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THE ECONOMIC VIABILITY AND STABILITY OF
"CAPITALIZED FAMILY FARMING:"
AN ANALYSIS OF AGRICULTURAL DECOLLECTIVIZATION
IN PERU

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The Economic Viability and Stability of "Capitalized Family Farming:"An Analysis of Agricultural Decollectivization in Peru

Agricultural decollectivization in Peru created a nascent "Capitalist Family Farm" sector. Does the empirical fact of parcellation suggest that small-scale agriculture is optimal? Will land reconcentration occur with differentiation among the parceleros. Studying the causes and consequences of parcellation provides insight. Productive efficiency is compared between the parceleros and their cooperative predecessors and among the parceleros. Some conclusions reached are: Rice yields increased relative to the final years of cooperative production. Sample parceleros and cooperatives exhibit similar levels of technical efficiency. The production potential of parcelled units is estimated to be less than that of a well-functioning cooperative system. Finally, differentiation among parceleros is occurring as a range of incomes are realized from a more or less homogeneous resource base.

While affecting nearly half the country's agricultural area and massively redistributing property rights in land, agrarian reform in Peru in the late 1960's and 1970's maintained the operational scale of the pre-existing hacienda agriculture through the creation of Agricultural Production Cooperatives, or CAPs [see Kay, 1982, and Caballero and Alvarez, 1981]. Beginning in the early 1980's, a process of subdivision, or parcellation, of the CAPs radically changed the operational scale and ownership structure of Peruvian coastal agriculture. To date, nearly all the large scale, collectively owned CAPs (which ranged from several hundred to several thousand hectares in

size) have been subdivided into individually owned and cultivated holdings which average some 4 hectares in size [Carter and Alvarez, 1988]. What are the short term economic implications and the longer term consequences of the creation of a small farms structure within what has been a highly commercialized and capitalized agricultural sector?

In contradistinction to theories of agrarian capitalism which emphasize domination by larger scale units, and which would thus seem to identify the new small farm structure as a temporary detour from a large farm path,^{1/} Scott [1985] and Lehman [1982, 1986] have identified a structural pattern of dominant smaller scale, "capitalized family farms" (CFF). Agricultural decollectivization in Peru presents an opportunity to empirically confront their revisionist structural hypothesis. Has the parcellation of agrarian reform agriculture created a nascent CFF sector, productive and capable of sustained capital accumulation? And, if it has, what does a CFF development path imply about land access and income distribution?

Answers to these questions are obviously relevant for understanding agrarian reform agriculture in Peru. They would also speak to the debate in other countries where the dual equity and productivity concerns of agrarian reform confront the institutional choice between large scale cooperative and small scale family farming. Parcellation, or some variant of it, has emerged in several other Latin American countries, as well as in Eastern Europe and China.

In an effort to help answer these questions, this paper analyzes parcellation in the Peruvian North Coast valley of Chancay-La Leche.^{2/}

Section 1 briefly describes Chancay-La Leche and the process of agricultural decollectivization. It also introduces the sample methodology and the data used in this study. Section 2 examines the causes of parcellation in Chancay-La Leche. The fact that parcellation was voluntarily and sometimes enthusiastically chosen by agrarian reform beneficiaries stands as prima facie evidence of the superiority of the small farm path. However, careful consideration of the microeconomic and macroeconomic environments in which parcellation occurred temper this conclusion. Section 3 then goes on to examine the economic performance of the new agrarian structure in Chancay-La Leche using 1985 production data for a sample of parceled rice growers. Comparisons are made both among the new *parceleros* and with the performance of the CAPs which farmed the same area over the 1975-1983 period. It appears that the new small scale producers have improved sector productivity relative to the final years of cooperative production. However, there is considerable variation in the performance of the individual *parceleros*. Whether this variation represents a significant economic force and portends a pattern of differentiation along a capitalized family farm path of development cannot be conclusively determined. Section 4 summarizes and concludes the paper.

Section 1 Agricultural Decollectivization on the Northern Peruvian Coast

Chancay-La Leche is one of the major agricultural valleys on the north coast of Peru. The climate in Chancay-La Leche is desert,

subtropical with temperatures averaging between sixty and eighty degrees fahrenheit (nineteen to twenty-five degrees celcius) and the soil is considered arid. All agriculture in the area is irrigated by flooding and is dependent on the Tinajones Reservoir located in the Andean region. The reservoir feeds the Chancay River as well as two other rivers. On average, the water supply is sufficient to maintain production; however, yields and hectares cultivated fluctuate with river levels (CEDEP, 1984). Rice and sugar cane have long been the dominant commercial crops in the valley. Large scale agriculture has dominated the valley at least since the Spanish conquest. Agrarian reform reshaped the valley beginning in 1969 when all private holdings greater than 150 hectares were converted into agricultural production cooperatives (CAPs). The CAPs generally maintained the commercial production patterns of the haciendas which preceded them.

Parcellation began *de facto* in 1978 when CAP Casimiro Chuman was subdivided into several smaller cooperative groups. In succeeding years, Casimiro Chuman experienced a rapid succession of structural change with each step involving a lesser degree of cooperative production. New agrarian legislation promulgated in 1981 legalized changes in the structure of agrarian reform property rights [see Carter and Alvarez, 1988]. The membership of Casimiro Chuman formally opted for individualized tenure 1982.

The example of CAP Casimiro Chuman was quickly followed by several other cooperatives in the valley. By 1986, sixteen of the twenty-two non-sugar producing CAPs were parceled. Informants indicate that some of the non-parceled CAPs desire to parcel when they find a suitable

means of resolving their current debt.^{3/} The sixteen cooperatives which have parceled held 56% of the cooperatively farmed land in Chancay-La Leche. Most of the parceled land (79%) is now farmed in small plots between 3 and 10 hectares in size. The remainder (21%) was reclaimed as government property which will be sold as frontier agricultural lands.

The major change in agrarian structure instituted by parcellation offers a dramatic experimental setting to analyze the productivity and stability of small scale commercial agriculture. The analysis presented in this paper relies on data from both before and after parcellation. First, data on production and household characteristics were obtained for a sample of *parceleros*. Sample selection followed a two stage stratified sampling procedure was followed. First, the parceled cooperatives within Lambeyeque were categorized into three groups based on the number of services currently offered by the service cooperative *Cooperativa Agraria de Usuarios*, or (CAU) formed on each CAP (or, better, ex-CAP) at the time of parcellation. One parceled associative enterprises was selected from each category. "San Isidro" was selected as representative of ex-CAPs serviced by a well-functioning CAU. "CAU San Isidro" supplies seeds, chemicals, machinery services, credit and water management and output marketing. "San Roque" was selected from the farms with just-functioning CAU. Its CAU currently offers machinery services and some assistance with crop-planning and credit management. Finally, the *parceleros* of Casimiro Chuman receive no services from their CAU.

In the second stage of sampling, individual rice producing units

were selected from each ex-CAP. A list of production units was generated from the Ministry of Agriculture's land registration maps. Thirty *parceleros* were then randomly selected and interviewed from each ex-CAP.

As a basis against which to compare the performance of the *parceleros*, data on production prior to parcellation was collected. For each of the ex-CAPs in the sample, detailed production and input expenditure information was collected from accounting records. Additional time series data on aggregate agricultural production in the valley of Chancay-La Leche were assembled from studies by local research institutes.

Section 2 Micro and Macroeconomic Environments of Parcellation

The spontaneity and relatively rapid spread of parcellation indicates that many CAP members found the change to be desirable. It is tempting to conclude that individual ownership must be a superior way to organize production, perhaps because cooperative production is burdened by what Putterman [1985] calls intrinsic problems. However, such a conclusion would divorce parcellation from the context in which it occurred.

An agrarian reform beneficiary's decision whether or not to parcel can be conceptualized as comparison of the individual's expected status under parceled tenure with that under cooperative tenure. The comparison obviously occurs within a particular historical context. That individuals prefer parcellation to a particular status quo of cooperative production (for example, one in which cooperatives have

become financially insolvent), does not necessarily imply that parcellation is superior to cooperative production.^{4/} Through a review of the micro and macroeconomic environments of parcellation, this section tries to identify what can and cannot be inferred about the relative desirability of small scale agriculture from the voluntary shift to parcellation.

Data on cooperatives in Chancay-La Leche [see CESS, 1986] indicate that profits declined over the late 1970's and early 1980's.^{5/} Following Putterman [1985], the forces behind the financial problems of the cooperative sector can be divided into those which were intrinsic to the cooperative model of production and those which were extrinsic to it--that is, induced by external factors.

In Peru, both intrinsic and extrinsic factors appear to be behind the observed trend of declining profitability. The external economic environment within which the CAPs operated deteriorated in the late 1970's.^{6/} Carter and Alvarez [1986] mark 1980 as a "turning point" in the external environment and in profit data for CAPs located along the central Peruvian coast. Even with an unchanged level of allocative and technical efficiency, enterprise profitability would have declined in this period.

Yet at the same time, internal labor-discipline problems may have contributed to low profits. The production cooperative is arguably a fragile institution, inherently exposed to, if not subject to labor discipline problems [Carter 1985]. Either inadequate (in terms of work incentives) remuneration rules or ineffective labor supervision can lead to low work effort and free-riding behavior on the part of

cooperative members. Carter's (1984) econometric analysis of Peruvian CAPs finds evidence of such productivity damaging intrinsic problems of cooperative production.

Data on trends in physical yields can help identify whether the decline in enterprise profitability reflected an internal collapse of the CAPs or simply an unfavorable external environment which left even efficient agricultural production unprofitable. Data from an unpublished study done by the Ministry of Agriculture [PADI, 1986] indicate that for rice and cotton production, cooperatives in Lambeyeque (the region which contains Chancay-La Leche) did not exhibit low-productivity relative to the Lambeyeque valley average in the pre-parcellation period. Similiar data on a major agricultural valley in the central coast also reveal that average CAP yields exceeded those of private producers in the area (Eresue [1985]).

Similarly, the three CAPs of Chancay-La Leche selected for detailed study for this research did not exhibit low productivity during the pre-parcellation period. Table 1 presents rice yield in kilos for the three studied CAPS during the period of 1974-1983 and mean yields for *parceleros* from each corresponding service cooperative for the 1984/85 crop year. The valley average, which includes both CAP and private producer yields, is provided for comparison. Additionally, water levels of the Chancay river, which provides irrigation water for the selected farms, are reported. As can be seen in Table 1, the average CAP yield exceeds the valley average prior to parcellation and the general downturn in macro economic environment of agriculture in the early 1980's. While more precise statements would require control

for differences in resource quality between cooperative and private sectors, the reported yield patterns are at least consistent with the conclusion that the CAPs were not intrinsically burdened by microeconomic failures.

Yet, on closer inspection, Table 1 reveals a more complex pattern.

While the CAPs produced yields exceeding the valley mean over the entire era of cooperative production (1975-1983), breaking the sample period into pre- and post-1980 periods shows that the cooperatives produced higher than average yields in the pre-1980 era and below average yields thereafter. While, as noted above, 1980 marked the beginning of extremely unfavorable economic conditions for agriculture, this factor alone does not explain the deterioration of the cooperative sector performance relative to private agriculture.

Whether or not the precipitous decline in CAP profitability was driven by problems intrinsic to the CAP model, or by external factors, thus remains unclear.^{7/} In any event, the tendency to discuss internal problems as separate from external factors overlooks interactions between the two. One interpretation of the data in Table 1 is that the harsh economic environment of the early 1980's precipitated an internal crisis in the CAPs such that CAP productivity fell relative to that of individual producers.

As Melmed [1987] discusses in more detail, an individuals' behavior within a cooperative, and ultimately enterprise profitability, depend on expectations--expectations about profitability in the coming year, the behavior of other individuals, etc. A worsening climate (e.g., economic recession or drought) could be hypothesized to

destabilize the expectations on which cooperation depends. Individuals would lose their original willingness to cooperate in response to signals which indicate that their future gains from cooperation are threatened by economic or political forces. Behavior might follow the uncoordinated pattern which Carter [1987] demonstrates can result in a degenerate "free-rider" equilibrium characterized by low levels of productivity and individual utility. Parcellation would then appear as an individually rational response to frustration over stagnant and unprofitable collective agriculture.^{8/}

Perhaps driven by this expectations mechanism, cooperative agriculture in Peru did not prove to be very resilient in the face of unfavorable external circumstance.^{9/} The reform sector had initially achieved its main goal of increasing agricultural productivity, as witnessed by trends of increasing output, and wages [McClintock 1981]. However, the trend of increasing productivity reversed itself in the late 1970's, a period of rampant inflation in which input prices rose faster than output prices for some principle crops, of severe drought, and of a changing political mood favorable to privatized agriculture. Beginning in 1979, explicit changes in credit policy and in the agrarian reform laws (e.g., more stringent demands for debt repayment, the conditioning of new loans upon parcellation [McClintock, 1987], the pardoning of the agrarian reform debts and the passage of legislation which allowed structural change within the reform sector) occurred. The stage was set for parcellation.

Thus, while the internal structure of cooperative enterprises is inherently open to labor discipline problems, external factors both

directly, by reducing profitability, and indirectly, by inducing labor indiscipline and low productivity, affect the stability of cooperative production. Differences in internal mechanisms for maintaining cooperation e.g., managerial skill and authority, then, allow some cooperatives to survive longer than others when faced with similar external conditions. These arguments can explain the typically observed trend of first increasing then decreasing productivity of agricultural producer cooperatives as well as their heterogeneous success. Once the self-reinforcing expectations of low productivity and profitability exist, parcellation becomes a rational choice from the perspective of individual socios.

In summary, the crisis of the early 1980's exacerbated whatever intrinsic problems the CAP sector had been experiencing and parcellation provided an escape from a cooperative production structure which had perhaps become economically untenable.^{10/} But what are the implications of this escape for the productivity of agricultural resources and the stability of the agrarian reform sector?

Table 1 reports that rice yields under parcellation for the 1984-85 rice season (a year of average water availability) exceeds the 1975-83 CAP average on the same land. However, splitting the CAP period into pre- and post-crisis periods (1975-80 and 1980-83) reveals that the parcel average exceeds the latter, but not the former. Yields are of course a very crude indicator of both economic performance and member welfare, and the next Section 3 advances a more sophisticated analysis of the effects of parcellation.

Section 3 The Consequences of Parcellation

This section explores some of the unsettled questions about the effects and desirability of parcellation. First, the economic efficiency of rice production under parcellation is econometrically compared with cooperative production under the CAPs. Section 3.2 explores additional factors which further constrain or enhance resource productivity under parcellation. Finally, as a way to study longer term structural implications of parcellation for the agrarian economy, Section 3.3 examines the variation in the productive behavior of individuals within the parceled economy.

3.1 CAPS vs Parceleros

The relative yields of parcelled producers and CAPs has already been presented in table one. Table 2 describes input use in the sample by the "parent" CAPS and the *parcelero* sample. The Ministry of Agriculture's input-use recommendation is included for comparison. One can see that *parceleros*, on average, use less machinery and seeds and more labor and fertilizer per hectare of rice cultivated. The lower use of fertilizer by the cooperatives may reflect the scarcity of water in the sample year (1978 was a drought year). With the exception of machinery use, the *parcelero* mean levels are closer than the CAP values to the recommended levels. However, as can be observed from Table 3, the range and variation in input use levels is large within the parceled economy, particularly for labor and machinery. Table 3 also shows how input use varies by service cooperative (CAU). In particular, machinery use increases with degree of functioning of the

CAU. Price data indicate that the CAU's which offer machinery services charge prices from one-third to one-half lower than the market price for machinery rental.

With regard to other inputs, the pattern is not clear. However, mean labor and seed use for San Isidro, a "well-functioning" service cooperative are higher than that of Chuman and San Roque. San Isidro also shows the greatest mean loss due to water problems even though it is geographically better situated for irrigation. Perhaps, this influences the lower mean yield of San Isidro compared to San Roque.

Based on the brief description given above, one might be tempted to conclude that parceled production looks favorable in terms of output (higher mean yields) and input use levels (closer to the technically recommendable levels). However, one cannot comment on the relation between outputs, inputs, prices and structural factors from these descriptive statistics. For example, the gain in productivity per hectare may be costly if resources are used less efficiently in the production process. Systematic analysis of economic efficiency allows more precise statements to be made regarding producer performance.

Empirically, efficiency may be analyzed using the coefficients of an estimated production function. For this study, a Cobb-Douglas functional form was estimated using maximum likelihood techniques for estimating production frontiers. This methodology permits comparison of technical and allocative efficiency across firms and groups of firms (for details see Melmed, [1987]).

A production frontier was estimated using the data from the parcel sample pooled with the historical data on the three 'parent'

cooperatives. The econometric specification included slope and intercept shifting dummy variables to represent the different institutional arrangements:

$$\begin{aligned} \ln Y = a_0 + a_1 D + b_1 \ln L + b_2 \ln M + b_3 \ln I + d_1 D \ln L + d_2 D \ln M + d_3 D \ln I \\ + e + u \end{aligned} \quad (5)$$

where D = a dummy variable which equals 1 if the observation is from a unit which produced cooperatively and 0 otherwise;

L = value of labor services;

M = value of machinery services;

I = value of intermediate inputs including seed, fertilizer and other chemical inputs;

e = the one-sided disturbance; and,

u = the symmetrically distributed disturbance.

This specification can not be rejected at the $\alpha = 0.05$ significance level^{11/}. As can be seen in table four, the coefficients of these shift terms suggest that the production frontier for cooperatives differs from that of parceled producers. In particular, the slope coefficient with respect to labor is significantly greater for the CAPs while that of machinery is significantly smaller.

These coefficients indicate that the cooperatives allocate inputs in accordance with profit maximization at market prices. The parceleros, however, are observed to underutilize fertilizer and overallocate labor. The intercept terms, however, do not differ significantly indicating equal technical efficiency of production across both arrangements. Finally, comparing the predicted potential output calculated using the estimated parcel-group frontier and the cooperative frontier for various input levels suggests that the production possibilities for given inputs in the absence of stochastic disturbances and technical inefficiency are greater under cooperative

organization than under parceled production. However, recall that the descriptive statistics presented earlier suggest that, on average, parcelero mean yields were greater than cooperative mean yields, especially in the later years of cooperative production. Thus, it appears that the potential gain in productivity was not captured by the cooperatives.

Comparing cost data between cooperative and parceled production is also illustrative of the changes occurring with parcellation. In the sample, variable costs, on average, represent 46% of the value of output for the CAPs and only 39% for the *parceleros*. More striking is the comparison of fixed costs between the two groups. Gonzales and Torre [1985: 261] indicate that a typical *parcelero* incurs fixed costs for social security, administration and finance amounting to 3,283,898 soles (another 48% of the value of output). The CAPs incurred many other fixed costs in addition to those listed for the *parceleros*. As an example, the following accounting record from CAP San Roque is illustrative.

Total revenues for San Roque in 1978 were 33,321,823 soles. Thirty-five percent of this value was spent on non-direct labor costs including management salaries, vacation pay, taxes, social security, accident pay and retirement funds. Transportation services, professional honorariums, accounting services, taxes, and repairs account for another six percent of the revenue. Another twenty-three percent of revenues were spent on finance costs. Finally, "diverse management costs," including expenditures on medicine, books and magazines, mobility, training programs, office supplies, education,

soccer and other unspecified costs represent thirty-six percent of revenues. After deduction of the direct costs of production, the cooperative experienced a loss of 19,730, 407 soles. Given that this is a typical accounting record, one sees factors which erode the profitability of the cooperatives. Thus, one might cautiously suggest that parceled production is more cost-efficient. However, it must be remembered that many of these services were lost with parcellation (particularly, subsidized medicine and education), or must now be paid for individually (e.g., social security).^{12/}

3.2 Behavior Within the Parceled Sector

The *parceleros* in the Chancay-La Leche sample exhibit attributes one would expect to see following the shift from large scale to household production.^{13/} The interviewed *parceleros* reported at least some retention of the rice crop for home consumption (100% of the sample); diversion of land from rice production to use for home construction and animal husbandry (64% of the sample); increased intensity of land use by short-season cropping (49% of sample); working more hours daily;^{14/} and the use of family labor (100% of the sample).

On average, family labor represents only 22% of total labor employed by a household. However, the extent of use of family labor is quite varied, ranging from 2% to 89% of total labor used. Correspondingly, the index of allocative efficiency for labor varies with 49% of the sample overallocating labor with respect to market prices. In the context of household production, overallocation of

labor at market prices is consistent with the notion of a low implicit household wage for family labor. For a variety of reasons, the cost of household labor could be expected to be below the market wage [Carter and Kalfayan 1988]. In the sample, overallocation of labor significantly increases with family size (the statistically significant Pearson correlation coefficient between the relevant index value and the number of members in a household is 0.44) and varies inversely with per capita income and profits (the relevant correlation coefficients are -0.20 (insignificant) and -0.47 (significant), respectively). In fact, mean profits of those farmers who overallocate labor is only 56% of mean profits of the other producers in the sample. These results are consistent with the Chayanovian idea that lower income farmers will tend to "overutilize" family labor.^{15/}

In addition, patterns of land-use for the aggregate sample are suggestive of diversification expected to occur in response to income uncertainty and increased incentive to use land intensively due to the direct link between effort and income. First, our data show that a substantial amount of CAP land was unutilized for agricultural production. This is apparently due to water procurement problems. CODELAM [1980] states that each year during the 1975-1980 period San Isidro was only approved for irrigating 500-700 hectares when their land holdings contain 1147 cultivable hectares. Much of the previously unused land was distributed among parceleros, implying more demand on scarce water. Second, until the last (1985/'86) crop season, only rice was planted by the *parceleros*. This is partially an artifact of the sample design which excluded sugar producers. In CAP Chuman, fifty

hectares were allocated to non-member permanent workers for sugar cultivation while in San Isidro many *parceleros* opted for sugar production. Production of cotton, corn, and other crops on the other hand no longer occurs during the rice season. Perhaps rice production is favored because it is less risky in the sense that its price is fixed by ECASA, a state organization which contracts with rice processors and distributes the rice to consumers. Third, as noted earlier, 49% of the *parceleros* are growing non-commercial food crops in the short season. De La Gala [1986] suggests that this is also occurring in other parcelled CAPS in the region. Finally, in 1985-86 no rice was grown because of a severe drought. Some producers switched to other food crops in the main season. Conversation with others indicated a desire to do so but inability because they lack knowledge of how to grow these crops.

Whether the observed diversification implies a decrease in aggregate output of commercial crops is not clear. First, as suggested in Table 1, some *parceleros* exploit land resources more intensively than did the CAPs which preceded them. Second, for crops, like rice, which have a season of less than a year, production of non-commercial food crops may occur in addition to rice cultivation rather than in place of it. Finally, some *parceleros* cultivate land that was fallow under cooperative management. De La Gala [1986] suggests that this occurs in other cooperatives in Lambayeque as well. Not surprisingly, then, the net impact of parcellation on cropping patterns remains unclear. Furthermore, it may be early to detect patterns of cultivation induced by the new behavioral context as structural

adjustment occurs over time and parcellation is a recent phenomena.

Accompanying the above-mentioned changes are other important structural changes in the agrarian economy. First, parcellation has changed the structure of credit distribution. There are now many times more creditors for the agrarian bank to service. In Lambayeque, one manifestation of this increase is seen in the amount of time lost to *parceleros* in the process of credit acquisition (some farmers report going to the bank forty times in attempt to get credit) and the untimely delivery of credit (for example, many *parceleros* complain that the money arrives after the optimal time for application of fertilizers or pesticides). In other regions the impacts of credit-overburden appear to be more severe in that not all *parceleros* have equal access to credit. In fact, an ONA survey of *parceleros* showed only 33% of those interviewed received credit from the agrarian bank [Carter and Alvarez, 1986], while in this study, 100% of the *parceleros* surveyed received such credit.

The demand for technical assistance has also increased with the increased number of producing units. *parceleros* are now managing agricultural production whereas before the majority participated as labor under the direction of more technically skilled managers. In the Lambayeque survey, almost all the *parceleros* expressed a desire for technical assistance while only 22% received any assistance. It might also be noted that of the reported assistance only 15% was obtained through public agencies. This is important to the extent that unequal access to private sources of technical assistance may accentuate differentiation. In other studies, similar problems with the lack of

technical assistance are noted [e.g., Eresue, 1985 and Gols, 1985].

3.3 Differentiation and Displacement Along the CFF Path?

A final structural issue brought out in the parcellation debate is that of stratification of *parceleros* and the potential for land reconcentration. This issue concerns the nature of agricultural development along the "capitalized family farm" (CFF) path. As a path, does it share the egalitarian characteristics of the "unimodal strategy" discussed by Mellor and Johnston [1984], or does it imply substantial differentiation and displacement as Lehman [1982: 19 and 1985: 364] hints?

Within the parcelero data, basis for stratification can be found in both intra- and extra-household characteristic differences. Differences among households in number, age, and skill levels of members, ex-ante income-levels, as well as local market conditions will lead to differences in efficiency which, in turn, will lead to differences in profits and ex-post income. While insufficient data are available to provide a strong empirical foundation for this argument, the figures presented in the following discussion are supportive.

Table 5 presents the distribution of index values of technical efficiency in the sample. Similarly to the already discussed allocative efficiency indices, the range of index values is wide. Variation in the observed efficiency among producers suggests that much variation in family structure and entrepreneurial capability exists. Table 6 documents a wide range of income levels in the sample. Thirteen percent of the sampled producers report incomes below the

published minimum vital rural income level for rural Lambayeque. The coefficient of variation in reported income levels is 0.58. The Gini coefficient for the distribution of income within the sample is 0.39. Because these figures represent only one crop-season, it is possible that the observed differences among parceleros may not reflect an emerging, permanent pattern of differentiation. However, for our sample, both profits and income are correlated with the technical efficiency index (the statistically significant Pearson correlation coefficients are 0.88 and 0.38, respectively). This suggests that some parceleros systematically produce lower income levels than others and, therefore, differentiation is occurring. Thiesenhusen [1975] documents similar patterns of increasing inequality of income after production cooperatives were subdivided in Chile and suggests that differentiation is characteristic of reforms which distribute land relatively equally among private producers.

One reason for concern with differentiation spawned by parcellation is that such differentiation could be the basis of land reconcentration as land market transactions may occur in response to relatively low profitability of inefficient producers. Additionally, land market transactions may occur in response to transitory socio-demographic phenomena as labor- or capital-rich households contract with land-rich households. Although none of the sampled *parceleros* have participated in land market transactions since parcellation, the possibility for stratification to continue via land reconcentration was opened with the legalizing of decollectivization and is an issue in the region [de la Gala, 1985: 271]. De la Gala suggests that land is not

being transferred presently because of delays in extending land titles to *parceleros* and the recent low profitability of agriculture resulting from extreme weather conditions in the area.^{16/}

Section 4 Conclusions

The subdivision, or parcellation, of agrarian reform production cooperatives has radically reshaped the organization of agricultural production in coastal Peru. Contrary to the fears of its worst opponents, production has shown no radical decline in the short term.^{17/} In fact, rice yield levels have increased since parcellation, at least relative to the final years of cooperative production. However, the changing relation between output and inputs leaves production under parcellation at level of technical efficiency similar to that under the CAP system. The mean level of technical efficiency in the sample is estimated to be 65%, an indication that agricultural output could be increased from the current set of resources.^{18/} This efficiency gap can be interpreted to signal pressure (or opportunity) for further structural change. Interestingly, the CAPs were estimated to have greater frontier (or potential) efficiency than the parcel system. However, as discussed in Section 2, the cooperatives had great difficulty realizing that potential in the crisis period of the early 1980's, a factor which undoubtedly fomented parcellation.

The new sector of producers can be described by reference to Lehman's [1981] description of a continuum of household producers which ranges from subsistence producers to "capitalist family farmers" who are wealthier and more integrated into the capitalist economy. On the

"capitalist family farm," production is organized "at least partially through intra-household or kinship relationships of power and authority and in the absence of any impersonal or bureaucratic organization of production." [Lehman, 1981: 134]. The employment of wage labor is characteristic of such farms and the bulk of production is sold commercially with the intent of purchasing consumer goods with the income generated by product sales [Lehman, 1981]. Finally, these farmers are not motivated by pure subsistence but rather strive to accumulate some capital. The "capitalist family farmer," then, might be thought of as the third world analog of the U.S. family farmer in a different historical context and at a different scale of production .

The small scale producers created by parcellation of agrarian reform cooperatives fit Lehman's description of capitalist family farmers. They derive from modern, commercial enterprises, yet they hold small plots of land, have income levels and face labor market conditions which fit the model of a household production economy. However, the *parceleros* are not a homogenous group, and differentiation is occurring as individuals realize a range of incomes from a more or less homogeneous resource base. Frontier production estimates indicate that at least some of the variance in income emanates from systematic differences in technical efficiency between individuals. Further work and observation are necessary to say whether these differences are strong enough to push some individuals out of commercial farming into either proletarian status or a more conservative, less commercially oriented "peasant" household production strategy.^{19/}

In summary, parcellation emerged from a financial crisis in Peru's

cooperative farm sector. It is difficult to say whether that crisis reflected intrinsic problems of the cooperative model, or whether it reflected difficult macroeconomic circumstances. Most likely, it reflected a complex interaction of the two. But regardless of whether the crisis and financial collapse of the CAPs was avoidable,^{20/} parcellation has occurred and created an "experimental" capitalist family farm sector. In the short term, that sector has maintained productivity, although its production is probably below that of a well functioning system of cooperatives. The longer term will reveal something of the structural stability and dynamics of small scale capitalist farming in Latin America.

TABLE ONE: OUTPUT/HECTARE (kilos)

Crop Season	CAP San Isidro	CAP San Roque	CAP Casimiro Chuman	CAP Avg.	Val## Avg.	River Water Levels++ (Million M3)
¹ 1974/75	7166	5128	6766	6553	5150	na, 1745
1975/76	7010	6112	7637	6976	5590	1745, 898
1976/77	6481	5573	5325	5595	5055	898, 1034
1977/78	4892	3367	3141	3788	4346	1034, 575
1978/79	6681	5270	5520	5636	5160	575, 779
1979/80	----*	5490	5992	5741	5394	779, 546
1980/81	6230	5318	5976	5841	6456	546, 884
1981/82	4140	4040	5360	4513	4850	884, 972
1982/83	2211	3450	----**	2831	4438	972, 1456
Average 1975/83	5601	4730	5714	5324	5160	
Average 1975/80	6446	5157	5730	5714	5115 (6100)#	
Average 1980/83	4193	4269	5668	4395	5248	
Parceleros 1984/85+	5942	6481	5885	6048	5899	1448, 443
(std)	(1826)	(1561)	(1661)	(1691)		
(max)	(9660)	(8832)	(8319)	(9660)		
(min)	(1380)	(2760)	(1932)	(1380)		

* Water problems meant no production. ** Already parcelled.

+ The group mean is weighted according to proportion of the total number of cooperatives in the valley represented by each type of CAU.

++ Water levels for the Chancay-Lambayeque River. Source: Direccion Regional de Agricultura-Oficina de Estadística. Two figures are given for each season because the cultivation period is from November to June.

The figure in parentheses is the average yield for this time period calculated excluding the drought year of 77/78.

Valley average yield. Source: Data presented in CEDEP (1985) and CESS (1986).

TABLE TWO: INPUT USE IN RICE PRODUCTION

<u>INPUT</u>	<u>UNIT</u>	Casimiro CHUMAN	SAN ROQUE	SAN ISIDRO	PARCELS*	MOA
Land	Ha.	100	287	200	7.17	---
Machines	hours/ha.	7	9.25	7	3.50	7.50
Labor+	jornales/ha.	130 (86.7)	94 (62.1)	169.5 (111.9)	133.80	135
Seed	kilos/ha.	130	172	120	101.00	100
Fert.	Kilos/ha.	320	305	218	405.00	530

* CAP data are for the 1977-78 rice season and are from *Diagnosticos Empresariales*, CODELAM (1979) and ORDELAM (1980).

** The figures are weighted means of the parcel sample.

+ The figures in parentheses are 2/3 the value of the journals given above. This is to make CAP and parcel jornales comparable. A standard journal is eight hours while the CAPS tended to count four to six hours as a journal (Source: Gonzales and Torre, 1986; informal conversation with Peruvian researchers.)

++ Ministry of Agriculture recommended usage. Source: CEDEP, 1

TABLE THREE: INPUT USE BY PARCELERO SUBGROUP

Variable	Unit	Group*	Mean	Std	Max	Min	CV
Land	ha.	SR	6.67	1.32	9.00	3.00	0.19
		CH	8.02	1.96	12.00	3.20	0.24
		SI	5.92	1.44	7.30	2.50	0.24
		TOTAL	6.92	1.80	12.00	2.50	0.26
Loss+	ha.	SR	0.61	1.34	5.30	0.00	2.19
		CH	1.34	2.32	6.70	0.00	1.73
		SI	2.72	1.77	6.00	0.00	0.65
Machine	hours/ha.	SR	3.57	1.92	8.00	0.99	0.53
		CH	3.00	1.43	5.50	1.00	0.47
		SI	4.51	2.92	12.80	1.20	0.64
		TOTAL	3.63	2.19	12.80	0.99	0.60
Fert.	Kilos/ha.	SR	400	97	540	180	0.24
		CH	442	79	630	277	0.18
		SI	333	103	473	83	0.31
		TOTAL	396	102	630	83	0.26
Seed	Kilos/ha.	SR	92	30	160	37	0.33
		CH	99	46	258	48	0.46
		SI	112	47	240	13	0.42
		TOTAL	100	42	258	13	0.42
Labor	Jornales/ha.	SR	107	36	208	62	0.34
		CH	138	77	310	49	0.56
		SI	152	72	262	39	0.47
		TOTAL	134	66	310	39	0.50

*SR = Parceleros from CAP San Roque; CH = Parceleros from CAP Casimiro Chuman; SI = Parceleros from CAP San Isidro and TOTAL = weighted mean of all parceleros in the sample.

+Loss = the number of hectares not cultivated by the *parcelero* due to drought.

TABLE FOUR: PRODUCTION FRONTIER COEFFICIENTS

--FULL SAMPLE

$$\ln Y = a_0 + a_1 D + b_1 \ln L + b_2 \ln M + b_3 \ln I + c_1 D \ln L + c_2 D \ln M + c_3 D \ln I$$

	<u>Coefficient</u>	<u>Std. Err.</u>
Intercept (parcels)	5.277	0.95
Intercept shift (CAPS)	0.670	3.88
\hat{b}_1 (Parcel labor)	0.314	0.08
\hat{b}_2 (Parcel machine)	0.365	0.08
\hat{b}_3 (Parcel inter. inputs)	0.128	0.06
\hat{c}_1 (CAP labor)	0.241	0.15
\hat{c}_2 (CAP machine)	-0.276	0.17
\hat{c}_3 (CAP inter. inputs)	-0.021	0.11
$\hat{\sigma}^2$ (estimated variance components ratio)	2.824	1.32
\hat{s}^2 (estimated overall variance)	0.392	0.11

TABLE FIVE: FREQUENCY DISTRIBUTION OF INDEX OF
TECHNICAL EFFICIENCY

<u>Range</u>	<u>Percent of Observations</u>
0 - 0.25	1.3
0.25 - 0.50	22.8
0.51 - 0.70	22.8
0.71 - 0.90	46.0
0.90 - 1.00	7.0

TABLE SIX: MONTHLY INCOME

		Mean	max	min	cv
Parceleros+	per capita	12.13	40.32	2.82	.61
	Total	62.75	161.27	11.28	.43
Group 1 (Chuman)	per capita	12.46	34.62	3.13	.57
	Total	60.29	103.98	28.00	.34
Group 2 (San Roque)	per capita	11.23	31.64	3.76	.55
	Total	64.47	132.50	26.06	.45
Group 3 (San Isidro)	per capita	12.70	40.32	2.82	.69
	Total	63.44	161.27	11.30	.48

Cooperatives (1979 average monthly income)++

Chuman	24.56
San Roque	12.91
San Isidro	20.77

Minimum Vital Rural Monthly Income: Lambayeque (Source: INE 1985)

12.35

* These figures are 1986 soles converted into dollars at the official 1986 exchange rate of I/13.39=\$1.

+ Source: Primary data collected by the author of this thesis.

++ Source: CODELAM, 1980 and ORDELAM, 1980.

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NOTES

- 1/ Kay [1980] and de Janvry [1981] present structural models which identify the large farm sector as that which has and will historically dominate of Latin American agriculture.
- 2/ The valley of Chancay-La Leche was chosen for this study to complement research efforts in other regions. Chancay-La Leche was purposefully chosen as representative of the areas which grow non-agro-industrial food crops and which are isolated from the economic gravity of Lima. Complementary research is underway in agro-industrial zones, export crop zones and the Lima food market region.
- 3/ Many cooperatives either sold machinery, etc. and paid back their debts before parceling, or divided the debt among parcel holders or maintained a service cooperative which, among other things, manages the debt. For some cooperatives, apparently none of these options was feasible.
- 4/ There may be forms of production, intermediate to the extant CAP system and a system of private parcels, which would be preferred to either system Carter [1987] presents a model of this optimal institutional choice. His model identifies an intermediate form of production organization as the abstractly most desirable.
- 5/ Eresue, et al. [1985] present similar data for the Southern Coastal valleys of Canete and Chincha.

- 6/ Melmed [1987] presents data on the deteriorating external environment in Chancay. The main points she makes are: 1) After 1976, the inflation rate increased rapidly with cost inflation exceeding price inflation in cotton and maiz production; 2) Real financial costs increased sharply after 1980 (Alvarez, [1983], attributes this to the rising production costs); 3) there was a tendency to increase the wage component of income perhaps to avoid paying the 35% profits tax imposed on cooperative producers in 1975.
- 7/ Gonzales (1985) attributes the decreasing financial stability of cooperatives in the Chancay Valley to lower use of land because of water shortages, the unfavorable relation between product prices and production costs, excessive debt, liquidity problems and declining productivity.
- 8/ Note that land reform cooperatives were typically formed as an equitable redistribution of land that would be more productive than simply allocating single plots to individual peasants. Thus, at first, it may seem incongruous that reversion to individual small-plot agriculture would be favored. However, the socioeconomic context of the tenure choice at the time of parcellation is often quite different than the socioeconomic context at the time of initial collectivization.

9/ Indeed, it would not be surprising if production cooperatives were in general less resilient than other institutional forms. A prototypical peasant or family labor farm can at least weather bad periods with little cash exposure. A hierarchical capitalist producer does not carry its labor force as a fixed cost membership and at least has greater ability to adjust its workforce to changing circumstances. Relative to both these alternatives, the production cooperative could be expected to more easily fall into precarious financial circumstances.

10/ Interestingly, McClintock [1988] reports from interviews that by 1987 (following a regime change in Peru which brought a more favorable macroeconomic environment for agriculture) both parcelled and non-parcelled farms were convinced they had made the proper (although diametrically opposed) institutional choices. This report raises the important issue as to whether the cooperative sector could be expected to recover in happier external circumstances.

11/ The likelihood ratio test was used to test for significant differences between the unrestricted model (equation (5)) and the model which allows the slope coefficients to differ across subsamples to be jointly zero. The test statistic value is 32.36 compared to the Chi-square critical value for four degrees of freedom of 9.48. Therefore, the null hypothesis ($d_1 = d_2 = d_3 = 0$) is rejected.

12/ It is especially important to consider the loss of such services when comparing income levels under cooperative versus parcelled production as is done in table thirteen. The cooperative data presented in this

table represent a year characteristic of the crisis year of the late 1970s. In this year, at least for San Isidro, there were no profits distributed, no social security contribution, no pension payments, no overtime pay, etc. The provision of these benefits in the earlier years (as CODELAM, [1980] indicates occurred) would imply a higher mean income for members. Unfortunately, inadequate data is available to accurately calculate CAP income levels for these earlier years.

13/ Eresue [1985] and Gols [1985] make similar observations about the reorganization of production and consumption following parcellation.

14/ This has not been formally measured, rather, it is based on conversations with *parceleros* during the interview process.

15/ Note that the term "overutilize" is used with respect to the efficient allocation of labor at the market wage. The greater use of labor is consistent with neoclassically optimal allocation of labor with respect to an effective wage which is lower than the market wage. The effective wage is determined by the real opportunity cost of labor for the family farm unit.

16/ Another important aspect of the stratification debate, which cannot be addressed with the sample data at hand, is that differentiation among *parceleros* may be affected by regional differences in the agrarian

economy. Specifically, proximity to Lima seems to imply a more active land market and greater availability of non-institutional capital and technical assistance. Also, for coastal rice-producers, input and output sales are dominated by ECASA (a state organization) whereas in other areas more competitive markets exist. One might conjecture that proximity to Lima will amplify differences among *parceleros* while the lack of competitiveness may dampen such differences.

- ^{17/} The ability of the system over the longer term to reproduce itself is a genuine question, especially given the large scale of existing irrigation infrastructure.
- ^{18/} This index value is comparable to the mean efficiency level found by Kalirajan [1984] in his study of Asian rice farmers. It is, however, below the efficiency levels of 85% for cooperatives and 89% for private producers observed in Peruvian rice farming by Carter [1984a] using 1977 data. The lower index value for *parceleros* relative to Carter's estimate for private farmers may reflect the lack of education and technical skill of the former hacienda and estate workers. The relatively low index value observed for the CAPS is not particularly meaningful as the sample contained observations from only three CAPS. Carter's data, on the other hand, contained observations on many cooperatives and the range and variation in index values was high.

19/ Carter's [forthcoming] analysis of a small farm credit program in Nicaragua finds similiar evidence of an intrinsic differentiation of small holders in the face of commercial opportunities.

20/ Interestingly, McClintock [1988] reports from interviews that by 1987 (following a regime change in Peru which brought a more favorable macroeconomic environment for agriculture) both parcelled and non-parcelled farms were convinced they had made the proper institutional choices. This report raises the issue of whether the cooperative sector could have in fact recovered from its crisis in the early 1980's.