

AGRARIAN REFORM AND NUTRITION IN PERU:
ASSESSMENT OF THE CORNELL-PERU PROJECT AT VICOS

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July 1976

No. 76-24

TABLE OF CONTENTS

	<u>Page</u>
I. Introduction	1
II. Agrarian Structure and Agrarian Reform in Peru	2
III. Methods for Assessing the Impact of Agrarian Reform on Nutrition at Vicos	3
IV. Agrarian Reform at Vicos	6
V. Agricultural Production and Income	7
VI. Dietary Surveys	9
VII. Vital and Health Statistics	13
VIII. An Alternate Method for Assessing Nutritional Status	15
IX. Summary and Reflections	16
X. Conclusion	18
Citations and References	19

AGRARIAN REFORM AND NUTRITION IN PERU:
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By June Neff

I. Introduction

Agrarian reform is widely believed to be central to national economic development throughout the Third World; it is a process which increases agricultural production and redistributes income in the agricultural sector. Agrarian reform achieves greater agricultural production and income equity by making more available locally critical production factors to larger segments of the agricultural population. For the traditional small farmer, access to land, extension service, credit, markets, and irrigation are necessary preconditions to effective participation in the national economy. In Latin America widespread national agrarian reform can have a pronounced impact on economic growth and development due to the fact that most of the people still reside in rural areas; in Peru, the population active in agriculture composed 60% of the national population in 1960 (33, p. 4).

The importance of examining the effects agrarian reform has on nutrition is twofold. First, several Latin American countries have already experienced national agrarian reforms: Mexico since the 1930's, Chile, Cuba, and Peru in the 1960's. And, in other Latin American nations, there is substantial political support for carrying out similar agrarian reforms. Second, if agrarian reform is a development strategy that increases national equity so that the economic standard of living improves among low income groups, one may expect that agrarian reform will also improve the dietaries of reform participants. In fact, income is a major determinant of nutritional adequacy of dietaries (12). An income increment for the bulk of Latin America's rural population, which is marginally employed and underemployed, will initially be expended on food; that is, at the subsistence incomes of Latin American campesinos, there is a high income elasticity for food. One would expect that when more substantial and varied dietaries are within the reach of the rural poor, the current widespread malnutrition problems in Latin America will be alleviated.

* In slightly modified form, this paper was first submitted as a part of the requirements for Agricultural Economics 660: Food, Population, and Employment Fall Term 1974-75.

This paper will explore the effect of a particular agrarian reform in the Peruvian sierra on the nutritional status of its Indian inhabitants. The complications encountered in attempting this task made it impossible to state definite conclusions about the interaction between agrarian reform and nutrition. For this reason, this paper will attempt, not only to point out the successes and limitations of a certain agrarian reform strategy, but also to note where serious gaps of knowledge exist, and show that current research methods must be more comprehensive and precise in order to be of any value. An alternate method for assessing changes in nutritional status over time is also suggested.

II. Agrarian Structure and Agrarian Reform in Peru

Peru is divided into two major agricultural regions: the coast and the sierra in the Andean Mountains. On the coast arable land is abundant; the land is well irrigated, level, and rich. The major crops of this region are export crops (rice, corn, cotton, and sugar cane) and are most subject to economies of scale. The prevailing land tenure on the coast reflects the agricultural conditions; large estateholdings (latifundias) have been increasingly consolidated by several wealthy Peruvian families throughout Peru's history. Today, these latifundias, subject to expropriation by the Agrarian Reform Laws of 1964 and 1969, have been divided into workers' cooperatives.

The Agrarian Reform Law of 1964 was enacted mostly in response to peasant takeovers in the Central and Southern highlands, did not affect the large coastal sugar estates, produced a large and ineffective agrarian reform bureaucracy, and accomplished little land redistribution (19, p. 54). The Agrarian Reform Law of 1969, however, expropriated the large coastal sugar estates, and many other landholdings in Peru; in all, 40% of Peru's farmland is subject to expropriation by this law. From 1962 to 1972, the number of production co-operatives formed was 134, and the number of families working on these co-operatives was 44,106 while the number of peasant communities recognized was 61 with 15,815 families affected. This represents less than one-fifth of the expropriation and agrarian reform to be accomplished by the 1969 Law (19, p. 59). The Law of 1969 recognizes four forms of agrarian organizations that can receive land: production co-operatives, peasant communities, private individuals (in fact, no individuals have received land), and a fourth category, where other organizations that did not fit the legal definition of a production co-operative fell (called Agrarian Associations of Social Interest) (19, p. 59). The agrarian reform, though, has proceeded unevenly: the fastest redistribution has occurred on the coast, and most of these new agrarian units are production co-operatives (19, p. 61). In 1974 productive coastal farmers, who have been the major beneficiaries of the agrarian

reform of 1969, are now resisting the government's efforts to extend agrarian reform to the sierra, and the social and economic gap between the Spanish-speaking criollos on the coast and the Indians, who speak Quechua, of the sierra is as wide as ever (26, p.2).

In the sierra arable land is far less abundant; the land is poorly irrigated, mountainous, and the soil is of poor quality. The major crops of this region are potatoes, maize, wheat, barley, and some vegetables; any surpluses are transported to the coastal cities. The prevailing land tenure in the sierra is consistent with the low productivity of the land. Haciendas are leased for a period of ten years and the hacendado (the renter of the hacienda), has free use of the labor of the Indians living on the land. The Indians, then, farm the best land on the hacienda for the hacendado for commercial production and for themselves to provide a means of subsistence. The short period of lease accentuates the natural low productivity of the land; the hacendado has no incentive to invest in the land. In fact, he is not interested in maximizing production but in maintaining his social and political power, and the highly authoritarian system is well adapted to controlling an illiterate and traditionally farming labor force.

As fewer peasant communities than production co-operatives have been recognized by the Agrarian Reform Law of 1969, there has been less agrarian reform accomplished in the sierra where most of the Indian peasant communities in Peru are located. The agrarian reform at Vicos, which is the subject of this paper, occurred in the Peruvian sierra. It was not an agrarian reform accomplished by the Agrarian Reform Laws of 1964 or 1969; rather, Vicos was an isolated experiment in social change taking place in the 1950's. While the impetus behind and the circumstances of this agrarian reform are very different from the present national agrarian reform, there exists some data from Vicos from before and after agrarian reform that allows study of its impact on nutrition; the experiment at Vicos, then, may help to show what the impact on nutrition will be in the present national agrarian reform in Peru. The location of Vicos in Peru is shown in Figure 1.

III. Methods for Assessing the Impact of Agrarian Reform on Nutrition at Vicos

Ideal nutritional status evaluation demands data from the numerous sources listed in Table 1; accurate assessment of the nutritional health of a community is a complicated, multi-faceted study. Usually, all the sources of information are not available to the nutritionist. At Vicos, the main information sources are dietary studies, and vital and health statistics, which serve as crosschecks on the dietary studies. Agricultural production and income data is used not only to show that agrarian reform was successful but also

FIGURE 1. MAP OF PERU



Source: John Bartholomew World Maps, 1973.

as estimates of the available food supply. The other information sources listed in Table 1 were not available although it will be shown that both information on anthropometry and food consumption patterns could have answered many of the questions raised by this paper. The last four information sources -- clinical nutrition surveys, biochemical and special food studies, and medical information-- are expensive methods, require highly skilled personnel, and could not have been used at Vicos.

TABLE 1. INFORMATION SOURCES FOR ASSESSMENT OF NUTRITIONAL STATUS*

Sources of Information	Nutritional Implications
Dietary surveys	Nutrient intakes
Anthropometric studies	Effect of nutrition on physical development
Food consumption patterns: feeding practices, taboos, etc.	Unequal distribution of food supply in community and family
Vital and health statistics	Population groups at high risk
Agricultural production	Food supply availability
Income and marketing data	Unequal distribution of food supply in community
Clinical nutrition surveys	Identification of severe malnutrition
Biochemical studies	Most precise identification of malnutrition of specific nutrients and their body stores
Special food studies	Problems related to intestinal absorption of nutrients
Medical information	Special nutrient requirements due to disease

* Source: Adapted from WHO, "Medical Assessment of Nutritional Status", (Technical Report Series No. 258, 1963), p. 7.

IV. Agrarian Reform at Vicos

In 1952 several Cornell professors made an agreement with the Peruvian government to lease Vicos from its owner, the Public Benefit Society of Huaraz of the Peruvian Ministry of Health, for the remainder of its ten-year lease ending in 1957. Vicos is composed of 30,000 acres of land of which 2,500 acres are arable and 5,000 acres are used for grazing animals (18, p. 8). The population in 1952 was enumerated to be 1,703 which is probably underestimated by five percent due to mistrust between census takers and Indians (1, p. 425). The agrarian reform initiated by the Cornell-Peru Project in 1952 altered the level of agricultural technology and skills, land tenure, and access to credit and markets. A description of the agrarian reform will show how each production factor brought about a rise in the per capita income.

In 1952 modern agricultural technology and skills were introduced to increase the productivity of the potato because of the high demand for this foodstuff on the national market; potatoes are the staple of the largest segment of the urban population (29, p. 14). Before 1952, Vicosinos (residents of Vicos) used traditional farming implements and a potato seed variety that had been infected by insect pests, fungus, and nematode worms especially in the immediate previous years. Crop rotation was practiced according to how good the last crop harvest was and what food was needed. The land was fertilized by enclosing livestock on the fields to deposit manure, the land was prepared with wooden plowshares worked by hand or animals, and the seed was planted in June and July in the lowlands for commercial production and in the highlands for subsistence in October and November. The late planting in the highlands was a result of the secondary importance of the potato to corn, the main staple of Vicosinos; the major consideration was insuring themselves with a means of subsistence and not the season that would allow for optimal potato production (29, p. 15). Introduction of modern agricultural technology and skills was accomplished with the establishment of an experimental station of Servicio Cooperativo Inter Americano de Produccion de Alimentos (SCIPA) at Vicos. SCIPA provided extension service in the use of guano for fertilizer, pesticides, and a new potato seed, which it made available. Presumably, after the incomes of the Vicosinos were raised from initial harvests, modern metal farming tools were purchased to replace the old wooden plowshares. (The exact point in time that modern tools began to be used is not stated in the literature.)

Previous to 1952, the hacendado required each Vicosino household head to work three days per week farming the best land on the hacienda, which composed ten percent of the arable land and was located in the lowlands. In this way, Vicosinos paid a labor tax for use of small subsistence plots, which composed ninety percent of the arable land and were located in the highlands. If the Indians would not farm the lowlands, they were whipped (a practice discontinued only in 1928), thrown into the hacienda jail, or their land in the highlands was

impounded. The Indian peons would meet weekly with the hacendado who would assign work tasks. In 1952 the Cornell Project abolished this system and facilitated the transition to a new problem-solving and decision-making organization, which consisted of a council of ten delegates, one from each of the ten major regions of Vicos. In the first years the profits of the harvest from commercial production in the lowlands was divided equally between agrarian reform participants and the Project. (Initially, many Vicosinos, freed from the labor tax, preferred to farm only their subsistence plots and did not trust Project workers enough to engage in the agrarian transformation (29, p. 29).) In 1957 the council decided to farm the lowlands collectively in order to pay the rent, approximately \$500 a year (10, p. 34), and to make downpayments on Vicos in anticipation of its complete purchase in 1962. Without a doubt, the change in land tenure created an incentive to increase agricultural production in the lowlands and the highlands.

Before 1952 the hacendado only had the means to invest in the hacienda. As mentioned previously, the short period of lease and the social and political interests of the hacendado prevented him from investing capital in the hacienda to improve the land's productivity. From 1952-57 the Project made an agreement with the Council of Delegates to provide the necessary capital for guano, pesticides, and the new seed if the Vicosinos would provide the animals, tools, and labor. From 1957-62 credit was provided directly to Vicosinos by SCIPA, and thereafter by the Agricultural Bank of Peru. Access to credit, then, was essential to increase agricultural production.

Finally, before 1952 the hacendado marketed the commercial production of crops for his own profit. In 1952 a marketing system for the sale of potatoes to Lima for the Indians' own profits was established. Later, in the 1960's an internal marketing system was initiated whereby other farm crops --maize, wheat, and barley --were sold at Vicos at prices lower by twenty to fifty percent than current prices on the regional market (10, p. 8). The profitable market for potatoes was able to absorb the increasing production of potatoes at Vicos.

V. Agricultural Production and Income

Accurate agricultural production and income data is important for two reasons: to quantify the income effects of agrarian reform, and to quantify the approximate availability and distribution of food supplies to Vicosinos for the assessment of nutritional status. Before 1952 the Indians earned .60 soles a day (30, p. 28) resulting in a yearly income of 220 soles or \$11.00 (in 1954 exchange rates, one sole equaled five American cents (30, p. 28)) in addition to their subsistence food production, which is not quantified anywhere in the literature. The discrepancy between this calculation of yearly

income and a published yearly income of 12,000 soles or \$600 is wide. The latter figure probably takes into account subsistence food production. Still, it is more than twice the estimated per capita income of Peru in 1967, \$241 (15, p. 834) and seems to be of questionable accuracy. Since reliable data on agricultural production and income before agrarian reform cannot be found, unfortunately a base period cannot be established.

Production figures for the 1952-57 period were difficult to obtain; one writer attributes this difficulty to the frequent early removal of potatoes by the Indians. From 1952-57 the Project and Indians shared the profits from the potato harvest equally. One writer reports 1,189 sacks (150 pounds each) of potatoes sold from the 1953-54 harvest (30, p. 29). The price for potatoes in 1954 was 65 soles per sack. So half the potato harvest earned the Indians 77,285 soles or \$1930 in gross sales; profit was considerably less. This profit, though, only applies to those Indians who participated in the agrarian transformation, and nowhere in the literature can the exact number of the initial agrarian reform participants be found.

Table 2 shows the potato production figures from 1957-62; it shows no clear trend in gross sales or profit, and no back-up data or explanation accompanies the production data in the literature. Again, the number of participants in the Enterprise for each year is not stated in the literature; it could be anywhere between 160 and 250 farmers (30, p. 28). Furthermore, potato production on individual plots varied considerably; some farmers received credit and others did not. Also, potato yields were greater on individual plots than on communal plots (13, p. 1). Highland potato production, other farm crops, and other sources of income (raising

TABLE 2. COMMUNITY FARM ENTERPRISE POTATO PRODUCTION AT VICOS, 1956/57 - 1961/62*

<u>Season</u>	<u>Hectares</u>	<u>Gross sales</u> (soles)	<u>Profit</u> (soles)
1956-57	10	---	---
1957-58	30	263,639	137,073
1958-59	50	312,371	91,161
1959-60	45	603,453	162,739
1960-61	45	---	266,000
1961-62	45	334,732	146,855

*Source: Dobyms, Doughty, Lasswell, eds., Peasants, Power, and Applied Social Change, p. 73.

and selling animals, weaving, etc.) assumed more importance during the 1957-62 period for some farmers; their contribution to income cannot be quantified. Expenditures in the early 1960's were reported to average around 100 soles per day during the week and 4000 soles on Sunday, the day Vicosinos go to market (3, p. 29-30). According to these figures the average Vicosino expended 239,200 soles a year or by 1964 exchange rates \$9,570 a year. This figure is clearly nonsensical. So, incomplete production and expenditure data cannot give a reliable income per capita figure for the years during which agrarian reform took place.

Project workers, though, state that the per capita income rose during the 1952-62 period. These increments in income must take into account price changes. While expenditures for coca and alcohol were reported to have increased the most (3, p. 24), between 1949 and 1961 the prices for coca and alcohol rose 150% and the price for sugar rose 200% while between 1954 and 1961 the price for potatoes rose only 40% (3, p. 34). Therefore, the products which the Indians cannot produce and must buy increased in price far more than the agricultural product the Indians sell, and the actual increment in income is lessened by this effect.

In summary, the lack of accurate production, income, and price data do not allow a quantification of the income effects of agrarian reform at Vicos. Household budget surveys would have been a useful tool in clarifying the data and especially in assessing the distribution of the income increments among Vicosino households.

VI. Dietary Surveys

Four dietary surveys have been carried out in Vicos since 1952. The first two surveys, undertaken in July 1952, and February 1953, will provide information on nutrient intake before agrarian reform. The third survey was done in May 1956 and will provide information on nutrient intake after agrarian reform had begun. Unfortunately, the fourth dietary survey, written as a typescript in Lima, could not be obtained for this paper.

The primary sponsor of the surveys was the Nutrition Department of the Peruvian Ministry of Health. Forty families and thirty-seven families consisting of 211 and 196 persons for the first and second survey respectively were chosen. There was an average of 5.3 persons per household. It is stated that the families were stratified according to economic status so as to be representative of the entire hacienda on the basis of data obtained from the Project staff; however, this data is not published in the literature. The time period for both surveys was four days; the reason given for this was that the monotony of the diet presumably did not necessitate a longer period.

Many possible sources of error become immediately apparent upon reading the surveys. The fact that none of surveyors spoke Quechua, the language of the Peruvian Indians, necessitated the use of an interpreter. Observation of food consumption took place before six in the morning and after seven at night due to the technical difficulties of following food consumption between those hours. No activity studies were done. Heights and weights were based on those obtained on a neighboring hacienda. The standard against which the nutrient intakes were compared was the Reference Man and Woman adjusted for body size and temperature. (Mean temperature in Vicos is approximately 60 degrees F. year round.) The Reference Man and Woman, though, are not only supposed to be healthy but also 20-39 years old. Yet, 57% of those persons surveyed were under the age of 21 years.

Two tables were published in the surveys: one, which showed the consumption of foods by 25% or more of the families, and another, which gave the nutritive value of a typical Vicosino's diet. There is clearly a seasonal variation in the amounts of foods in the dietary according to the harvests of the major food crops: barley, corn, wheat, broad beans, potatoes, and oca. Table 3 shows how the consumption of foods varies between July, a month of abundant food and February, a month of relative food shortage.

TABLE 3. AVERAGE SEASONAL CONSUMPTION OF FOODS PER FAMILY PER DAY AT VICOS IN JULY 1952 AND FEBRUARY 1953*

	(grams)					
	<u>barley</u>	<u>corn</u>	<u>wheat</u>	<u>broad beans</u>	<u>potatoes</u>	<u>ocas</u>
July 1952	390	980	420 ^{a/}	490	775 ^{b/}	1600
Feb. 1953	160	600	700 ^{a/}	250	2900 ^{b/}	0

* Adapted from Carlos Collazos, "Dietary Surveys in Peru", Journal of the American Dietetic Association, Dec. 1954, p. 1225.

a/ Of all the food crops wheat is harvested latest into the year, September, so that it is apparently a food heavily consumed in months of food shortages.

b/ Potatoes are apparently stored for consumption in months of food shortages. Potatoes supply more nutrients than any of the other foods.

One source of error in compiling nutrient values of the typical Vicosino diet is that although food preparation and cooking alter nutrient availability, all values were based on fresh foods. Furthermore, nutrient content of local foods was not determined by food

analysis but based on tables compiled elsewhere. Another problem is that food descriptions are lacking. Upon comparing the survey nutrient values with those of the Food Composition Table For Latin America (1961), the discrepancies shown in Table 4 were found. The discrepancies, then, can be attributed to three reasons: local conditions and food preparation which affect nutrient composition of foods, lack of food descriptions, and advances in nutrition research that make the 1960 values more accurate.

TABLE 4. COMPARISON OF PROTEIN CONTENT OF SOME FOODS TYPICAL OF DIETARIES AT VICOS USING TWO FOOD COMPOSITION TABLES*

	(per 100 grams)		
	<u>barley</u>	<u>dry corn</u>	<u>broad beans</u>
Table I ^{a/}	7.4	6.1	25.9
Table II ^{b/}	9.6	10.6	9.1

*Source: Carlos Collazos, "Dietary Surveys in Peru", Journal of the American Dietetics Association, Dec. 1954, p. 1226, and INCAP/ICNND, Food Composition Table For Use in Latin America, (Bethesda, Md., 1961).

a/ Table I values are based on fresh foods, and are taken from dietary surveys at Vicos.

b/ Table II values are based on edible portion of foods, and are taken from INCAP/ICNND, Food Composition Table for Use in Latin America, 1961.

A deficiency of Vitamin A is perhaps the only indisputable nutrient deficiency found on the basis of the three dietary surveys, at least for children and women. Vitamin A deficiency, though, may not be widespread among the adult male population. Coca chewing is common among Indian men. Coca is commonly thought to be chewed to kill hunger pangs; one researcher, though, found that coca chewing has not diminished among men as dietaries improved and that chewing coca is a means of social interaction (13, p. 4). As mentioned before the expenditures on coca have increased during agrarian reform so that the nutrient contribution of coca, whose nutrient value is shown in Table 5, to the adult male dietary assumes more importance after agrarian reform. The Vitamin A content of coca is especially high. But, since the amount of coca chewed is unknown, the contribution coca makes to the dietary of the Vicosino male is a matter of conjecture.

TABLE 5. SELECTED NUTRIENT COMPOSITION OF 100 GRAMS OF EDIBLE PORTION OF DRY COCA*

Nutrient Composition	Unit
Energy	286 kcal
Protein	16.1 gm.
Carbohydrate	48.5 gm.
Vitamin A	5,455 mg.
Vitamin C	53 mg.
Calcium	80 mg.
Iron	37.8 mg.

*Source: ICNND, Nutrition Surveys of the Armed Forces - Bolivia 1964, p. 257.

As with coca, the consumption of alcohol and beer is not recorded. The consumption of chicha, a beer made locally from corn, is reported to be especially high, even for small children (24, p. 58). Alcoholic consumption makes a significant contribution to caloric intake.

Background on the third survey of May 1956 is not available although it is assumed that it was done in a similar manner to the earlier surveys. Table 6 shows the changes in nutrient consumption at Vicos from the first two surveys to the third survey in May 1956. Only energy, Vitamin A, and Vitamin C nutrient consumption increased from the first survey of 1952 to the third survey in May 1956. Vitamin A consumption in 1956 at 799 International Units is still not adequate nor does one know if energy needs are met by the 1956 intake of 2066 kcal since energy expenditure is unknown. Vitamin C intake increases, but it was more than adequate at 81 milligrams in 1952 anyway (due to the high consumption of potatoes). Protein, iron, and calcium intake remains the same. Both protein and iron intake are adequate in 1952 and 1956, though, and it seems likely that the calcium figure, remaining constant at exactly 200 milligrams, was fudged.

That Table 6 does not show a great increase in nutrient intake from July 1952 to May 1956 must be in part due to the fact that July is a month of many food harvests while May is not. Nevertheless, Table 6 shows average ingestion per person; many Vicosinos, then, are consuming less than 2000 kilocalories as well as less of all of the other nutrients. The May 1956 figures are also subject to the many technical problems discussed previously for the earlier surveys.

TABLE 6. SELECTED NUTRIENT CONSUMPTION AT VICOS,
AVERAGE INGESTION PER PERSON PER DAY, 1952, 1953, and 1956^{a/}

	Energy (kcal.)	Protein (gm.)	Calcium (mg.)	Iron (mg.)	Vitamin A (mg.)	Vitamin C (I.U.)
1952	1686	54	200	21	417	81
1953	1612	41	200	14	413	80
1956	2066	53	200	21	799	151

*Source: Carlos Collazos, La Alimentacion y el Estado de Nutricion en el Peru (Lima, Peru, 1960), p. 140.

^{a/}Consumption of other nutrients--thiamine, riboflavin, and niacin--is not shown because these nutrients were consumed in adequate and similar quantities in all three surveys.

While the researchers at Vicos boast that nutritional status improved at Vicos from 1952 to 1956 during agrarian reform, it is clear that the dietary surveys done at Vicos are subject to so many errors and irregularities that they cannot be used reliably to indicate any change in nutritional status at Vicos.

In summary, the problems that arise from assessing changes in nutritional status from dietary surveys are numerous; the exact consumption of foods is difficult to obtain, food analysis of local foods should be done, and nutrient availability to the body, and the requirements of Vicosinos cannot be stated with any precision. Further studies must be done, and these studies would be detailed and expensive. It is necessary to find another simpler method of assessing changes in nutritional status.

VII. Vital and Health Statistics

There is one other source of information, vital and health statistics, from Vicos that can serve as a crosscheck on the stated successful nutrition outcome based on the dietary surveys. The change in crude birth rate (CBR) and crude death rate (CDR) at Vicos is as follows (in number of births or deaths per 1,000 persons):

	CBR	CDR
1952	45.6	14.5
1963	56.2	24.6

The death rate almost doubled in the ten years during which an improvement in nutrition supposedly took place; an improved dietary is not consistent with an increasing death rate. One can only speculate on the reasons for this phenomenon: the only explanation offered in the literature for the increase in the death rate is better reporting and greater exposure to infectious disease with increasing exposure of Vicosinos to the outside world (1, p. 427).

While the rising birth rate at Vicos from 1952 to 1963 may suggest better maternal nutrition status, which allows a woman to bear more children, infant mortality rates (IMR) and child-woman ratios, which can serve as a rough indicator of the toddler mortality rate, show that more of the infants and toddlers born are not surviving. Table 7 shows the rise in the IMR; it may have risen due to a possible decline in breastfeeding and again, exposure to new infectious diseases. (Breastfeeding in 1952 was universal (21, p. 1122); what happened between 1952 and 1963 as far as breastfeeding is concerned is unreported.)

TABLE 7. INFANT MORTALITY RATE (IMR) AT VICOS, 1952 AND 1963*

	(number of deaths per 1,000 infants)		
	<u>IMR</u>	<u>No. of live births</u>	<u>No. of deaths 1st year</u>
1952	122.0	82	10
1963	142.9	119	17

*Source: J. Alers, "Population and Development in a Peruvian Community", Journal of Inter-American Studies, Oct. 1965, p. 427.

Table 8 shows that the child-woman ratios have declined drastically from 1952 to 1963. In other words, there are fewer surviving toddlers and infants per mother in 1963 than in 1952. Can all of these deaths be attributed to the deaths under one year? Some data on morbidity suggests that older children also were dying in greater numbers. In 1956 an epidemic of measles swept the community, killing an unknown number of children, in 1959 epidemics of whooping cough and measles killed sixty children under the age of five (1, p. 433). These statistics are also inconsistent with an improved dietary; well nourished children rarely succumb to common childhood diseases. Of course, poor distribution of food within the family may limit the availability of food to the youngest members of the family. But, this explanation does not seem probable in explaining all the deaths; maldistribution of food within Vicosino families is not described as severe (21, p. 1130).

TABLE 8. CHILD-WOMAN RATIOS AT VICOS, 1952 AND 1963*

	(number of children per 1,000 women)		
	<u>Child-woman ratios</u>	<u>Children aged 0-4</u>	<u>Women aged 15-44</u>
1952	729	270	371
1963	643	312	485

*Source: J. Alers, "Population and Development in a Peruvian Community", Journal of Inter-American Studies, Oct. 1965, p. 427.

VIII. An Alternate Method for Assessing Nutritional Status

One method of assessing nutritional status is anthropometric studies; height and weight are the simplest, yet most indicative, measurements of nutritional status. In a population, those groups at highest nutritional risk are children under five years of age, and pregnant and lactating women. If these groups could be determined to have adequate nutrition based on anthropometric measurements, it would be a fair assumption to state that the community's nutritional status as a whole was adequate. No simple and accurate method has been developed for assessing nutritional risks to pregnant and lactating women; the Ilesha Health and Weight Chart developed in Nigeria for under fives, though, has been shown to be a useful tool for detecting children at high risk of developing malnutrition.

Weight measurement is the basis for the usefulness of the Ilesha Health and Weight Chart (16, p. 268):

It is generally accepted that a slowing in the physical growth rate provides the earliest and perhaps the most sensitive indication of impending malnutrition; up to the age of five years failure to gain weight is particularly informative. An increase in the rate of weight gain is also often the earliest evidence of recovery from malnutrition.

On the chart is recorded the child's rate of growth between high and low percentiles. The importance of evaluating weight is not obtaining an absolute ideal weight but to maintain a regular rate of weight gain over time; a child who stays in approximately the same percentile over time is maintaining a normal rate of weight gain.

Inoculation and "high risk" factors are also recorded on the chart. The nine "high risk" factors are a maternal weight below 43.5 kg., a birth order greater than seven, death of either parent

or a broken marriage, deaths of more than four siblings, especially between the ages of one month and 12 months, a birth weight below 2.4 kg., multiple births, failure to gain 0.5 kg. a month during the first trimester or 0.25 kg. a month during the second trimester of life, breast infections in the mother or difficulties in breastfeeding, and episodes of common childhood diseases or diarrhea early in life. If this tool or a similar method had been used in Vicos before and during agrarian reform, a much more accurate indication of the agrarian reform effects on nutrition could have been had.

IX. Summary and Reflections

What, then, can be said about the effect of agrarian reform on nutritional status at Vicos? Due to a paucity of agricultural production and income data, incomplete dietary data, and the inconsistencies between dietary data and vital statistics, only speculations can be made.

First, perhaps the collective increments in nutrient intake on the hacienda did take place but the increments were not enough to bring the average Vicosino into a state of adequate nutritional status. For example, energy expenditure, which was not quantified, but is probably generally high at Vicos, may have still exceeded caloric intake. And, inadequate caloric intake diverts ingested protein from vital body repair and maintenance functions to more primary energy needs. In addition, the introduction of new infectious diseases, against which the Vicosino had no natural resistance, may have partly offset the effects of an improved dietary on health. Infections and fevers increase nutrient requirements, especially for protein. Protein malnutrition prolongs convalescence, gives poor wound healing, and predisposes to additional infections, probably partly due to diminished immune responses. The debilitating effect on nutritional health of intestinal parasites common in all Vicosinos also must not be overlooked.

While health programs were established at Vicos during agrarian reform, health personnel concentrated on curative health programs to the neglect of preventive health programs. (In curative medicine attention to nutritional health is also usually cursory.) One writer states (25, p. 18):

... the health program for the treatment of the sick had made deeper inroads into the society than had the environmental sanitation, nutrition, maternal and child care, and health education programs.

Preventive health programs, then, were not extensive at Vicos during agrarian reform. Perhaps inadequate knowledge of nutrition as well as sanitation, maternal and child care, and health, rather than an

inadequate food supply were the major deterrents to an improvement in nutritional status. For instance, the inadequate intake of one nutrient, Vitamin A, shown in all three surveys is evidence of the lack of nutrition education. Significantly, women, who prepare the food, were not found to be the Vicosinos who had the most knowledge of vitamins. (Knowledge of vitamins was found to be best correlated with army experience (25, p. 140)).

Another plausible explanation is that an appreciably improved dietary was not shared equitably throughout the hacienda; this would explain the inconsistencies between dietary, and vital and health data. In other words, the selection of the sample for all the dietary surveys may not have been truly representative, though all Vicosinos were taken into account in compiling the vital and health statistics.

Additional contributing factors to explain a possible decline in nutritional health, among other factors, are selective inflation of food prices, a possible decrease in breastfeeding, and withdrawal of food during infections (common practice worldwide) while children at Vicos experienced an increased number of infections per year. Factors such as these are crucial to nutritional health, and may have played a role at Vicos.

Finally, increased population pressure at Vicos may have partly offset increases in agricultural production, income, and food supply. Population density increased from .46 persons per acre in 1952 to .57 persons per acre in 1963 (1, p. 425). One writer suspects that without expansion of arable land or substantial technological improvements, the gains in agricultural production will be threatened soon by growing population pressure (10, p. 134).

Population pressure and generally poor agricultural land continue to be two major constraints to implementing agrarian reform in the Peruvian sierra in the present national agrarian reform in Peru. It is no surprise that the national agrarian reform has effected less change among the rapidly growing, illiterate, and marginal Indian population in the sierra. Those peasant communities in the highlands, which may have been a part of the national agrarian reform, might be expected to experience a similar, less than optimal effect on nutrition, despite a greater food supply, as seems to have occurred at Vicos; that is, the introduction of new infectious diseases, a lack of nutrition education and preventive medicine, and a rapidly growing population are probably the major deterrents to an improvement in nutrition in the agrarian reforms in the sierra.

On the other hand, the newly formed and more successful production co-operatives on the coast probably have had better results in improving nutrition. On the coast income tends to level out within each co-operative, but income levels between co-operatives diverge widely. Wages, housing, education, and medical services, then, vary

from co-operative to co-operative depending mostly on the productivity of the latifundia that previously occupied the land (19, p. 79). In this situation agrarian reforms on sugar estates, the most productive co-operatives, may be expected to have optimal nutrition effects while other coastal co-operatives may not be as successful in improving nutrition. In all of Peru, it seems likely that the degree of social and economic marginality of the participants of an agrarian reform would best determine the impact of the reform on nutrition.

X. Conclusion

Despite the positive effect of agrarian reform on agricultural production, income, and food supply, this paper suggests that agrarian reform is not a cure-all for malnutrition. However, agrarian reform is important in nutrition and health planning. In order to improve community health, careful health and nutrition planning is necessary within an agrarian reform. In other words, a simple increase in food consumption may not be sufficient to improve nutritional status. Vice versa, careful health planning may not be sufficient to improve nutritional status in a traditional agrarian order that preserves low levels of production, income, and food supply for the majority of the agricultural population.

The effects of agrarian reform have been examined in the short term in this paper; long term study of agrarian reform may show different nutrition effects. In the short run, any agrarian reform may not be wholly successful because most subsistence level peasants wisely continue old agricultural practices until the validity of new agricultural methods has been demonstrated. True agrarian reform is a radical social change; time and continued commitment is required for acceptance of and adaptation to a new agrarian organization.

Citations and References

- 1 J. Oscar Alers, "Population and Development in A Peruvian Community", Journal of Inter-American Studies, vol. 7, no. 4, October, 1965.
- 2 J. Oscar Alers, "The Quest for Well-Being", American Behavioral Scientist, vol. 8, no. 7, March 1965.
- 3 David Barkin, "Commercial Activity in a Peruvian Community", (summer field studies program, Columbia Univ., 1961).
- 4 Solon Barraclough, Agrarian Structure in Latin America (Lexington, Mass., 1973).
- 5 Micheline N. Beaudry-Darisme, "The Application of Sociological Research Methods to Food and Nutrition Problems on a Caribbean Island", Ecology of Food and Nutrition, vol. 1, 1972.
- 6 Alan Berg, The Nutrition Factor (Washington, D.C., 1973).
- 7 Carlos Collazos, "Dietary Surveys in Peru", Journal of the American Dietetics Association, vol. 30, no. 12, Dec. 1954.
- 8 Carlos Collazos, La Alimentacion y el Estado de Nutricion en el Peru (Lima, Peru, 1960).
- 9 Sir Stanley Davidson, R. Passmore, and J. F. Brock, Human Nutrition and Dietetics, (Baltimore, 1972).
- 10 Henry Dobyns, Paul Doughty, and Harold Lasswell, eds., Peasants, Power, and Applied Social Change (Beverly Hills, 1971).
- 11 FAO/WHO Expert Committee, Energy and Protein Requirements (Rome, 1973).
- 12 Marco Ferroni, "The Impact of Urbanization on Nutrition in Latin America: The Peruvian Experience" (thesis, Cornell Univ., 1974).
- 13 Norman Fine, "Coca Chewing: A Social Versus Nutritional Interpretation" (summer field studies program, Columbia Univ., 1960).
- 14 Marina Flores, "Dietary Studies for Assessment of the Nutritional Status of Populations in Nonmodernized Societies", American Journal of Clinical Nutrition, vol. 11, no. 5, Nov. 1962.
- 15 Lee Foster, ed., The N.Y. Times Encyclopediac Almanac (N.Y., 1969).

- 16 D. Hegsted, ed., "The Ilesha Health and Weight Chart", Nutrition Reviews, vol. 26, no. 9, Sept. 1968.
- 17 Allan Holmberg, "Changing Community Attitudes and Values in Peru: A Case Study in Guided Change" in Richard N. Adams, ed., Social Change in Latin America Today (N.Y., 1960).
- 18 Allan Holmberg, "Land Tenure and Planned Social Change: A Case From Vicos, Peru", Human Organization, vol. 18, no. 1, Spring, 1959.
- 19 Douglas Horton, "Haciendas and Cooperative; A Preliminary Study of Latifundist Agriculture and Agrarian Reform in Northern Peru" (Land Tenure Center Report, Univ. of Wisconsin, 1973).
- 20 Ruth Hueneman, "Nutrition and Care of Young Children in Peru-Purpose, Methods, and Procedures of Study", Journal of the American Dietetics Association, vol. 30, no. 6, June 1954.
- 21 Ruth Hueneman, "Nutrition and Care of Young Children in Peru-Chacan and Vicos, Rural Communities in the Andes," Journal of the American Dietetics Association, vol. 31, no. 4, June 1955.
- 22 ICNND, Nutrition Survey of the Armed Forces - Bolivia (Washington, D.C., 1964).
- 23 INCAP/ICNND, Food Composition Table for Use in Latin America (Bethesda, Md., 1961).
- 24 William Mangin, "Drinking Among Andean Indians", Quarterly Journal of Studies on Alcohol, vol. 18, no. 1, March 1957.
- 25 Abner Selim Montalvo, "Sociocultural Change and Differentiation in A Rural Peruvian Community"(thesis, Cornell University, 1967).
- 26 New York Times, November 6, 1974.
- 27 E. Payne, "An Intestinal Parasite Survey in the High Cordilleras of Peru", American Journal of Tropical Medicine and Hygiene, vol. 5, no. 4, July 1956.
- 28 Rodolfo Stavenhagen, Agrarian Problems and Peasant Movements in Latin America (Garden City, 1971).
- 29 William Stein, "Changing Vicos Agriculture" (manuscript, SUNY at Buffalo, 1972).
- 30 Robert Stevens, "Agricultural Production on Hacienda Vicos," (manuscript, 1959).

- 31 H. Van de Wetering, "The Demand Induced Impact of Land Redistribution" (manuscript).
- 32 Mario C. Vazquez, "A Study of Technological Change in Vicos, Peru" (thesis, Cornell University, 1955).
- 33 Enrique Viques-Roig, Economic Development Through Agrarian Reform in The Central Sierra of Peru (University of Iowa, 1967).
- 34 WHO, "Medical Assessment of Nutritional Status" (Technical Report Series no. 258, Geneva, 1963).