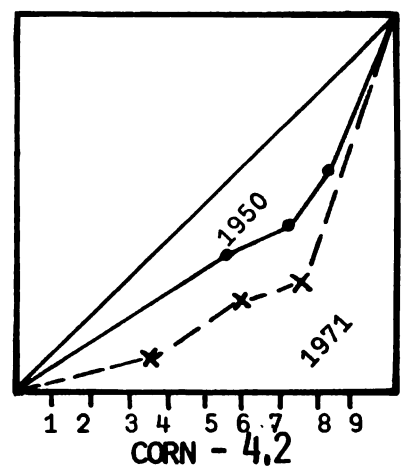
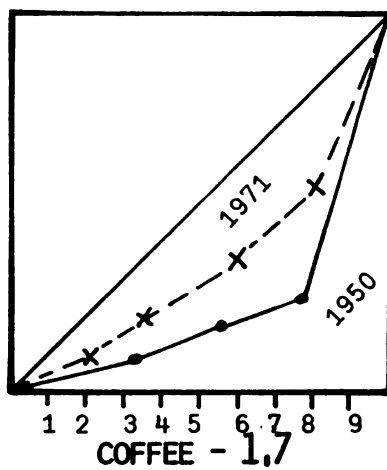
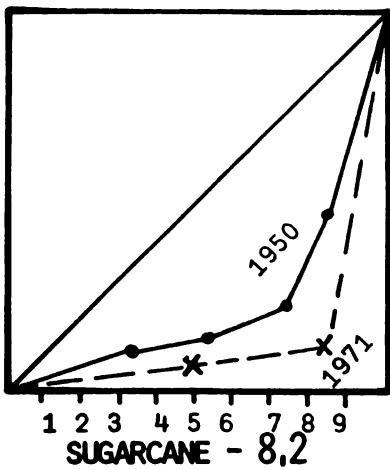


TABLE 6

Rates of growth of production, 1948-1952 to 1968-1972 (percent).

	Wheat	Rice	Corn	Beans	Manioc	Sugar- cane	Coffee	Bananas	Cotton	Bovine meat
Costa Rica	a	4.8	-2.1	3.8	2.2 ^b	4.8	6.4	3.4		7.1
Dominican Republic		5.4	0.3	1.3	1.1	3.6	2.2	1.4		3.3
El Salvador		3.8	2.3	0.3	7.6 ^b	4.6	3.1	- 2.8	20.9 ^b	2.6
Guatemala	2.3	4.0	2.3	3.9	4.0 ^b	8.3	4.1	1.5	19.6 ^b	0.3
Haiti		5.4	0.9	4.6	1.2	-0.8	-0.7	- 1.1	- 3.4 ^b	
Honduras	0	-4.6	2.5	4.4		4.4	5.4	2.6		4.6
Mexico	6.9	4.2	4.2	6.6		6.2	5.6	5.0	3.0	5.8
Nicaragua		5.4	3.5	3.3	6.4 ^b	5.6	3.2	10.9	12.4 ^b	4.7
Panama		2.6	0.5	-3.0	-3.0	6.9	3.0	5.3		5.2
Colombia	-2.7	6.1	1.0	0.5	2.5	2.3	2.5	4.0	14.8 ^b	
Venezuela	-7.7	8.2	4.2	-1.9	3.6	8.2	1.7	- 8.5	6.5 ^b	

^aBlanks indicate no production in either period or no data available.

^bVery small production in base period. These rates were, therefore, not counted in the rankings in the text. Method of estimation:

$$Y = \exp \cdot \left[\left(\ln \frac{\text{Prod } 1968-1972}{\text{Prod } 1948-1952} \right) \div 20 \right] - 1.$$

Sources: 1948-1965: For all crops, Food and Agriculture Organization of the United Nations, Production Yearbook, 1971.

1968-1972: For wheat, corn, rice, and cattle, idem, Production Yearbook, 1972.
 For sugarcane, idem, Production Yearbook, 1971, and Production Yearbook, 1973.
 For beans and manioc, idem, Production Yearbook, 1973.
 For coffee, cotton, and bananas, idem, Production Yearbook, 1972, and Production Yearbook, 1973.

for the crops where Lorenz curves can be established, the fastest growth occurred in the crops whose Lorenz curves shifted toward a larger inequality of output. A similar situation exists in Costa Rica.

In other countries we find high growth in the more unequal or more large-farm dominated crops. In Colombia, for example, rice is the most large-farm dominated crop; and it also has the highest growth record. In the Dominican Republic, it is rice, sugarcane, and tomatoes that have high growth rates (tomatoes have a growth of 5.7 percent); and we have shown, in terms of social relationships, that these are the most capitalist-dominated crops. Conversely, corn, beans, and manioc, the most peasant-dominated crops, have the lowest growth rates.

The conclusion, then, is that the proportion of output accounted for by the peasant-dominated crops is decreasing. To take an example, if we assume that in a country such as Costa Rica the capitalist sector (say, rice, sugarcane, some coffee, bananas, meat) grows at an annual rate of about 5 percent, and the peasant sector grows at about 1 percent (these figures look reasonable for the Dominican Republic also), and that in 1950 each sector accounted for half of the total output, by approximately the year 2000 the peasant sector will be producing only 10 percent of the total output. This gives some idea of the rate of disappearance of the peasantry as a commodity-producing segment of society: if things go on as they have, we should expect an almost completely capitalist agriculture in many of these countries in the next 30 years or so.

B. The Extent of Proletarianization

The most direct way to study the disappearance of the peasantry would be, of course, through direct studies of changing social relationships. There are several disadvantages to this approach, however. First, this approach disjoins the trends in proletarianization from trends visible in the realm of agricultural production and technological change which are, after all, our main interest.

Secondly, this approach, which has so far relied mainly on the data and the categories from population censuses, is subject to the same caveats as are the agricultural censuses: the definitions change over time and so does the quality of the census in each country. Finally, because these studies generally deal with "employment" concepts, there is a problem here that is parallel to the one we encountered in the agricultural census. The type of data used in the population census may lead one to believe, for example, that "peasant employment" is expanding more quickly than is salaried employment. But, is "peasant employment" a quantity? And, is it commensurate, in any sense, with "salaried employment"? It is unlikely, for example, that employment on one's own farm is as intense, or as productive, and therefore as remunerative, as is that on capitalist farms.

Looking at Table 7, we see again that the record is ambiguous: no generalized pattern emerges; and the differences do not seem to obey any obvious logic. Thus, in some of the large countries where overall capitalist development is obviously fairly advanced, such as in Mexico or Argentina, the data seem to indicate a disappearance of the peasantry. In other large countries at similar stages of overall development, such as Brazil or Venezuela, the peasantry appears to be expanding. We, therefore, are forced to look beyond this type of data.

Specifically, we will look at the productivity of labor, by crop and by type of farm, in the case of the Dominican Republic. We see in Table 8 that the productivity of labor in the capitalist sector is a good deal higher than it is in the peasant sector. While it may not be the case that high productivity of labor in a sector is a sufficient condition for the actual reward to labor power to be high, it is certainly a necessary condition. From this evidence, we can suppose that employment in the peasant sector is not quite the same thing as employment in the capitalist sector: the two are not strictly comparable. The labor of a semiproletarian population is more productive when employed in the capitalist sector than when employed at home--about 50 percent more productive in the case of the Dominican Republic. Not only is productivity of labor higher at a given point for the capitalist crops, it also tends to increase faster over time. Thus, in Colombia, where the production of commercial crops has expanded 37 percent more than has the requirement of labor for those crops, the production of traditional crops has expanded only about 6 percent more than the labor requirement (Table 9). In this sense, the productivity of labor in commercial crops has grown at four or five times the rate at which it has expanded for traditional crops.

It is this evident disparity that has led Emilio Klein to call the peasants "mano de obra arrinconada", explaining that "la mano de obra que demanda el sector moderno no es la que permanece en el sector tradicional". In this sense, the peasant sector that remains is not so much a self-reproducing group of commodity producers but a "refuge" for marginalized labor power.

C. Structural and Technological Conditions

Peasant production is everywhere marginalized: it takes place in the less favorable lands, with little or no irrigation, with no credit, and with little use of modern technology. First, we will look briefly at modern technology. The distribution of technology between peasants and capitalists is highly skewed. In El Salvador, for example, 76 percent of the area planted with hybrid maize in 1961 was in farms larger than 100 hectares, but only 10 percent of the traditional maize area was in such farms. At the other end of the distribution, only 5 percent of hybrid maize was planted on farms smaller than 5 hectares--but those farms had planted 63 percent of all traditional maize (Table 10). In Mexico, at about the same time, farms smaller than 5 hectares accounted for only an

TABLE 7

GROWTH RATES OF PEASANT AND SALARIED EMPLOYMENT IN SELECTED LATIN AMERICA COUNTRIES, 1950-1970

C O U N T R Y	1950 - 1960			1960 - 1970		
	Peasant Employment	Salaried Employment	Difference	Peasant Employment	Salaried Employment	Difference
Argentina	0.3	-3.2	+3.5	-0.8	0.4	-1.2
Bolivia	n.a	n.a	n.a	-0.7	-3.6	+2.9
Brasil	3.0	0.8	+2.2	0.9	0.4	+0.5
Colombia	1.9	1.5	+0.4	-0.5	1.8	-2.3
Costa Rica	3.5	1.3	+2.2	-0.1	2.3	-2.4
Chile	0.6	0.4	+0.2	0.3	-3.0	+3.3
Ecuador	3.4	1.7	+1.7	0.6	0.3	+0.3
El Salvador	-1.8	4.0	-5.8	6.0	0.3	+5.7
Guatemala	n.a	n.a	n.a	4.1	-4.2	+8.3
Honduras	-0.5	-2.6	-1.9	1.2	2.6	-1.4
México	-1.8	4.1	-5.9	-0.4	1.5	-1.9
Nicaragua	1.4	1.7	-0.3	-1.6	-1.6	0.0
Panamá	2.1	7.3	-5.2	0.2	3.6	-3.4
Perú	n.a	n.a	n.a	1.2	-2.1	+3.3
República Dominicana	n.a	n.a	n.a	-0.2	5.5	-5.7
Uruguay	n.a	n.a	n.a	0.7	-1.0	+1.7
Venezuela	1.7	-0.4	+2.1	0.7	-1.6	+2.3

SOURCE: Estimates of PREALC based on CEPAL census tabulations. Taken from Emilio Klein, "Employment in Peasant Economies", ILO-PREALC, Santiago, 1980.

NOTE: The original data classify labor as: a) self-employed; b) workers and employees; and c) non-salaried family labor. In agriculture, farmers are self-employed and peasant employees are the sum of a+c. The farmer category is used as a proxy for small farmers as census data does not provide information regarding farm size. Nevertheless, this overestimation is not considered important because, as is the case in most Latin American countries, the vast majority of farmers are small-scale.

TABLE 8
Productivity of Labor,^{a/} By Social Class
Dominican Republic

Crop	Semi-proletarians ^{b/}	Peasant ^{c/}	Capitalist ^{d/}
Corn	1.4	1.5	2.4
Manioc	2.1	2.3	3.4
Sweet potatoes	2.4	1.8	4.7
Tomatoes	3.5	3.4	3.4
Rice	3.0	3.0	3.5

a/ Value of output/value of labor power used.

b/ Farms selling a net amount of labor power.

c/ Families with net purchases of labor power but where purchased labor power is less than 50 percent of total labor power availability on the farm.

d/ Purchased labor power accounts for more than 70 percent of total labor power availability.

Source: U. S. Agency for International Development/ Secretariat of Agriculture of the Dominican Republic, Sample Survey of Dominican Agriculture, 1975.

TABLE 9
Labor Requirements and Production in Colombia
1950, 1960, and 1970

Year	Production		Labor requirement		Productivity change ^{a/}	
	Commercial	Traditional	Commercial	Traditional	Commercial	Traditional
1950	100	100	100	100	0	0
1960	317	102	285	112	11	-9
1970	483	148	352	140	37	6

^{a/} Percentage difference between the index of production and the index of labor requirement.

Source: Departamento Administrativo Nacional de Estadística, La Agricultura en Colombia, 1950-1972. (Bogotá: DANE, 1974).

TABLE 10

Distribution of Maize Area
El Salvador, 1961

Farm size hectares	Hybrid maize		Traditional maize	
	Number of farms	Area	Number of farms	Area
	percent			
< 5	52	5	86	63
5-19.9	19	5	10	17
20-99.9	16	13	3	10
> 100	14	76	1	10
Total	100	100	100	100

Source: Ministerio de Fomento, Dirección General de Estadística y Censos Nacionales, Censo Nacional de 1961, III. Censo Agropecuario 1961, Resumen General de la República, Parte B.

insignificant portion of hybrid maize, but they accounted for 12 percent of traditional maize (Table 11). In an interesting example of interaction between the factors that make peasant agriculture marginal, we see that hybrid maize is much more frequently accompanied by irrigation than is traditional maize. In El Salvador, we have comparable data for two points in time (Table 12). Here we see that the disparity in adoption of modern technology seems to have been somewhat overcome, as the use of hybrid maize is no longer exclusively biased toward the very large farms, although it is interesting that large farms continue to be much more important users of hybrid seed than of traditional seed. The fact that total corn planted on large farms has shrunk, while total corn acreage planted by small farms has expanded, may help to explain this phenomenon. In Colombia, we have a similar phenomenon: the percentage of area planted under improved seeds is much greater for the commercial or capitalist crops than for the traditional or peasant ones. Here there seems to be some indication that, while adoption is increasing in some of the commercial crops, it is decreasing in some of the peasant or "mixed" ones (Table 13). Fertilizer adoption follows the expected pattern. In Venezuela, for example, only the more capitalistically produced crops can be said to be fertilized at all--and only the largest farms producing these crops use fertilizer (Table 14). As is the case in the Dominican Republic, rice and tomatoes, which we have identified as being capitalist-produced crops, show acceptable levels of fertilization; the peasant-planted crops do not (Table 15). Thus, fertilizer use follows the use of improved seeds. The capitalist and large farmers use more and adopt the practice sooner. Since biochemical use, which because of its inherent divisibility is relatively scale-neutral, is so biased toward the larger farms, we can expect mechanical technology to be even more so. Indeed, this is so well known that we only mention it after having gone to some length to demonstrate that the adoption of biochemical technology is biased as well.

The institutional supply of inputs adds to the marginalization of peasant production that we have seen in the area of privately supplied physical inputs. The bias in the supply of public credit, for example, is so well known that most rural development programs emphasize credit for the "small" farmer, and many of the loans from institutions, such as the United States Agency for International Development (AID) or the World Bank after the early 1970s, were earmarked for the small farmer. For example, in Colombia in a noncommercial bank, the average loan for the peasant crops decreased during the late 1950s and early 1960s while it increased in two selected capitalist crops (Table 16). In the Dominican Republic, only the crops produced by capitalists can be said to be covered by credit, although some capitalist farmers producing peasant-dominated crops seem to obtain some credit (Table 17). Since, especially in the 1970s, inflation was high in most of these countries, the interest charged on most agricultural loans almost never covered the real cost of the loan--at least for the official loans. In many cases, the real interest rate charged was negative. Thus, the bias of credit toward capitalist agriculture represents a subsidy paid to the capitalist sec-

TABLE 11
Irrigation of Maize,
Mexico, 1960

Farm size hectares	Hybrid maize		Traditional maize	
	Total area	Irrigated area ^{a/}	Total area	Irrigated area ^{a/}
	percent			
< 5	0	<u>b/</u>	12	9
> 5	50	38	42	7
Ejidos	50	26	46	9

a/ Irrigated area as a percentage of total for that category.

b/ Insignificant.

Source: Secretaria de Industria y Comercio, Dirección General de Estadística, IV. Censo Agrícola Ganadero y Ejidal, Mexico, 1965.

TABLE 12
Distribution of Maize Area,
El Salvador, 1971

Farm size hectares	Hybrid maize		Traditional maize	
	Number of farms	Area	Number of farms	Area
	percent			
< 5	86	53	87	73
5-19.9	10	18	10	17
20-99.9	3	14	3	7
> 100	1	16	<u>a/</u>	2
Total	100	100	100	100

Source: Dirección General de Estadística y Censos, Tercer Censo Nacional Agropecuario, 1971, Vol. II, San Salvador, 1975.

a/ Blanks indicate insignificant figures.

TABLE 13

Percentage of Area Planted Under Improved Seeds,
Colombia, 1950-1972

Crop	Year	
	1967	1971
	percent	
Cotton	94	99
Rice	23	40
Beans	0	4
Corn	22	24
Wheat	45	26

Source: Departamento Administrativo Nacional de Estadística la Agricultura en Colombia, 1950-1972, Separata.

TABLE 14

Percentage of Farms Using Fertilizer, by Crop
and by Farm Size, Venezuela, 1971

Farm size hectares	Crop			
	Rice	Sugarcane	Manioc	Beans (Caraota)
	percent			
< 5	1	7	2	8
5-20	17	14	6	10
20-100	26	16	5	12
>100	38	37	8	15
All	17	14	4	9

Source: Ministerio de Fomento, Dirección General de Estadística y Censos Nacionales, Censo Nacional de 1971. IV. Censo Agropecuario, Total Nacional.

TABLE 15

Fertilizer Use by Social Category and by Crop,
Dominican Republic, 1975

Crop	Social category		
	Semiproletarian	Peasant	Capitalist
dollars per hectare			
Corn	0.00	0.48	5.44
Manioc	0.16	1.44	2.08
Sweet potato	0.00	0.16	0.00
Tomato	61.44	81.12	54.40
Rice	17.12	64.00	82.56

Source: U. S. Agency for International Development/Secretariat of Agriculture of the Dominican Republic, Sample Survey of Dominican Agriculture, 1975.

TABLE 16

Credit in Colombia by the Caja de Crédito Agrario Industrial y Minero (Nominal), 1954 and 1964

Crop	Average loan size		Total loan volume	
	1954	1964	1954	1964
	1,000 pesos			
Cotton	2.2	10.5	9,353	50,271
Rice	1.3	3.1	5,392	70,949
Beans	1.5	1.0	592	6,679
Manioc	1.1	0.6	1,368	21,010

Source: Caja de Credito Agrario, Industrial y Minero, Informe de Gerencia, 31 December 1965.

TABLE 17

Credit as a Proportion of Cost of Production, by Social Class, Dominican Republic, 1975

Crop	Social category		
	Semiproletarian	Peasant	Capitalist
Corn	0.00	0.03	0.03
Manioc	0.00	0.02	0.26
Sweet potato	0.00	0.00	0.11
Tomato	0.53	0.63	0.83
Rice	0.13	0.22	0.58

Source: U. S. Agency for International Development/Secretariat of Agriculture of the Dominican Republic, Sample Survey of Dominican Agriculture, 1975.

tor. The same holds for irrigation. In Table 18 and 19, for Venezuela and the Dominican Republic, we see that there is a bias in the use of irrigation toward the capitalist-produced crops or toward capitalist producers in general.

To conclude this section, we can claim that the distribution of inputs, both privately and publicly supplied, tends to marginalize peasant production in such a way that it either lags behind or is excluded entirely from the adoption and use of productivity-raising inputs and services.

D. Poverty and the Welfare Situation

The result of the slow but sure disappearance of the peasantry as producers of agricultural commodities is its reappearance as producers of only one commodity: labor power. Largely because this disappearance is taking place at a time when the worldwide development of the forces of production creates an impressive array of laborsaving technologies that are more profitable than is labor-intensive technology at any reasonable factor/price ratio at the disposal of agrarian capital, the labor power made available by the disappearance of the peasantry is not fully needed by the process of expansion of capital. The rural wage thus tends to settle not far above a low minimum, beyond which the fierce wage competition cannot drive it. Those who hold permanent or semi-permanent jobs begin to form a relative elite of workers who, although poor, are not desperately so. The large masses of the poor are thus found among the peasants who no longer are efficient commodity producers but who have not been absorbed into the capitalist sector or who provide only occasional, temporary labor.

The manifestations of this process are well known. According to the World Bank data, around 1975 some 42 percent of the rural inhabitants of Latin America had a per capita income of \$ 75 or less (World Bank). Judging from Table 20, where we see that the mean per capita income for the lowest 40 percent of the population appears to be about \$ 100 in 1963 dollars, the World Bank figure for 1970 seems adequate. In addition, there is some evidence that the situation may be worsening or may have worsened in the past two decades (Griffin, 1977). In El Salvador, for example, real income of the poorest three-quarters of the rural population may have declined by as much as 25 percent between 1961 and 1975 (Samaniego). In Guatemala also, the real income of the rural poor seems to have decreased (Griffin, 1976). In Peru, according to Webb, there has been no improvement in the level of material welfare of the poorest (Webb). Furthermore, where absolute poverty is so noticeable, the distribution of income in the countryside is notoriously unequal and worsening over time (Economic Commission for Latin America)

TABLE 18

Percentage of Farms Using Irrigation, by Crop
and by Farm Size, Venezuela, 1971

Farm size hectares	Crop			
	Rice	Sugarcane	Manioc	Beans (Caraota)
	percent			
< 5	1	25	8	13
5-20	5	18	9	11
20-100	6	14	6	10
>100	20	32	8	12
All	6	20	8	12

Source: Ministerio de Fomento, Direccion General de Estadistica y Censos Nacionales, Censo Nacional de 1971. IV. Censo Agropecuario Total Nacional.

TABLE 19

Percentage of Area Irrigated, by Crop and Social Category,
Dominican Republic, 1975

Crop	Social class		
	Semiproletarian	Peasant	Capitalist
	percent		
Corn	1	9	3
Manioc	5	9	32
Sweet potato	8	19	0
Tomatoes	100	100	100
Rice	26	56	60

Source: U. S. Agency for International Development/Secretariat of Agriculture of the Dominican Republic, Sample Survey of Dominican Agriculture, 1975.

TABLE 20

LATIN AMERICA: AVERAGE INCOME OF THE LOWER 40 PERCENT OF THE POPULATION
IN METROPOLITAN, URBAN AND RURAL AREAS 1970 (US\$ 1963)

Region	Country	Metropolitan Area	Urban Area	Rural Area
I				
Argentina (R)	-	542	-	-
Uruguay (R)	-	453	-	-
Panamá (SR)	673	871	448	-
Costa Rica (H)	782	1,228	1,104	649
II				
Chile (H)	610	-	790	440
México (H)	645	-	1,046	461
Venezuela (H)	-	1,479	1,056	-
III				
Brasil (R)	165	-	240	101
Colombia (R)	318	-	486	211
Honduras (R)	126	597	373	101
Perú (EAP)	-	255	-	-

KEY: R = Recipients
 SR = Salaried Recipients
 H = Household
 EAP = Economically Active Population

SOURCE: CEPAL, Social Development Division, based on a household survey,
1977.

While income itself remains a somewhat abstract category, the commodities it can purchase are not. Thus, it is by looking at levels of nutrition, mortality, education, and so forth that the consequences of poverty become clearest. For example, while in the United States the rate of nutrition-related deaths of children under five years of age was, per 100,000 population, in 1968 to 1972 only about 300, in most of Latin America it was well over 1,000 (Table 21). This rate seems to be much higher in rural areas.

The struggle of the marginalized peasant for a living has two other important consequences: ecological change and population growth. In the first case the competitive edge of capitalist agriculture has displaced the edge of the peasantry on the more marginal, and hence more vulnerable, lands. Furthermore, since scientific development has responded largely to the needs of commercial agriculture, there is an inadequate stock of know-how on dealing with marginal lands. The population explosion can also be seen as a result of the struggle of the semiproletarianized, marginalized peasant to deal with the conditions of his existence. By increasing the size of his family, the peasant attempts to increase the number of labor-market participants or direct helpers on the family's land. Thus, while high population growth may be irrational from a social point of view, it responds to an individual rationality.

The consequences of poverty, therefore, become social problems that tend to exacerbate the causes of poverty within the context of capitalist accumulation.

II. DEBATE ON THE PERMANENCE/ELIMINATION OF PEASANTS

It is actually impossible to understand the relationship between technological change and peasants and to make recommendations as to what kind of technology should or should not be developed for peasants without understanding the debate on the nature and future of peasants and taking sides on the issues. The key question debated is whether peasants can provide an active developmental force qua peasants or if they have been so penetrated and differentiated by capitalism that they are essentially reduced to the status of a cheap labor reserve for the capitalist sectors. For the first position, gradualistic improvement of peasant systems, intermediate technologies, and schemes of integrated rural development are at the basis of development programs. For the other, the defense of peasants is a more complex and contradictory proposition that we will discuss below.

TABLE 21

Americas (selected areas): Numbers and rates of nutritionally related deaths 1/ in children under 5 years of age, 1968-1972.

Country and area	: Total deaths		: Nutritionally related deaths		
	: Number	: Rate 2/	: Number	: Rate 2/	: Percent of total deaths
Argentina	:	:	:	:	:
Chaco Province	:	:	:	:	:
Resistencia.....	864	2,070	537	1,286	62
Rural Departments.....	837	2,387	429	1,224	51
San Juan Province	:	:	:	:	:
San Juan (city).....	326	1,292	174	689	53
Suburban departments.....	780	2,195	451	1,269	58
Rural departments.....	1,050	2,404	576	1,319	55
Bolivia	:	:	:	:	:
La Paz.....	4,115	2,660	1,958	1,266	48
Viacha.....	161	4,806	66	1,970	41
Brazil	:	:	:	:	:
Recife.....	3,635	2,934	2,413	1,947	66
Riberão Prêto	:	:	:	:	:
Riberão Prêto (city)....	464	1,088	324	760	70
Franca.....	434	1,943	278	1,244	64
Communities.....	228	1,301	152	867	67
São Paulo.....	4,312	1,769	2,537	1,041	59
Canada	:	:	:	:	:
Sherbrooke.....	371	407	179	197	48
Chile	:	:	:	:	:
Santiago.....	2,489	1,299	1,381	721	55
Comunas.....	225	1,396	120	744	53
Colombia	:	:	:	:	:
Cali.....	1,627	1,608	914	903	56
Cartagena.....	1,255	1,459	815	948	65
Medellín.....	1,348	1,445	835	895	62
El Salvador	:	:	:	:	:
San Salvador.....	2,738	2,636	1,487	1,432	54
Rural municipios.....	1,082	5,049	593	2,767	55
Jamaica	:	:	:	:	:
Kingston & St. Andrew....	1,903	1,038	1,125	614	59
Mexico	:	:	:	:	:
Monterrey.....	3,953	1,814	2,153	988	54
United States	:	:	:	:	:
San Francisco.....	234	544	125	290	53
California, suburban.....	664	413	372	232	56
Total.....	35,095	1,672	19,994	953	57

1/ Includes deaths in which nutritional deficiency and immaturity were identified as underlying or associated causes.

2/ Rates per 100,000 population.

Source: Puffer, Ruth Rice and Carlos V. Serrano, Patterns of Mortality in Childhood, PAHO, 1973.

A. The Populist or Campesinista Position

This position originates with Chayanov and other members of the Organization of Production School in Russia at the turn of the century (Shanin, 1972). For them, Russian agriculture was fundamentally composed of independent peasants, the traditional communal organizations were still pretty well intact, and inequality in farm sizes only reflected a process of demographic differentiation throughout the life cycle of peasant households (biological determinism). Peasants were thus seen as a stable element of society, and economic progress had to go through improvement of their production conditions. An alternative to both large-scale capitalist farming and collective socialist farming existed in the family farm organized in services and marketing cooperatives (Chayanov).

A similar neopopulist position has emerged vigorously in recent years, either as part of a quest for explanations to the staunch permanence of peasants in Europe and Third World countries or in appreciative admiration for the achievements of the family farm in the United States. This includes the works of Servolin, Vergopoulos, 1971, Gutelman, Diaz Polanco, Moncayo and Rojas, Rey, Archetti, Owen, and Cochran, among many others. In the United States the radical critique of the development of capitalism in agriculture took almost exclusively a populist expression (Hightower, Rodefied *et al.*, Berry). While going beyond the Chayanovian model where peasants are analyzed without attention to their relations with the broader system, the neopopulist position is essentially based on the postulates of functionality and stability of peasants under a capitalist society.

Functionality, in the sense that the family farm is seen as a superior institution in its capacity of delivering cheap food to the rest of the economic system. This is so because, while the productivity of labor is seen as equal or slightly lower in peasant than in capitalist farming, peasants have a cost advantage over capitalists since they produce without need for rent, profit, and implicit wages at the level of opportunity cost. The extreme populist vision presented by Servolin and Vergopoulos, 1971, is consequently that the ultimate capitalist reform is to entrust agricultural production to peasants and have in agriculture a "capitalism without capitalists". Moncayo and Rojas thus advocate redistributive land reforms and rural development programs as mechanisms of state intervention to habilitate peasants with this functional role.

The neopopulist position is also based on the postulate of stability since, while a surplus is being extracted from peasants through market relations, noncapitalist peasant modes of production are conceptualized as functionally articulated to and dominated by the capitalist mode of production. The theory articulation of modes of production developed by Pierre Phillipe Rey to explain the transition between feudalism and capitalism thus found unexpected application in attempting to explain

the permanence of peasants (Brabdy, Foster-Carter). Bartra thus speaks of "permanent primitive accumulation". Others like Roseberry and Wanderley, relying on Kaustky's analysis, look at peasants as food producers reduced to the function of workers working at home for capital. The family farm thus retains the formal appearance of autonomy but is, in fact, fully controlled by agribusiness and merchant capital and allowed a global return to resources equal to no more than a worker's wage. Reproduction of this articulated mode is explained either by the behavioral postulate that peasants are not profit maximizers or by surplus extraction through external relations of domination. In both cases, peasants are dispossessed of an investible surplus, and internal class differentiation is thus held in check. The peasantry is thus presumably able to fulfill its function for capital and reproduce itself as a uniclass mode.

The populist position has been criticized for failing to identify the capacity of capitalist agriculture to displace peasant farming and for failing to acknowledge social differentiation within the peasantry itself. Thus, Mann and Dickinson and Patnaik stress the superior productivity of capitalist farming in many branches of production and the fact that the permanence of peasants in certain regions and activities only denotes their unwilling reduction to poverty. Numerous empirical studies evidence the existence of deep class divisions among peasants and the high degree of proletarianization of a large majority.

B. The Proletarian Position

For Lenin, the Russian peasantry in the early 1900's was so deeply penetrated by capitalism and differentiated into social classes that any proposal to deal with the rural sector in terms of traditional peasants was merely utopian. Rural society was dominated by an agrarian bourgeoisie that had appropriated most of the land, and the bulk of peasants had been reduced to the status of semiproletarians. The political implication of this observation was that peasants should be mobilized in alliance with the proletariat and their petty bourgeois tendencies rapidly neutralized.

It is clear that in Latin America today the majority of peasants is highly proletarianized and that it is not because the absolute number of peasants may be large and sometimes increasing (see Table 7) that the social relations that characterize them qualify them as peasants in the populist sense. Numbers can not be advocated irrespective of a characterization of the underlying social relations. With feudalism essentially disappearing from agriculture under the combined forces of class conflicts, expansion of a labor market, and threats of land reform, and with the majority of peasants confined to subfamily land plots, external sources of income are essential. This results in rural-urban migrations,

seasonal migrations, and development of local labor markets. At the same time, insufficient employment opportunities and low wages force peasants to maintain and defend their ties to the land, adjusting for this purpose household patterns of division of labor by sex and age. Under this situation, peasant agriculture becomes a labor reserve that symptomizes both the use-elimination of peasants by the capitalist sector and incapacity of the capitalist sector to create employment and wage conditions that would lead to their full absorption as workers.

Since the bulk of peasants is objectively more worker than peasant, their welfare is highly dependent on employment and wage conditions and, hence, on successful implementation of a proletarian program. Subjectively, however, rural proletarians and semiproletarians remain attracted by peasant (populist) demands, creating serious contradictions for implementation of the proletarian position in the absence of effective political organizations. This ideological position is due to the fact that, for the rural poor, poverty comes historically from loss of the peasant status. Access to land remains the safest alternative source of income. Surveys of the ideological positions of rural workers in Brazil (Sigaud) and semiproletarian peasants in Mexico (Teran) both reveal this orientation.

For those who do not assume a populist stand and recognize the objective and/or subjective conditions of peasants as proletarians, at least four alternative positions can be identified.

1. Objective conservative position.

For those who acknowledge that a majority of peasants is dispossessed of land but who support perpetuation of the social status quo, the policy option consists in either advocating a "basic needs" program or off-farm employment and minimum wage regulations. Basic needs essentially approach poverty on the consumption side through the distribution of public amenities (Streeter, Overseas Development Council). It is the most conservative approach since it proposes to use fiscal revenues to establish welfare systems, with the case of Sri Lanka as a demonstration of the possibility of doing this even at low levels of economic development. Off-farm employment programs advocate the viability of smallscale enterprises, using arguments which are essentially the same as those used by populists to argue the superiority of the family farm (Chuta and Liedholm). Finally, minimum wage and job security programs attempt at transferring to workers a greater share of the benefits of the on-going development of capitalism (International Labour Organization).

For those who acknowledge the dispossessed condition of peasants and accept social change within agriculture, redistributive

land reforms to create "commercial family farms" are advocated as a necessary precondition to effective rural development programs. This is the position argued by Wortman and Cummings even though no workable proposal is put forward as to how land reform can be achieved.

2. Subjective Conservative Position.

For those who advocate the social status quo in the context of capitalist social relations where commercial agriculture monopolizes the bulk of the land and where the majority of peasants is reduced to a semiproletarian and proletarian status., rural development programs are proposed as schemes for political stabilization. In this case, creation of a rural petty bourgeoisie out of the upper peasants serves to buffer out increasingly antagonistic classes since the petty bourgeoisie is economically tied to the interests of commercial agriculture and ideologically identified with peasants. The scheme is seen, in particular, as a way of decreasing pressure on the land in capitalist farming and demands for extensive land reforms.

3. Objective Progressive Position.

For those who acknowledge the proletarianized condition of peasants and either disregard the subjective contradiction or propose to resolve it by "concientization" programs, the alliance between urban workers and proletarianized peasants is seen as the basis for social change. Upper peasants are to be opposed and rural development schemes without collectivizing land reforms are denounced as reactionary.

4. Subjective Progressive Position.

In this case, both the proletarianized condition of peasants and the petty bourgeois nature of their ideology are acknowledged. The "national bourgeois revolution" is seen as an important tactical phase. As part of it, peasants' demands for land reforms and for rural development programs should be satisfied. Yet, these are seen as means of political mobilization--not as ends in themselves. Hence, the collective nature of land reform and the organizational/participatory aspects of rural development are stressed. Both land reform and rural development should, to the largest extent possible, be managed by peasants themselves. The social dynamic thus created can, in turn, be directed at social change. In this view, then, technological change is seen as an instrument of social change--not as an end in itself.

III ALTERNATIVE ROADS TO THE SOCIAL DIFFERENTIATION OF PEASANTS

In this part we will look at the way classical writers on political economy and politics have theorized the differentiation or the destruction of the peasantry. Then we will look at modern concepts of differentiation. Throughout, we will concentrate largely on those aspects of the theoretical schemes that emphasize, in one way or another, the role of technology.

A. Classical Schemes

The classical bourgeois political economists, rather than theorizing about the differentiation of the peasantry, theorized about its nondifferentiation. It is important to categorize this as one road to differentiation, if nothing else, because the theories of these classical political economists provide some important insights into the nature of differentiation and some of its technological determinants.

The idea, associated with Adam Smith and John Stuart Mills, is that, since agriculture is so dependent on natural phenomena or, more importantly, on sequences of natural phenomena, the division of labor is limited. In this case, large operations have no advantage over smaller operations. At the same time, according to Smith, this accounts for the peculiar fact that (in his times) the rate of technological progress in agriculture was not as fast as in industry. Thus, the richer nations, while more productive in both industry and agriculture, were much more so in industry (Adam Smith). Here we are not concerned with whether or not this point of view is absolutely correct. The important, and very plausible, insight is that, to the extent that agriculture remains a phenomenon linked to sequences of natural phenomena, the penetration of the division of labor and of capitalism is somewhat limited. Thus, many of the scientific and infrastructural efforts of the capitalist state that are directed toward agriculture aim to make it more and more independent from sequences of natural phenomena. Irrigation minimizes the dependence on natural rainfall. Genetic research minimizes dependence on specific sequences of warmth and cold and sunlight and darkness. We will return to these points below when we look directly at technological issues.

Starting with Marx himself, Marxist political economy saw no inherent barriers to the penetration of capitalism into agriculture. This position was based on a perception of the possibilities of economies of scale in agricultural production.

For Marx, the causes of the downfall of peasant agriculture were:

1. The "destruction of rural domestic industry, which forms its (peasant agriculture's) natural supplement as a result of the development of large scale industry".
2. "Competition, either of the plantation system or large scale agriculture. Improvements in agriculture, which on the one hand cause a fall in agricultural prices and, on the other, require greater outlays and more extensive material conditions of production" (Marx, p. 807).

It was, however, Kautsky who did the most to develop the Marxist point of view about the possibility of economies of scale in agriculture. The sources of superiority of large farms, according to Kautsky, were the following:

1. Most farms have a certain fixed investment of invariable size which therefore decreases as a proportion of total cost as size increases. Other investments increase in cost less than the increase in capacity they make possible. Fencing one plot of 100 hectares costs only 10 times as much as fencing one plot of one hectare, so that fencing 100 plots of one hectare each cost, in wire and labor, 10 times more than covering the same area with only one plot.
2. Recurring costs are higher in a given area if this area is subdivided. This is due to waste of time in working the length of a farm, given its width, and in hand labor in corners not amenable to machine work.
3. Even if machines are divisible, or small, a number of small farmers will need more of them than will one larger farmer to cover the same area.
4. But there are many machines that are not divisible.
5. The larger farms permit more of a division of labor in the handling of machinery. Also, larger farms permit specialization of breeds and, hence, increased efficiency: the large capitalist farmers can specialize by having milk cows, whereas the small farmer's cattle must work, provide milk, and later provide meat. Also, large farms can take advantage of the division of labor between manual and intellectual tasks. Only large farms, for example, can afford to hire accountants or agronomists.

6. Finally, in the category of physical or agricultural advantages, Kautsky cites irrigation and drainage works that operate efficiently only on a larger scale. The loss of water from an irrigation system, for example, rises less than proportionately with the size of the system.
7. Then Kautsky mentions the economies of scale inherent in the intermediation and credit processes. Obviously, it takes 10 times as many transactions to conclude 10 deals of \$ 100 as it does for one of \$ 1,000. Hence, middlemen tend to favor larger farmers by giving them better prices or by purchasing more at the farmer's convenience, by paying for transportation, etc. There are extremely important but often intangible effects. Kautsky also mentions credit, pointing out again that, because of transaction costs of one sort or another, the rates charged to small farmers must be larger (Kautsky).

After Kautsky, no explanation about the possibility of economies of scale in agriculture has contained anything substantially new, either in the Marxist field or in the bourgeois field. Lenin, for example, in his analysis of the impact of the introduction of machinery in agriculture, says essentially the same thing as did Kautsky (Lenin). Those who disagree with Kautsky's analysis, on the other hand, have not added to the understanding of the issues. Usually, those who claim that the peasant unit is not as inefficient as did Kautsky simply claimed that the factors listed by Kautsky are not strong enough--that the economies of scale they generate can be captured on relatively small noncapitalist farms.

Given this point of view on technology, classical Marxist authors analyzed three ways in which capitalism develops in agriculture in the context of the countries that they analyzed. The classical, or English, way involves the differentiation of the peasantry into farmers and proletarians in a situation in which landlords retain control of the land. This is largely the situation analyzed by Marx (Marx). It is important to understand that capitalism has its genesis in the ranks of the peasants and that it was the struggle of the peasants against the landlords that personified the struggle between feudalism and capitalism (Dobb). Thus, Marx sees a differentiation which is only latent in the peasant class but which begins to emerge as soon as rents begin to turn into money rents. The classical or English way in itself is not particularly interesting to us because the processes of capitalist development in Latin American agriculture do not resemble it.

Kautsky's description of the process of capitalist development in agriculture and, to some extent, Lenin's have been called the "Prussian" or "junker" path of development. According to Kautsky's description of the Prussian process, the end of serfdom automatically brings about a massive proletarianization of the peasants. The landlords-turned-capitalists thus emerge with a competitive edge over small-scale production so that the development of capitalism among the peasants becomes impossible. Under these circumstances, the only competitive advantage of the small farmer is the production of labor power. According to

Kautsky's analysis, a rural home is inconceivable, or impractical, without some land. Hence, rural proletarians do not become totally dispossessed of means of production: they remain as semiproletarians, with the appearance of being peasants.

Lenin analyzed a process of development that has been called the "American" or "peasant" way. Here, as opposed to the junker or the British case, the end of serfdom implies that the peasants get to keep significant amounts of land. Again, however, as in the British case, the peasants emerge from serfdom already in a semidifferentiated state, as some peasants receive larger allotments of land than do others. On this basis, differentiation continues via competition so that in time some peasants are impoverished and others become rich.

The most important single aspect of the transition to capitalism in agriculture is the implantation of a system of bourgeois property rights, or modern property as we know it, for it is this implantation of private property that makes it possible to separate the direct producer from the means of production and is therefore ultimately responsible for the emergence of a proletariat. In situations where there are common lands, or where there is private property but homesteading on government lands is possible, the development of a capitalist agriculture is hindered by lack of labor market.

B. New Roads

In addition to the classical ways, which apply largely to social formations (except perhaps to the Prussian way) where the development of capitalism is essentially internal to the social formation, there are analyses that apply to social formations affected by imperialism. The classical analysis of this situation was carried out by Rosa Luxemburg (Luxemburg). According to her, the process of expansion of capitalism resulted in the development of capitalism in the noncapitalist regions of the world. She identified three steps in the process. There is the struggle against natural economy. If the peripheral areas are to serve as producers of inexpensive commodities and to help resolve the problem of realization of surplus value, the natural economy, wherever it exists, must be broken down. Furthermore, labor in these communities is bound to the means of production: this bond must be broken. After the commodity economy exists, capital can take the place of simple commodity production. And, after the bond between labor and the means of production is broken, a process of differentiation can start among the remnants of the members of the dominated communities.

The modern paths toward capitalist development common to the peripheral nations today are variants of those paths that were identified by the classical Marxists and of the imperialist impact analyzed by Luxemburg.

In many Latin American countries, for example, modern landed property was established either in the second half of the last century or early in this century. On this basis, a process of land concentration (which deprived traditional owners of their common property) and of fragmentation (which helped to break up the old semifeudal latifundia) laid the basis for the emergence of capitalism along several paths, of which we identify four. First, in those countries where there is a strong peasantry (that is, where there was, in the 19th Century, a strong numerous class of petty commodity producers as in Costa Rica and the Dominican Republic), during the 20th Century there has been a process of differentiation along the classical lines of the farmer road. Secondly, once private-land property was established, urban interests, such as agricultural middlemen and technocrats (such as agronomists) began to invest in land, perhaps initially as a hedge against inflation or because industrial investment opportunities were unavailable, and they became agrarian capitalists. Thirdly, old semifeudal latifundia have been modernized through market pressures, the pecuniary ambitions of the landlords, or, in the more recalcitrant cases, through the pressure of land reform in the 1960s and the 1970s. Finally, there has been the large impact of foreign investment. Even in the late 19th Century, there were important American investments throughout the Caribbean; those investments seem to have been expanded in the era of the multinational corporation, although most investments in modern days have taken place in the industrial sector. The investments of American corporations around the turn of the century in Central America and the Caribbean were one of the factors that forced the definition of modern property rights which, in turn, was one of the factors exacerbating the early guerrilla-type activity that the many U.S. armed interventions in the area were intended to squash.

C. Factors Affecting the Rate of Social Differentiation

We will now deal explicitly with technological and institutional factors that affect the rate of differentiation. We established above, in the first part of this paper, that a division of labor between capitalist and peasants agriculture has been established where one type of agriculture specializes in certain products and the other takes over other products. In looking at the factors that accelerate or retard differentiation, we will also be able to propose explanations as to why this division takes place.

1. Technological factors. In the first place, there are factors that begin to divorce agriculture from dependence on sequences of natural events. These tendencies seem to have developed first in processes that are not very dependent on area, i.e., that produce a great deal of value on a small surface area. These products are the easiest to isolate from nature. Thus, there is the development of hydroponics in vegetable production and the development of a completely industrialized broiler industry, even in much of the Third World. Similarly, irrigation projects help to free agriculture, to some extent, from some of the constraints of natural phenomena. Thus, capitalism develops more quickly in these projects and in crops that best capture the better supply of water. This is why the modern seeds of many cereals require irrigation for proper development and, with irrigation, yield much more than do traditional varieties. It is also one reason why the use of those varieties encourages the development of capitalism. Besides this, there are other types of research oriented at freeing agriculture from nature; some are aimed at the genetic alteration of plants and their sensitivity to natural cycles.

Secondly, there are factors that increase the organic composition of the production process. According to Engels, capitalist penetration into branches of production previously dominated by petty production occurs sooner in those branches in which the organic composition is higher because it is there that price can deviate from value most and begin to provide the merchant with the capital to capture the rate of profit he is accustomed to acquiring in the circulation sphere (Engels). Unfortunately, this argument depends on the notion of a historical process of transformation of values into prices, a notion which, according to some modern Marxists, is of questionable validity (Morishima and Catephores). But it need not depend on this concept. If we accept that peasant producers can, even though they may not always or regularly do so, produce at an implicit wage below the wage paid in the capitalist sector, it is evident that, in those branches of production where the organic composition of the production process is very low, it will be relatively easier for the peasant production unit to resist competition from capitalist units which must use hired labor power. The idea that peasant families "self-exploit" themselves to an extent greater than the workers are "exploited" on capitalist farms (in the non-Marxist sense that they receive a lower wage) is not as unlikely as it may seem at first. If it were not so, it would be hard to explain, for example, the large amount of open, involuntary unemployment, particularly in certain seasons. In any case, the argument is that technological developments that increase the efficiency of the production process by raising its organic composition reduce the margin by which peasant producers can out-compete capitalist producers. Here it is important to note that almost any technical development of any sort is likely to raise the organic composition of the production process. Sophisticated new seeds, for example, are likely to be costlier than traditional seeds, even if they are more productive. Hence, unless the mere use of new seeds changes the

requirement of labor power in an upward direction, it is likely to increase the organic composition because seeds are part of constant capital. Herbicides and pesticides almost certainly increase the organic composition because, while their application requires labor power, the labor power required for weeding and manual pest control decreases. Mechanical innovations evidently also raise the organic composition. Hence, almost any innovation is likely to decrease the peasant's chance of survival, according to this factor.

Thirdly, there are factors that increase the size of the optimum production level or the amount of investment necessary to produce efficiently. This is the most traditional Marxist argument. The same argument has been used by Claude Servolin to explain what he sees as a division of labor between capitalists and peasants. According to him, many of the technological innovations of the past raise the minimum investment necessary, but they do not increase the scale of production and the demand for labor power per unit of optimum size so much as to necessarily drive out family farms from all branches of production. Only in branches where the necessary investment is truly massive and where the optimum farm size demands more labor power than the family can provide do we find capitalism penetrating (Servolin). As we saw in reviewing Kautsky's ideas on the development of capitalism, the type of technological development that is likely to increase the optimum scale is that which requires a large fixed investment in order to minimize costs. Therefore, mechanical or infrastructural innovations are most likely to aid capitalist development. Alternatively, genetic innovations that maximize the sensitivity of plants to infrastructural investment also would encourage the development of capitalism. Thus, plants that would significantly increase yield and efficiency only with mechanical plowing and harrowing are likely to benefit more those farmers who can perform these tasks mechanically.

Fourthly, and finally, there are innovations which, by decreasing the production time, increase the rate of turnover of capital. According to Mann and Dickinson, the profitability of capital in agriculture is lowered by the fact that the production time (that is, the amount of time capital is actually tied up on the production process) is much larger than labor time (that is, the amount of time over which surplus labor is purchased by the tied-up capital). This renders agriculture relatively unattractive to capital, thus leaving the field open to peasants to a larger extent than do most other sectors of the economy. The capitalist state, therefore, directs scientific efforts toward shortening the life-cycles of crops and cattle. And, to the extent that these efforts succeed, they remove constraints on the field of activities amenable to penetration by capital (Mann and Dickinson).

2. Institutional factors. In this section we discuss briefly certain institutional factors that encourage the development of capitalism in agriculture, again emphasizing those aspects that are relevant to technological issues. We emphasize first the institutional factors which we consider to be "closer" to economic-technological issues than the sociopolitical factors we discuss below.

First, there is the marketing mechanism. As we saw in our review of Kautsky, in marketing there are very important economies of scale that often are passed on in the form of volume discounts or price premiums or in imperceptible ways (free transportation, providing the labor power for preparing the product for market, making bulk and breaking bulk in such ways that the product is more appealing to the wholesaler, etc). These economies of scale are the result of large fixed costs in marketing, transportation, and storage and handling, consisting of costs of trucks, load lifters, warehouses, etc. Even the labor power in marketing, especially in underdeveloped countries, is a sort of fixed cost: because the laborers must be paid by the day, it is more economical for the intermediary to spend the whole day loading the product of one farm than to waste time in travel between small farms. The money thus saved is often passed on to the large farmers in the ways mentioned previously (LeVeen).

It is important to realize that what applies to the marketing of the product also applies to the inputs. Hence, any technological development that increases the need for market-purchased inputs increases the indirect economies of scale that the farm can capture. And, since most technological innovations must, almost by definition, increase the peasant's dependence on the market through the input side, they are likely to increase the pressure on farms to grow. In this sense, hybrids are more likely to encourage capitalist development than are new varieties; new varieties that are demanding in terms of fertilizer are more capitalist-oriented than are varieties that do not depend on chemical fertilizers (perhaps by fixing nitrogen themselves). Alternatively, technologies that increase the farmer's ability to make on the farm fertilizer of high quality and sufficient quantity would decrease the pressure for farms to grow larger.

Secondly, the provision of credit is subject to the same economies of scale as those of marketing for the same reason: high fixed transaction cost. The technologies that increase the need for purchased inputs simultaneously increase the need for credit, thereby adding another source of competitive advantage to large farms. If agricultural credit is subsidized, as is often the case, technologies that increase the need for credit help larger farms to capture the subsidy even more disproportionately than would normally be the case, especially because subsidized credit has led many of the state-affiliated agricultural banks to increase transaction costs as a hidden interest charge, thus increasing even further the economies of scale in credit.

Thirdly, concurrence on the labor market of semiproletarians available on a seasonal basis subsidizes unilaterally the capitalist sector and accelerates the demise of peasants as producers of a marketable surplus. Since semiproletarians can work for a wage that is only the difference between the cost of maintenance and reproduction of labor power and subsistence needs insured by production in the home plot, wages paid are driven to that minimum level by fierce competition among semiproletarians on the labor market. In addition, plentiful availability of seasonal labor implies that labor costs need only be incurred in the strictest minimum number of days. Semiproletarian peasants thus subsidize capitalist farms while upper peasants (family farms) cannot take advantage of this source of surplus value. The subsidy is transferred into higher land prices or lower market prices or lower market prices according to elasticity of demand and relative power of agrarian and non-agrarian interest. In both cases, upper peasants are either driven out of production or forced to internalize cost disadvantages into higher levels of self exploitation.

3. Social and political factors

Beyond the technological and institutional factors we have already discussed, there are broader factors that affect the rate of differentiation of peasantries. Since these are somewhat outside the main thrust of this paper and since the authors have dealt elsewhere with these issues specifically, we discuss them only briefly (Crouch and de Janvry).

In the first place, there may be leveling mechanisms that are internal to the peasantry itself, such as communitarian practices that redistribute wealth and thus prevent, or slow down, its accumulation by specific individuals. These practices take the form of symmetrical labor exchanges (mano de vuelta) and of redistribution of consumption through ceremonies where the more economically successful individuals derive status by spending on the consumption of others (Cook and Diskin on the Zapotecs in Oaxaca).

Secondly, it is possible that the capitalist state itself may impose certain constraints upon peasantries, oriented at preventing the differentiation of the peasantry. The purpose of this would be to maintain the capacity of the semiproletariat to reproduce itself as a semiproletariat by paying part of its costs of reproduction, in the face of the disintegrating effect of capitalist competition. Since this capacity depends on the nexus between the worker and his kinship-land network, the state may attempt to create conditions that isolate these kinship-land networks from capitalism. The ejido in Mexico and the

reserves in South Africa are often cited as examples of such attempts (Wolpe, Stavenhagen).

Thirdly, it has been argued that, through the formation of cooperatives, peasant farmers can take advantage of the economies of size and all of the technological factors that would otherwise lead to differentiation.

It is obviously beyond the scope of this paper to evaluate which of all of these factors is most important, or even whether any of them is strong enough either to cause a differentiation of the peasantry or to block it. In the first place, the literature on this is inconclusive. Secondly, it is highly historically and geographically specific. Hence, a quick summary is impossible.

IV. PATTERNS OF SURPLUS EXTRACTION

In this part, we turn to a brief exploration of the interrelations between the patterns of surplus extraction and technological progress. We make our point of departure the well-known idea that one of the defining characteristics of peasantries is that they are a surplus-yielding class (Wolf).

A. Precapitalist Forms: Rents in Labor Services and Rent in Kind

In the case of these types of surplus extraction, we distinguish, essentially, two situations: the truly feudal situation, where the rent relation is not a contractual relation, an exchange of product for land, but a servile or power relation; and the pseudo-feudal relation where the landlord's relation to the peasant is purely economic.

In the first situation, the form of surplus extraction blocks the adoption of technology for the reason discussed by classical Marxists. The fact that the surplus appropriator has an extra-economic right to the surplus means that no amount of inefficiency, vis-a-vis the others, can deprive him of his status as a surplus appropriator. In this kind of a situation, surplus extraction, therefore, tends to be of an absolute nature; and the increase of efficiency is blocked (Brenner).

The second situation would be typical of countries where the self-landlord relation is illegal; where, therefore, the lord cannot force the peasant to yield rent to him. Here, the lord has to depend on economic mechanisms to extract surplus from the peasant; hence, the traditional Marxist explanations about the backwardness of the productive forces under feudalism is too general. Under these conditions, two factors can retard the adoption of production-increasing changes. If in the rent-in-kind arrangement the landlord pays only some of the costs but takes a large percentage of the rent, then the marginal productivity of the input in question has to be much higher than would be the case if the sharecropper were a small owner. For example, if the landowner paid only the initial costs, such as plowing the land, cleaning up irrigation ditches, and so forth, and claimed half of the output, then the marginal productivity of, say, nitrogen would have to be twice as high for the sharecropper to fertilize at the same level an owner would. Of course, if the landowner and the sharecropper shared the same costs and returns, the situation would be different; but this is rather unusual. Another factor which may retard technical change in the case where it is the sharecropper's condition to be in perpetual debt to the landowner that ties them together is that the increase in productivity may, if the sharecropper's tendency to consume out of the increase in productivity is small, allow the sharecropper to eventually cancel the debt and so break the bond to the landowner (Badhuri). Here, the landowner will block technological developments.

B. Capitalist Forms: Cash Rents, Terms of Trade, and Surplus Value

Cash rent, being independent of the amount of production, does not retard technological change in the same way sharecropping does. Indeed, there is really no difference between cash rent and land ownership since, theoretically at least, the price originally paid by the owner is equal to the discounted stream of cash rent payments he would have otherwise had to make. Of course, the true owner can capture capital gains, but this is beside the point. Even in this case (either cash rent or land ownership), of course, technical progress in agriculture is retarded relative to what would be possible under the ideal capitalist condition: nationalization of the land. But this is, again, beside the point.

Thus, we can conclude that of all types of rent arrangements possible, cash rent is least likely to retard technical progress; but the fact that there is private ownership of land is an ultimate barrier since so much capital is constantly tied up in it.

There are several types of surplus extraction via price formation which, if we stretch the term a little, can be called forms of

unequal exchange. In the first place, there is competition between peasant producers of a given crop and capitalist producers of the same crop. If the capitalists are able to produce more efficiently using a technology that is not accessible to peasant producers, the peasant producers will be using more than the socially necessary labor in the production process and, hence, yielding labor to society in a form which, incidentally, benefits no one, is wasted. This very need of the peasants to overwork themselves in turn tends to prevent their adoption of any technological improvements, not to mention those that enable the capitalists to outcompete them. Secondly, there is the role of merchant capital. It is clear that merchant capital, if it is of a monopolistic nature, as it usually is, and especially if it can use its power at the level of the state to politically enforce certain terms of trade, can retard technical change. This can happen both at the margin, since the decreased price of the output lowers the output/input price ratio and, hence, lowers the optimum level of input use, and in a source-of-funds sense since the decreased price lowers the rate of profit (or the rent) the farmer captures and, thus, reduces the funds available to him to finance investments. In this context, it is clear that peasant producers will be in a worse situation than capitalist producers. This is due to the fact that, while the merchants dealing in capitalist-produced goods are likely to be quite as monopolistic as those dealing with peasant-produced goods, capitalists are more likely to countervail the merchant class power at the level of the state thus maintaining more favorable prices for themselves in spite of the monopolization of the trade activity. Thirdly, in cases where there is considerable influence, at the level of the state, from the industrial classes, it is likely that the price of wage goods will be relatively depressed, especially to the extent that these wage goods are produced by peasants. If the peasant's need for consumer goods is low enough, and if other means of access to cash (such as wage employment) are unavailable (due to, for example, high unemployment rates), the supply of peasant-produced goods is likely to be inelastic so that artificially depressed prices will serve to extract surplus from peasant producers and, hence, limit the funds available for investment activities.

The final form of surplus extraction we will deal with is surplus value; that is, surplus yielded by the peasants in their role as semiproletarian suppliers of labor to the capitalist sector. In this context, there are two important points of notice. First, to the extent that the peasant is more and more proletarian, the role of farming as a source of income evidently decreases. Hence, the peasant-semiproletarian's interest in technological change is likely to be small. Secondly, to the extent that production on the peasant farm is merely a part of variable capital on the capitalist farm for which the semiproletarian is made responsible, increases in productivity in the peasant sector are likely to result in decreases in the part of variable capital which the capitalists are responsible for. Thus, to hope that increased productivity on the farm, as a result of the adoption of a particular

package, will simultaneously increase the peasant's income, thus enabling him to make further investments and "hooking" him on technological change, would be rather vain. An alternative, and likely, scenario is that the increase in productivity would result in lowered wages thus, perhaps, leaving the peasant interested in technical change but not enabling him to retain any surplus with which to finance the adoption of a new package.

To conclude, we have identified the many ways in which the specific patterns of surplus extraction may operate to speed up or retard technological change on peasant farms. We have seen that rents in kind are much more likely to retard technical changes; that the presence of monopolistic merchants is much more likely to retard technical change when it is peasants, rather than capitalists, who face these merchants; that the adoption of technical change is likely to be lower in the case of wage foods produced by peasants, and fastest in the case of nonwage foods produced by capitalists, if the industrial class has influence at the level of the state; and, finally, we saw that the extent of semiproletarianization of the peasantry is likely to have a retarding impact on the rate of technical change among peasants.

V ORGANIZATION OF THE PEASANT HOUSEHOLD

The peasant household is a particularly complex unit since it embodies processes of production, circulation, and reproduction of both the means of production and labor power. Yet, it is essential to understand how these processes operate since they condition the behavior of peasants toward technological choices.

A. Key Process in the Peasant Household

Since the peasant household is so multidimensional, it is useful to start from a framework that integrates and classifies the many variables that characterize it. This will be particularly useful to design surveys and to conduct empirical analyses of peasant households. Such a framework was recently developed by Deere and de Janvry, and we briefly restate its essential features here.

At a given moment in time, the stock of family labor, in relation to the household's access to the means of production, is reflected

in the particular division of labor by sex and age embodied in the household labor process. Household labor power is used in the home-production process or sold as wage labor on the labor market where it participates in what is termed here the wage labor production process. A continuous spectrum of combinations between the two pure extreme types of households -purely agriculturalist and purely proletarian-can be identified.

Household labor, dedicated to home production, generates a gross product which is either retained as a use value by the household for home consumption or sold on the market as a commodity (the circulation process). Here, again, a continuous spectrum between pure subsistence household production with no marketable surplus and the pure commercial farm that is exclusively producing for the market can be identified.

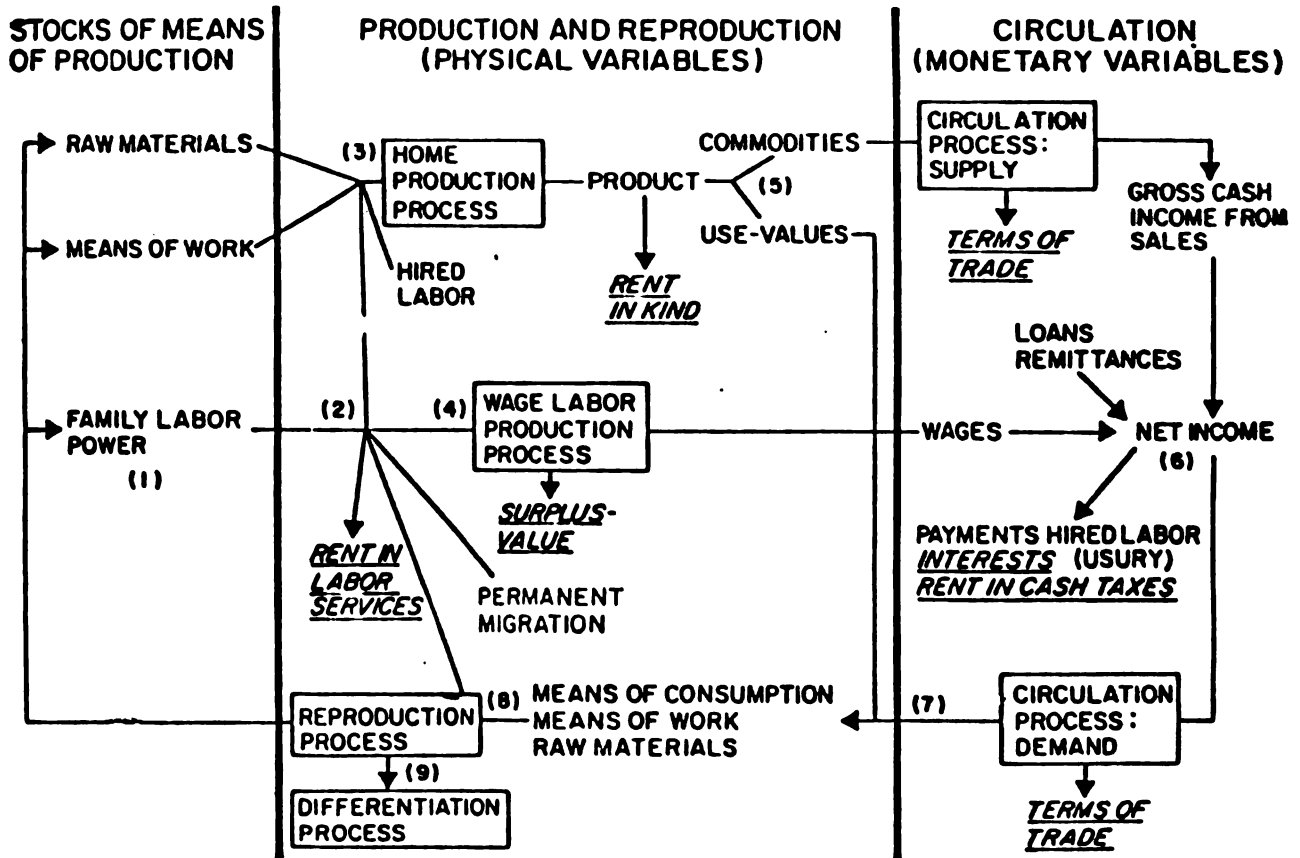
The sale of commodities and the wages received from the proletarian labor process constitute the gross monetary income. This income, after deduction of the various monetary costs involved in production, generates a net income which permits the purchase of means of consumption for reproduction of the household and means of work for replacement and net investment.

Means of consumption and means of work, derived from both home production and purchase, sustain the reproduction of the household as both a consumption and a production unit (Meillassoux). Reproduction includes both daily maintenance to restore the capacity to work and generational reproductive activities reflected in the size, age and sex composition of the household. The scale of this reproduction, in turn, determines the pattern of social differentiation and the consequent changing class position and composition of peasants.

The four key processes identified characterize the organization of the peasant household -home production process, wage labor production process, circulation process, and reproduction- differentiation process. They are schematized in Figure 3. In the left-hand column, the stocks of means of production at a particular point in time are identified. They include raw materials (land and water), means of work (seeds, trees, animals, tools and implements, fertilizers, and fuels), and family labor (number, sex, and age of members). In the right-hand column, the monetary variables that characterize the circulation process on both the supply and demand sides are presented: gross cash income from sales, wages, net income formation, and purchase of means of consumption and work. The center column highlights the two fundamental processes of production (home and wage labor) and reproduction (of the consumption unit and of the means of work). These two key processes are partially mediated through circulation in terms of the formation and disposition of net income and also directly reflect the social relations of production.

FIGURE N° 3

ORGANIZATION OF THE CAMPESINO FARM HOUSEHOLD



LEGEND:

() LEVELS OF EMPIRICAL ANALYSIS

— MECHANISMS OF SURPLUS EXTRACTION

From Figure 3, nine key sets of variables can be identified for the empirical analysis of the peasant household. These variables correspond to the different nexuses which indicate that either a process of choice and decision making is taking place or that an accounting identity can be established. They are (a) the stocks of means of production at time; (b) division of labor by sex and age in the household process; (c) choice of activities (products and technologies) and allocation of resources in the home-production process; (d) choice of activities and job search in the wage labor production process; (e) disposition of the product between sale (marketing) and retention for home use; (f) the formation of net income (sources of income); (g) effective demand-disposition of net income; (h) reproduction of the consumption unit (family labor) and of the means of work-acquisition of raw materials; and (i) the level of stocks of means of production at time $t + 1$ which provides the basis for the analysis of social differentiation.

1. A typology of peasants

A characterization of peasants at the above three levels (class position within particular modes of production and roads of development of capitalism; patterns of surplus extraction and, hence, of subordination to other classes; and organization of the peasant household as a unit of production, circulation, and reproduction) permits us to construct a typology of peasants which, in turn, provides a partial characterization of the agrarian structure.

First, there are instances where may be one of the two essential classes of a particular mode of production, whether this mode is dominant or not in the social formation. This is the case for peasants under feudal and communal modes. We thus have:

- a. Semifeudal peasants: They are usually internal to the landlord's estates and allowed the usufruct of a plot of land, which absorbs necessary labor, in exchange for a rent-in-labor services or in kind. They are submitted to a variety of forms of economic and extraeconomic coercions (debt peonage, etc.) that prohibit or seriously limit their mobility.
- b. Incorporated peasants: They are part of traditional communities dominated by caciques or aristocratic classes that submit peasants to payment of tribute and to forced labor. Symmetrical relations of labor reciprocity and redistribution of consumption tend to exist among peasants.

We reject the concept of articulation of modes of production between the capitalist mode and a peasant or parcelario or simple commodity mode (see Crouch and de Janvry). Instead, with capitalism dominant and peasants no longer incorporated in feudal or communal modes, peasants become an intermediate fraction of class with a "contradictory class location" (Wright) between the essential classes of the capitalist mode of production: bourgeoisie and proletariat. According to the road of development of capitalism followed, the rural bourgeoisie itself can be a junker class, a farmer class, a merchant-technocratic class, or a class associated to international agroindustrial capital. The two essential classes -bourgeoisie and proletariat- define the outer upper and lower limits to peasants. The rural bourgeoisie is a net employer of salaried labor while the rural proletariat only derives its income from the sale of labor power. Within these outer limits, we find a whole range of types of peasants.

- c. Rural petty bourgeoisie or family farmers: Within a reasonable (?) range, this fraction of class is neither a net employer or seller of labor power. Among peasants, it is the main source of a marketable surplus and, hence, the main recipient of technological change and a potential customer of rural-development programs. In some cases, it can become fully subordinated to industrial and merchant capital through external specification of the labor process thus reducing it to the status of workers working at home for capital (Graziano da Silva). It is the category that tends to differentiate into rural bourgeoisie and semiproletariat.
- d. Semipeasants and semiproletariat: This is the most numerous and heterogenous category of peasants in Latin America today. Insufficient control of raw materials and means of work imply the need to complement home production (agriculture and handicrafts) with external sources of income including wage work, commerce, and remittances for migrants. At the same time, insufficiency, uncertainty, and seasonality of these external sources of income force peasants to be fiercely defensive of their land plots. The category includes sharecroppers (rent in kind without extraeconomic farms of coercion) and tenants (rent in cash). While some vertical mobility toward the rural petty

bourgeoisie is possible, most semiproletarians are in the process of continuous deterioration of their condition of peasant producers. Remnants of communitarian relations with symmetrical relations of work and exchange may, in some instances, serve to limit the pace of decomposition.

B. Choice of Activities and Choice of Techniques

The choice of activities and of techniques on peasant farms is affected by a number of factors both internal and external to the farm. To understand why certain techniques are adopted and others not and to explain the pattern of diffusion of new technologies among farm and regions, it is important to identify what these factors are.

1. Factors internal to the farm

- a. Agroclimatic Conditions. Seen in a historical perspective, it is no wonder that commercial agriculture tends to be located in the most favorable and homogenous ecological-locational areas while peasant agriculture has been pushed to the more marginal areas. Thus, while the technological packages of the Green Revolution spread rapidly in commercial agriculture (when economic conditions allowed it), the limiting factors to yield increases in peasant agriculture are much more varied and complex. In the Andes, for example, the microclimatic heterogeneity of peasant systems is enormous. Since, as Perrin and Winkelmann observed, "agricultural technology is more site-specific than we were led to believe by some of the early successes with wheat and rice varieties" (Perrin and Winkelmann), this means that new technologies for most peasants will either not be available or will be developed at high cost relative to the extensiveness of their potential area of application.

Beyond enormous heterogeneity, peasant land plots also tend to be characterized by poor soil quality, erosion, high gradients, and lack of irrigation facilities. In some instances, centers of economic activity have moved over time so that areas of peasant settlement, which were originally located close to active

markets, are now remote from centers of effective demand. With the collapse of indigenous manufactures under the impact of free trade after 1850 and location of modern industries in major metropolii, often conveniently located to serve international markets, many peasant areas thus find themselves destitute of effective demand.

- b. Risk. There has been so much discussion on the subject of risk aversion in peasant farming that it has, in some way, become an excuse not to try to understand the broader structural, economic, political, and cultural aspects of peasants. In some way, risk aversion has become the modern substitute for traditional behavior (Schultz) in disguising the complexity of reality. Yet, it is certain that risk considerations do enter importantly into a peasant's decision making since the very survival of his family depends on correct economic choices (Roumasset).

The key hypothesis behind the risk studies is that poverty (smaller farms) tends to inhibit adoption. Thus, a number of models of decision making under risk using the ideas of safety first (Moscardi and de Janvry), expected utility (Benito, Dillon and Scandizzo), or of cautions optimization (Day and Singh) have been constructed. They usually show that risk does explain behavior, but it is only fair to say that they fail to establish a simple causal relation between risk aversion and poverty. Risk, for example, does affect the choice of production systems based on simbiotic instead of sequential (rotation of pure stands of crops) cropping. It also leads to strategies of sequential risk reduction by successive adjustments in decisions taken. Dillon and Scandizzo find that risk aversion decreases when minimal subsistence is at risk. Cancian also finds that poorer Mexican peasants are more prone to adopt new technologies than middle peasants since the coercion to meet subsistence needs forces them into greater risk taking. Lopilato similarly finds that poorer peasants are forced into the more risky cash-cropping activities (vegetables for the Oaxaca market) while middle peasants can afford to continue with the traditional corn-beans association. These results, however, contradict most other studies which conclude that poverty does increase risk aversion and that larger

farmers do indeed tend to adopt innovations earlier because they can afford more extensive risk taking (Winkelmann, Moscardi and de Janvry, and Rogers).

- c. Labor Constraints. Traditional wisdom in the tradition of classical economics is that the marginal productivity of labor power (Lewis) and of labor (Georgescu Roegen) is zero. This implies that peasants' production and welfare can be increased through the diffusion of labor-intensive technologies. This vision has, however, been shattered by both neoclassical economists (Schultz) and empirical political economists who evidenced that (a) the marginal productivity of labor is not zero, in particular, because of confluence of peasants to the labor market as semiproletarians; (b) the marginal productivity of labor power is not zero, even if the average productivity is low (and, hence, poverty high), because there exist regional shortages in critical periods of the year, usually harvesting; (c) the nature of the division of labor by sex and age implies that there is no full substitutability among members of the household (Deere); and (d) wage work in agriculture tends to compete for labor in the very periods of critical labor needs on the home plot.

The consequence is that labor availability and sex roles can create effective bottlenecks to technological change on peasant farms. New technologies that are labor using consequently need to be introduced jointly with labor-saving innovations.

- d. Diet Requirements. It is interesting to speculate why peasants keep on producing wage foods as a priority while commercial farming tends to be attracted by the more remunerative agroexports, inputs for industry, and luxury foods. Thus, it is commonly said that, in countries like Brazil, Mexico, and the Dominican Republic, "peasants" produce the vast majority of the marketable surplus of wage foods.

A number of explanations are plausible, such as the fact that some cash crops require costly investments or require close integration with multinational agribusiness. For this reason, Arroyo and Lipton advocate the need for new efforts to integrate the peasantry with multinational agribusiness in order for peasants

to shift use of their resources to the more remunerative production of agroexports and for agribusiness to find a cheaper source of exportables in peasant production. But the most common explanation (clearly of populist vintage) of why peasants grow principally wage goods is that peasants fundamentally produce to satisfy their own consumption needs and only sell their surplus production to insure cash requirements.

If this is the case, than peasant production systems are largely determined by consumption and, hence, diet requirements. Thus, we find associations of crops such as corn and beans or rice and fish, etc. In this case, technological transformations of these systems would need to preserve these balanced diet requirements.

- e. Land Tenure. A majority of Latin American peasants is still characterized by precarious forms of tenure or by rental agreements that result in substantial surplus extraction. Badhuri and Scandizzo, for example, have shown how usury with a landlord class blocks the possibility of technological change. Shortrun rental contracts and uncertain tenure also limit investments to the short run.

2. Factors External to the Farm

- a. The family farm and supporting institutions. One of the most emotional and inconclusive debates in the field of rural development is that on the optimum pattern of farm organization, especially the contrast between family farm and managed farm (commercial farms and plantations) with hired labor, labor cooperatives, and state farms. Both success and horror stories can equally be told for one type of farm and the other. Economies, in particular, have approached the issue in terms of economies of scale and of whether division of labor or personal attention (the eye of the master) are more efficient in agriculture (Owen, Nikolitch, Rodefeld, and Schickele).

A general conclusion of these studies on alternative farm organizations is that there seems to exist little systematic internal economies of scale and that the key determinant of the superiority of one type of farm

over the other is more importantly determined by the adequacy of the external supportive system of institutions (LeVeen, Weitz). Thus, the family farm systems in the United States has been highly effective in the course of American history because of the external support of public and private institutions, and its rapid transformation and elimination is also due to increasing biases against the family farm in those external institutions (Hightower, Rodefled, et al). In Latin America, the modernization of peasant farming and its successful incorporation of technological change are equally dependent upon the creation of the appropriate supporting system.

If there are no internal economies of scale, the main argument advanced by advocates of the family farm is that it is more efficient in a social sense when resources are valued at their social opportunity cost. Thus, if there is surplus labor in peasant farms, the social cost of labor is zero in family farms; and their social efficiency tends to be superior to that of capitalist farms that must remunerate hired labor at the going market wage. Berry and Cline and Dorner and Kanel use their calculation to advocate the rationality of land reforms that create family farms in Third World agriculture. As we saw before, the validity of this argument is, however, crucially dependent upon the postulate of zero opportunity cost for peasant labor power, an assertion that is doubtful when the peasantry is closely integrated into labor markets as semiproletarians.

- b. Terms of Trade. It is well known that the terms of trade tend to be highly biased against wage foods through a combination of exchange rate policies, subsidized imports, price control mechanisms, and the monopolistic power of merchants. As a result, technological change in wage foods and, hence, in peasant farming tends to be stifled. In Mexico, for example, the crisis of corn both results from and accelerates the crisis of peasants (Gomez); massive imports of corn after 1950, reaching 2.6 million tons in 1975, have led to a 33 percent decline in real prices between 1963 and 1972. As will be discussed in Part VI of this report, unprofitable prices and lack of effective demands have proved to be serious bottlenecks to the diffusion of technological change in peasant farming.

- c. Information and Credit. The delivery of public information (extension) and credit tends to be highly biased against peasants. Thus, even though the mass of credit to agriculture in Latin America is as high as one-third of the gross value of agricultural production, public credit only reaches about 16 percent of rural households and most peasants are excluded. Extension services similarly only reach about 10 percent of rural households and are systematically biased toward larger farms (OAS-IICA). As a result, diffusion of technological change among peasants is conditional upon the reorientation of agricultural institutions toward peasant-based rural development.

VI EXPERIENCES WITH TECHNOLOGICAL CHANGE IN INTEGRATED RURAL DEVELOPMENT PROGRAMS

Attempts at "transforming traditional agriculture" through coordinated developmental programs supported by foreign aid are not new. The first efforts started in the 1940s as a product of the Cold War under the banner of community development programs. Holdcroft characterizes these programs as efforts to (1) involve people on a community basis to solve their common problems, (2) promote democratic as opposed to "totalitarian" forms of government, and (3) facilitate transfers of technology. By the early 1960s, the approach had created disillusionment. Community development workers had been unable to transform the existing social relations (distribution of the land, exploitation by landlords, and urban domination), and the economic conditions of the poor had remained unaltered. The programs were consequently rapidly dismantled, and the possibilities offered by the technological breakthroughs of the Green Revolution became the new center of interest for the international community.

While the Green Revolution had positive effects on cereal production and consequently benefited capitalist farming and the urban economy (which does not necessarily mean that lower food prices benefited consumers, as Pinstrup-Andersen and Scobie argue, since they may equally well result in lower monetary wages and increased profit rates), it had negative welfare effects on peasants (Griffin, 1976, Scobie, Byres). Since the bulk of population was still rural in the early 1970s and able to exercise significant political pressures, particularly, directed at gaining access to land, the modernization of peasant agriculture through technological change promoted by programs of rural development became the

central preoccupation of international development agencies (World Bank, MacNamara). Attempts were made to tailor the technology of the Green Revolution to the conditions of peasants and develop new institutions to foment its diffusion. Technology was thus expected to resolve both the problem of food production through its diffusion in capitalist farming (reinforced by the threats of expropriation under the legislated land reforms of the 1960s) and the problem of rural poverty through its diffusion in peasant agriculture (Wortman and Cummings).

Integrated rural development projects were organized to promote the diffusion among peasants of new technologies, credit use, and information. Concentrating only on the issue of technology, since this is the subject of interest here, some of the practical lessons derived from these experiences follow.

A. Availability of New Technologies for Peasant Agriculture

A clear conclusion of observations made in four projects (Puebla and Plan Maiz in Mexico, Cajamarca in Peru, and Garcia Rovira in Colombia) is that no new technologies were being offered to peasants. New corn varieties offered by CIMMYT in Mexico and Peru could not outcompete the traditional varieties improved by local seed merchants and already widely used by peasants. Technological recommendations thus only consisted in inducing peasants to use higher fertilizer doses and greater plant densities. Without technological change, and since cultural practices were, in fact, well adjusted to existing technology (accounting for risk, labor constraints, diet requirements, etc.), the recommended higher input levels usually led to economic losses. The poor but efficient became inefficient and poorer. The only peasants to gain from the program were those that did not have access to credit before the project and gained access to it through the project. But resulting welfare gains must then be credited to institutional change, not to technological change.

These experiences demonstrate that the technologies of the Green Revolution developed for commercial agriculture cannot be transferred directly to peasant farming even if apparently neutral to scale. Redefinition of the programs and subsequent programs (e.g., Rio Negro in Colombia) focused on production systems instead of individual crops. But in this case as well, failures to deal effectively with production systems indicated the unavailability of both a proven methodology to conduct this type of research and of results available for dissemination. The challenge which is currently being assumed is consequently to develop such methodology and generate such results.

B. Organization of Research for Peasant Agriculture

This setback showed that research must be tailored specifically to the conditions and needs of peasants. Because peasant agriculture has been neglected in the past, the backlog of available appropriate technologies is minimal. While still largely to be refined in the process of implementation, significant steps have recently been taken toward the definition of a research methodology for peasant agriculture (Hildebrand, ICA, CIMMYT).

Three types of research methodologies can usefully be contrasted to identify the approach which is most promising for peasant agriculture. The first consists of commodity-oriented research where activities are analyzed in isolation from one another and from the socioeconomic context of their use. For food crop, for example, improved varieties are sought that produce higher yields (an increased ability to respond to higher fertilizer doses) and have greater environmental robustness. This commodity focus has been typical of the organization of research in the agricultural experiment stations and the international research centers. It is best adapted to the needs of commercial farming where crops are produced in pure stands (fundamentally to allow mechanization) and where farms are heavily specialized in one or a few activities and are homogeneous with respect to the environment. Yet, it also largely characterized the organization of research in the three projects observed. In Puebla, it was only after four years of work with pure stands of corn that the widespread corn-bean association was "discovered" and experimentation initiated upon it. In Garcia Rovira, despite the intended focus on production systems, research was mainly conducted on a crop-by-crop basis.

A second approach consists of taking into account the totality of the physical dimensions of farming systems. Here, activities are studied in relation to one another. For commercial farming, this implies studying alternative rotations of crops to increase total yield and robustness. For peasant farming, where the association of crops is more generally simultaneous than sequential, this implies testing associated crops for the same goals. It is only in recent years, prompted by the lessons of rural development experiences, that research on associated crops has been initiated.

The third approach comes directly from knowledge of the socioeconomist conditions of peasant agriculture derived from experiences at rural development. Possibly a major contribution of the Puebla-type projects has been to evidence the need for this new methodology if technological packages are indeed going to be developed for and diffused in the peasant sector. Its two fundamental aspects, by contrast to other research methodologies, are:

1. Identification of currently used farming systems and of their socioeconomic context. Following a preliminary reconnaissance through secondary information and case studies, a thorough benchmark study is made for each region of the production structures, resource endowments, activities used, input and output prices, institutional constraints, household organization, and behavioral conditions. Homogeneous farming systems are thus identified. An inventory of basic technology is obtained; and the ecological, economic, and social logic of the use of this technology is fully explicated. The benchmark studies on peasant farming recently initiated by ICTA in Guatemala, ICA in Colombia, and CIMMYT and the International Potato Center in the Andean region are systematic attempts at fulfilling this task. These studies require joint efforts between biologists and social scientists, as well as peasant participation, to insure full understanding of the rationality of the basic technology used. They, consequently, require enough restructuring of the organization of agricultural research to permit this interdisciplinary effort to occur effectively.

2. Adaptive research is designed to develop new technological options by successive approximations starting from the basic farming systems and technology. The ultimate criterion followed to guide research is no longer physical but is the increase in welfare of peasant households. To this end, the structural, economic, institutional, and behavioral characteristics of the peasant economy have to be taken into account. The observations made in the project areas are useful in identifying some important constraints to be respected in the design of new technologies: labor constraints in particular periods of the year, opportunity cost of different family members, riskbearing capacity, requirements for cash flows to insure consumption needs and the purchase of factors of production, financial constraints, availability of inputs, production of means of consumption throughout the year, and nutritional balance. There are also subjective criteria of importance such as consumption and work habits, the implicit rate of discount in resource use, and the degree of rationalization in the use of resources. While the supply of technology is based on a fully rational economic calculus by the diffusion agents, the demand side incorporates tradition, habits, and, hence only partial economic rationality.

Adaptive research is highly location-specific and interdisciplinary. It requires taking scientific experimentation to the field while maintaining the rigor of analysis—a difficult combination to achieve as the projects observed clearly evidenced. Largely to be defined, still, is the complex task of translating observations on peasant circumstances into the definition and implementation of research priorities that will result in increased welfare for peasants. Also to be experimented with is the participation of peasants in the definition of research needs and the process of adaptive research in order to improve adjustment of technological packages to widely varying conditions

and to ensure their subsequent diffusion. To be determined is how specific such research can be and still be cost effective.

C. Factors that Constrain Technological Change in Peasant Agriculture

Even with appropriate technology available, there exist structural and economic bottlenecks to its diffusion in peasant agriculture. The net result of these bottlenecks has been that only the larger peasant farms have been able to adopt new technologies. Technological change as an instrument of modernization can consequently only be effective for a small fringe of upper peasants and should not be counted upon as a means of eradicating rural poverty.

The first and most obvious bottleneck is farm size. This limits technological change, not so much because of internal diseconomies of small scale or of external diseconomies (lack of access to credit, information, etc.) but because of the nature of the sources of income and division of labor in the smaller farm. In those farms, insufficient productive resources imply that external sources of income have to be relied upon and that agriculture is, for a majority, a secondary activity even if it remains essential due to lack of employment opportunities and poor wages. Cajamarca, a relatively wealthy valley of the Peruvian plateau, is here revealing: of the rural households with fewer than 100 hectares of land, 85 percent earn less than half of their net income from agricultural production; 74 percent live on farms of fewer than 3.5 hectares where agriculture accounts for only 16 percent of net income, while wage labor provides 51 percent of net income. Of the farms of fewer than 3.5 hectares, corn, wheat, and barley -the crops to which the technological effort of the local rural development project was directed- only generate 5 percent of net income. Even significant technological changes in those crops would only have negligible effects on net income and are consequently unattractive to most peasants. For them, either land reform or improvements in wage and employment are more important determinants of welfare than technology. The key to successful rural development programs is, consequently, to either insure the adequate structural preconditions through increased farm size or to realistically confine the project clientele to the upper segment of peasant population with enough land resources.

The second bottleneck to technological change in peasant farming, less obvious but equally constraining, is the limited profitability of investment. This is due to either lack of effective demand for the wage foods produced by peasants or, more commonly, to control of food prices through cheap food policies. Lack of effective demand is the

image of urban poverty and unemployment; cheap food policies are introduced to reduce inflationary pressures, protect real incomes, and increase profit rates (Lipton, Schertz). These price distortions divert land use in capitalist farming toward the production of agroexports, inputs for industry, and luxury food items. Peasants remain in the production of wage goods only inasmuch as (1) their marketed surplus is an excess beyond household consumption requirements, (2) they remain in production even while foregoing land rent and return to financial capital, and (3) they accept implicit wages below opportunity cost.

A third bottleneck is the increase in risk associated with investment in new technologies. It is quite likely that new technological packages, developed and field-tested under adequate moisture conditions, often perform worse than the traditional technologies when subjected to rainfall deficiencies. As production costs are increased dramatically (recommended practices in Puebla required a 90 percent increase in costs over traditional practices (Biggs)), fluctuations in net income and the probability of net losses are also increased. While some observations (Cancian) tend to indicate that smaller peasants will have to take greater chances because they have no other options and, hence, be the early adopters, studies of diffusion usually indicate that risk is an important deterrent that most affects the smaller farmers who are constrained by safety-first requirements (Moscardi and de Javry).

A fourth bottleneck is often found in labor constraints at critical periods in spite of the widely held presumption of surplus labor in peasant agriculture. Since the bulk of small peasants is semiproletarianized, labor constraints exist as periods of peak labor demands on the labor markets tend to coincide with peak labor needs on the peasant farm. If the new technologies are labor-using, then not only must the marginal productivity of labor be positive, it must equal or exceed going wages in the critical periods. In Puebla, for example, Villa Issa found that limited adoption of recommended practices could be explained by failure to meet this last requirement.

The implications of these experiences for the design and diffusion of technologies for peasants are consequently the following:

1. Existing technologies developed for commercial agriculture are unlikely to be immediately useful for peasant agriculture.
2. New technologies must be developed following an adaptive and participatory improvement of existing production systems.

3. Insufficient availability and poor quality of productive resources for most peasants imply that technology only benefits upper peasants and consequently enhances inequalities and social differentiation. Thus, technological change tends to accelerate the process of "depeasantization" (Feder) unless it occurs in institutional frameworks that limit it (land reform).
4. Improved terms of trade for wage foods are generally preconditions for profitable investment in new technologies and for retention by peasants of part of the surplus created by technology.
5. New technologies must be carefully tailored to the specific risk-bearing capacity of peasants and to the complex patterns of time allocation and division of labor by sex and age.

VII SUGGESTED QUESTIONS FOR RESEARCH ON TECHNOLOGY AND PEASANTS

Research on the relationship between technology and peasants can be specified at two levels. One is positive and deals with an analysis of the historical processes of the generation of technology and the impact of that technology on the economic and social position of peasants. The other is normative and is concerned with the formulation of technological and other policies that would aim at provoking some desired impact on peasants. The first four of the following questions fit more closely into the first category, the rest into the second:

1. In terms of institutions and the organization of research, what have been successes and failures in generating new technologies for peasant farming (CIAT, CATIE, ICA)? How can research institutions that take peasants as their principal clientele remain politically and economically viable?

2. In physical terms, how much technological improvement can be brought to bear on existing peasant production systems? Are past technological failures in Integrated Rural Development Programs due to lack of understanding of peasant production systems or are they due to the inadequacy of existing technology (developed for commercial agriculture)

in improving (understood) peasant systems? Is there a large gap between actual and optimum known peasant technology and between optimum and latent (in an Innovation Possibility Frontier sense) technology?

3. In economic terms, assuming that technological improvements can be developed, what are the social costs and benefits of doing this? Peasant farming is located in areas (has been marginalized into areas) where ecology is highly uneven and unfavorable and hence where production systems are extremely varied; the possibility of massive diffusion of improved systems is consequently limited, and delivery costs to peasants are high compared to those in capitalist farming.

4. In economic terms, the technological improvements of peasant systems are constrained by a set of structural and economic factors that limit the scope of potential innovations. These constraints include:

- a. Farm size.
- b. Labor availability -time allocation including that to activities outside the farm, seasonal migrations, correspondence with division of labor by sex and age, and the need to spread labor demands throughout the year to increase the average productivity of labor while overcoming seasonal bottlenecks.
- c. Depleted land (slopes, erosion, mining) and lack of irrigation.
- d. Limited access to credit, information, and markets.
- e. Limited ability to bear risk.
- f. Correspondence with diet requirements.

Given this manifold of constraints, is it meaningful to seek a technological solution to low productivity and poverty in peasant farming.

5. How is the wage gap versus productivity gap between peasant and capitalist farming conditioned by crops and technology (Mann and Dickinson, Patnaik, Vegopoulos, 1978, Servolin)? Are there productivity improvements that can be captured by peasants only -for example, sym-

biotic systems by contrast to cassava research that ends up benefiting commercial farms; i.e., is technology necessarily a mechanism of expulsion of peasants or can it be used as defense mechanism?

6. What types of institutional arrangements can be devised to control the social differentiation induced by technology -income redistribution mechanisms, collective forms of organization (land reform)? How can differentiation be held in check while incentives are maintained?

7. Are the gains from technological change retained by peasants or extracted through a variety of mechanisms? Since there is a close correspondence between

peasants and low profitability activity high risk vs. capitalists and high-profitability activity low risk

and if technology raises profitability and reduces risk, will it:

Maintain peasants under low-profitability, high-risk conditions, even after technological change, through mechanisms of surplus extraction and domination?

Allow capitalization in peasant farming but eliminate peasants through social differentiation?

Allow for the reproduction-modernization of peasants through control of differentiation?

8. As urban-industrial political pressures increasingly prime over peasant demands (migration, industrialization, food crises, and inflation), will the peasant question be resolved through migration, benign neglect, and repression instead of through modernization of peasant production systems -i.e., is it already too late for peasants in Latin America? Or do the various current crises of capitalism reopen a new era for peasants?

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