

Population and Resources in Puerto Rico¹

By FREDERIC P. BARTLETT

From the Field Office of the National Resources
Planning Board, San Juan, Puerto Rico

THE PROBLEM AS SEEN BY OTHERS

THE POPULATION-RESOURCES PROBLEM of Puerto Rico is not a new discovery; it has been stated in almost identical terms time and time again by many competent observers. Because others have phrased it better than we can, we should like to quote here the words of several authorities.

Chardón, Menéndez Ramos, and Fernández García:

The economic problem of Puerto Rico, insofar as the bulk of its people is concerned, may be reduced to the simple terms of progressive landlessness, chronic unemployment, and implacable growth of the population. Appendix A shows the appalling increase in population, with an increase in birth rate from 20.4 to 39.0 in 25 years and a decrease in death rate of 36.7 to 22.4. A policy of fundamental reconstruction should, therefore, contemplate the definite reduction of unemployment to a point, at least, where it may be adequately dealt with by normal relief agencies; the achievement of this, largely by restoration of the land to the people that cultivate it, and by the fullest development of the industrial possibilities of the Island. These achievements will be unavailing, however, if population growth cannot be checked, or at least reduced. This last factor is of very great importance because, even if a parity between population and employment—as to farming or to industrial jobs—can be approximately achieved, it cannot be maintained unless the rate of population growth can be kept within the scope of further economic development. It therefore seems to be highly desirable, probably imperative, that a land restoration and industrial development program, combined with a policy of emigration to suitable environments, be fully worked out as soon as possible. The carrying out of these programs should then progress as rapidly as the means at hand and the nature of the specific problems presented may determine.²

Pérez:

The effects of population pressure and of the lack of balance between population and resources are observed everywhere: high unemployment, cheap

1. Received for publication March 29, 1943. Read before the Second Annual Meeting of the Puerto Rico Public Health Association, January 30, 1943.

2. C. E. Chardón, R. Menéndez Ramos, and R. Fernández García, *Report of the Puerto Rico Policy Commission*, San Juan, P. R., June, 1939.

labor, low productivity per man, high morbidity and mortality rates, unsatisfactory living conditions in general.³

Hill and Descartes:

The most important underlying economic factor in Puerto Rico is the tremendous density of population. The effects of the lack of balance between population and resources are noticeable everywhere. Labor is cheap. Productivity per man is low. The margin of cultivation has been pushed to land of little productivity. On good lands cultivation is very intensive. The low per capita incomes of a large part of the population do not permit the maintenance even in large cities of the same standards in such services as education, sanitation, recreation, store facilities, and restaurants found in small urban centers in the United States.⁴

The Brookings Institution, in its monumental study of 1930:

So long as the population to be supported increases more rapidly than the means of subsistence, there can, of course, be no permanent improvement of Puerto Rican living conditions. The enduring economic problem in Puerto Rico, as elsewhere, is to determine and secure the best balance between resources and productive equipment on the one hand and the population to be supported on the other. In Puerto Rico the best balance does not now exist, for population has outrun the capacity of the present economic resources and organization to furnish full employment and satisfactory living conditions.⁵

Dudley Smith, of the Association of Sugar Producers of Puerto Rico:

Puerto Rico's problems arise from its low per capita income resulting from the large number of people who must share the total income produced from the Island's limited resources.⁶

Matz, Snyder, and Lonigan, in a report to the first Interdepartmental Committee on Puerto Rico:

The basic difficulty in Puerto Rico is . . . absolute low income . . . due to . . . increase in population out of all proportion to the increase in economic opportunities.⁷

3. M. A. Pérez, "Economic Background of Puerto Rico as an Essential Determinant in Health and Social Problems," *P.R. Health Bull.*, 6:381-387, 1942.

4. E. B. Hill and S. L. Descartes, *An Economic Background for Agricultural Research in Puerto Rico*, Bulletin 51 of the Agricultural Experiment Station, Río Piedras, P. R., December, 1939.

5. V. S. Clark and Associates, *Porto Rico and Its Problems* (Washington, D. C.: The Printing Corporation of America, 1930).

6. D. Smith, *Income Problems in Puerto Rico* (Washington, D. C.: Association of Sugar Producers, October, 1939).

7. J. B. Matz, T. R. Snyder, and E. Lonigan, *Economic Rehabilitation in Puerto Rico: Report to the Interdepartmental Committee*, Washington, D. C., August, 1934.

Zimmermann, in his report to the second Interdepartmental Committee on Puerto Rico:

So long as present trends of population growth continue, there is little or no prospect whatsoever of so increasing the supply of available resources, or of so improving the sum-total of commercial opportunities of the Island's agriculture, industry, and trade that a satisfactory balance between social needs and means of support can be struck; the necessity of turning or "bending" these trends becomes *the most vital issue in Puerto Rico*. That does not mean that a single stone should be left unturned in the attempt to improve and enlarge the earning power of the people of Puerto Rico, but it does mean that, no matter how many stones are turned, *a balance between needs and means* cannot be struck without a drastic change in present population trends.⁸

That the basic problem of Puerto Rico is the maladjustment between resources and population is, clearly, the conclusion of most serious students.

THE ROOTS OF THE PROBLEM

How did Puerto Rico come to this pass? The foregoing quotations outline only the end result. What are the constituent elements of the problem? Although stated many times before, they might be once more reviewed for the record.

Puerto Rico is an island one thousand miles removed from the continental country of which it forms both an economic and political part. It possesses no mineral resources of commercial importance (excepting silica sand, limestone, and clay); its available land for cultivation is limited to one million acres, yet its population has twice doubled in the last one hundred years and at present shows no tendency whatsoever to "taper off." It is increasing at a net rate of more than thirty thousand a year. On the basis of medium assumptions, Thompson and Welpton's empirical estimates indicate that the population will continue to increase at its present rate until 1960 at least, when it will reach almost two million nine hundred thousand. Within only twenty years Puerto Rico will have another million people to feed—and it cannot adequately feed its present one million nine hundred thousand! By 1960 there will be in Puerto Rico three persons for every acre of arable land. These facts mean that the pressure of population on resources, which is already great, will become intolerably greater.

8. E. W. Zimmermann, *Staff Report to the Interdepartmental Committee on Puerto Rico*, Washington, D. C., September, 1940.

Of course, a rapidly increasing population is not inherently a problem; indeed, many countries have consciously tried to encourage such expansion. Nor is a high ratio of population to land a problem, for even by 1960 Puerto Rico will not have as high a density for each arable acre as Japan has today. However, these two factors do become serious when they exist simultaneously on an island that nature has not endowed with abundant riches. An analysis of *why* this situation now exists may show answers as to *how* it can be relieved. These answers constitute the only valid plan for the development of the Island.

Basically, the present situation in Puerto Rico developed because of an increasing growth in population (Tables 1 and 5, Chart 1), with no land frontier to be pushed forward and an insufficiently rapid increase in productivity. The first was caused by a very high birth rate and a decreasing death rate, the latter apparently by inadequate natural resources. The interrelations between the two, though, may be more complex. It may have been inadequate resources that induced high birth rate, as peoples who live precariously close to starvation multiply more rapidly than others in order to assure their group existence. Everyone is agreed that low birth rates seem to be the accompaniment of secure standards of living. The facts are briefly these:

The birth rate in 1941 was 39.8 per thousand (Table 3). Only three independent countries of the Caribbean had higher rates at the time of their last official estimates: Costa Rica with 42.3 births per 1,000 population, El Salvador with 41.8, and Guatemala with 41.2, while at the other end of the scale there was Cuba with 16.7, Panama with 26.7, and Nicaragua with 27.4—all more than ten points lower than Puerto Rico.⁹

The death rate in 1941 was 18.6 per thousand (Table 3). Although low in comparison with many other Caribbean countries, it cannot be said that in Puerto Rico the introduction of public health measures alone overthrew a previously existing biological balance. In the ten years preceding American occupation, the population of Puerto Rico increased over 15 percent, and in the succeeding decennia by 17, 16, 19, and 21 percent, respectively, a not very impressive expansion in rate of increase. On the other hand, the average death

9. Incidentally, Cuba's birth rate of 16.7, as reported by the U. S. Bureau of the Census from latest official Cuban sources (F. E. Linder, "Population and Population Statistics of the Caribbean Area," *U. S. Department of Commerce, Bureau of the Census, Special Reports*, 12:568-569, 1941), is even lower than that of the United States, 17.3, and only two-tenths above that of England. It is so surprising that in 1939 Cuba should have had approximately the same birth rate as the United States and England that this may cast doubt on other demographic data from areas where vital statistics are not above question (Table 2).

rate for the first ten years after the occupation (excluding the apparently abnormal year of 1900) was 23.6, while the average death rate for the last ten years has been 19.2. This decrease of 15.0 percent is substantial but not impressive when compared to the reduction in the United States average figures from 14.7 in the period 1916-1920 to 11.2 in 1930-1940, or 24.5 percent.¹⁰

Has productivity kept up with, advanced beyond, or fallen behind the increase in population over the last thirty years? This is a difficult question to answer because early figures for Puerto Rico are probably unreliable and recent data are inadequate. Census information, which presumably is the most reliable, shows a rather confused picture (Table 6). Between 1910 and 1940 population increased by 67.2 percent, while certain indices of production or income increased more and others less (Table 5).

I. These increased more than the increase in population:

	Percentage change 1910-1940
Sugar-cane production	187.5
Tobacco production	83.8
Cotton production	158.3
Production of all other field crops	493.0
Gainfully employed in manufacturing and mechanical industries	149.4
Gainfully employed in transportation	198.0
Gainfully employed in professional services	258.9
Gainfully employed in clerical occupations	586.1
Total Value of Exports	185.0
Salaries and wages in industry	158.8
Value added by manufacture	131.1

II. These increased, but less than population:

Gainfully employed in agriculture	3.3
Persons engaged in industries	47.4
Gainfully employed in trade	49.9
Total Gainful Workers	32.6

III. These actually decreased:

Coffee production	-38.1
Cattle and calves	-4.5
Gainfully employed in domestic and per- sonal service	-221.0

10. The weighted death rate for all Spanish-speaking countries rimming the Caribbean, as most recently reported, was 16.0 (F. E. Linder, *op. cit.*), although again the possible error to which all data are subject is not negligible.

A cursory study of these figures will seem to reveal that productivity in general has kept well in advance of population here in Puerto Rico, as it has throughout most of the industrial world. Indeed, these figures almost appear to demonstrate that the Island's production has doubled in per capita terms since 1910 but, of course, even census data may be incorrect. Certainly, they are incomplete. Although some of any increase in productivity may have merely benefited absentee interests, this could hardly amount to over \$10,000,000 to \$15,000,000 a year. If production has indeed doubled, it is strange that the famous phrase of President Coolidge, "We found the people of Puerto Rico poor and distressed, without hope for the future, . . . poverty stricken, and diseased,"¹¹ should apply in great measure to the present as well as to 1898. The P.R.R.A. (Puerto Rico Reconstruction Administration) in 1936 and 1937 studied the incomes of 745 families¹² living in the sugar-cane area and of 5,743 families¹³ living in the tobacco, coffee, and fruit regions. The average annual incomes, both in cash and in kind, were found to be \$255 and \$171 per family in these two regions, respectively. The W.P.A. (Work Projects Administration) in a more recent study (Appendix A) of two thousand families scattered throughout Puerto Rico has estimated that the average annual income is \$341.¹⁴

Unfortunately, as has been already stated, adequate figures for current income and any figures at all for income in earlier years simply do not exist. Conservative estimates of the Island's 1941 income, for instance, vary from \$175,000,000 to \$225,000,000, while the Puerto Rico Chamber of Commerce recently stated that in 1941 the income of the Island was approximately \$357,000,000.¹⁵ If, however, we assume that 80 percent¹⁶ of Puerto Rico's three hundred and fifty thousand families are within the lower income class, if we accept the W.P.A. estimate of \$341 a year as the average annual income of these families and, if we agree with the Chamber of Commerce's estimate that the income of Puerto Rico for 1941 was \$357,000,000, then we must conclude that (1) the average income of

11. Letter of President Calvin Coolidge to Governor Horace M. Towner, in reply to the Concurrent Resolution of the Legislature of Puerto Rico, February 28, 1928.

12. P. Morales Otero *et al*, "Health and Socioeconomic Conditions on a Sugar-Cane Plantation," *Puerto Rico J. Pub. Health & Trop. Med.*, 12:405-490, 1937.

13. P. Morales Otero *et al*, "Health and Socioeconomic Conditions in the Tobacco, Coffee, and Fruit Regions," *Puerto Rico J. Pub. Health & Trop. Med.*, 14:201-289, 1939.

14. I. W. Jacobs, *Survey of Incomes and Expenditures*. Joint Survey of the W.P.A. and the Department of Labor, San Juan, P. R., 1942-1943.

15. The Economic Review of the Chamber of Commerce of Puerto Rico, January, 1941.

16. This assumption is itself only based on opinions received.

Puerto Rico's upper income groups in 1941 was \$3,736 a year and that (2) the average income of *all* Puerto Rican families in the same year would have been over \$1,000 per family, if the entire income of the Island had been evenly divided. An income of \$1,000 for all families, in comparison with a present income of around \$350 for 80 percent of all families, would indeed be a clear improvement for the latter. Although the potential per-family income figure of \$1,000 for Puerto Rico, thus computed, compares with a figure of \$2,300 for the average continental United States family in 1941 based on similar calculations,¹⁷ the first is still so high that it raises serious doubts as to the validity of the total income estimate. These figures would indicate that, while the lower 80 percent of United States families receives approximately *half* of the nation's income, in Puerto Rico the lower 80 percent of the families receives only about *one-fourth* of the Island's income.

Whatever may be the relative importance of a high birth rate, a relatively low death rate, and an apparently very uneven distribution of income, it is clear that (1) the increases in production cited above have not been sufficient to raise general living standards to a point where the latter have any appreciable effect on the birth rate or size of families, and that (2) the end product is a state of discouragement and apathy. These are final causes and results of the vital problem that now faces Puerto Rico. Social responsibility requires a valued stake in the community's welfare; if there is no feeling of mutual advantage, there can exist no feeling of responsibility and, therefore, no conscious or unconscious desire to bring only those children into the world who can contribute to it and be adequately supported by it.

In summary terms these three main forces—increasing population, inadequate production, and poor income distribution—have resulted in a vicious, upward spiraling movement which seemingly is headed for inevitable disaster. The basic causes are economic; they are evident in the ubiquity of poverty. The contributing causes are discouragement and apathy; they result in high birth rates which, in turn, continue the maladjustment of population to resources, with the consequences just described. The spiral moves on and up.

17. U. S. consumer expenditures for 1941 were \$80,280,000,000 (*Survey of Current Business*, October 2, 1942); the number of families in 1941 were approximately 35,362,000 (*Statistical Abstract of the United States*, 1941 (1940 figures adjusted to 1941)).

WAYS OUT

Notwithstanding, there are certain factors dealing with the Puerto Rican problem which have not been customarily stressed but which lend some hope that this vicious circle may some day be stopped. For instance, while it is often noted that Puerto Rico's population has increased very rapidly, it is not often pointed out that between 1800 and 1940 the population increased only twelve times while that of the United States in the same period increased twenty-five times, or twice as fast as in Puerto Rico. Nor is it often noted that since the first Spanish censuses in Cuba and Puerto Rico, two and one years, respectively, before the United States declared its independence of England, the population of Cuba has increased twenty-five times and that of Puerto Rico only twenty-seven times, which certainly is not a significant difference. Of course, birth rates in any country are not static. In the period of 1878 to 1882 Germany had a birth rate approximating that of Puerto Rico today. Fifty years later Germany's birth rate had been reduced by more than half to the figure of seventeen births per thousand population. Warren S. Thompson has estimated that "in China there are probably 1,000 people, or more, living on each square mile of arable land, while in Java there are perhaps 1,200 to 1,400, and in Japan over 2,500."¹⁸

These figures compare with between eight hundred to one thousand people per square mile of arable land in Puerto Rico. If population densities per square mile of total land area, irrespective of its cultivability, is considered, Puerto Rico has approximately five hundred and fifty persons per square mile in comparison with seven hundred and twenty-five for Belgium, seven hundred and fifty for England, and approximately the same number for the Netherlands. Possible solutions to the population-resources problem are thus suggested by the fact that great population increases as in the United States can come to an end, that birth rates as in Germany can be halved within a period of fifty years, that perhaps twice the number of people are supported per acre of land in Japan and Java than in Puerto Rico, and that the population of several countries of the world, not particularly noted for their agricultural resources, can support a very substantially higher density of population than Puerto Rico.

The present Governor of Puerto Rico indicated, in his inaugural

18. W. S. Thompson, *Population Problems* (New York: McGraw Hill Book Co., 1935).

address, that the problem might not be insoluble. He stated in part:

It is not a task which is impossible, if it be given devoted attention. The solutions—the theoretical solutions—have been pointed out often enough. Poverty is not merely the result of a mechanical relationship between the resources of a region and the number of its people. On either side of such an equation there are infinite possibilities of variation: the resources may be of many kinds, more or less wanted by the world outside, more or less available, actually, to those who have to depend on them for support. . . . We have no coal or oil but sun, wind, and water will be the important sources of power in the future. We have a deficiency of arable land by present standards, but what if its productiveness should be doubled or quadrupled?¹⁹

To improve the situation actually, more than words are of course necessary. If Puerto Rico really wants to secure a higher standard of living, it must adopt a conscious policy or plan, and adhere to it. There is no alternate solution to the problem other than the final solution which Malthus foresaw, namely, increasing misery. This final solution, however, can be accepted by no one in an age of reason. In this paper the outline of a more rational approach is indicated with the realization, notwithstanding, that neither the approach suggested here, nor any other, can nor should be adopted except by the people of Puerto Rico themselves.

In general, it is believed that the population problem can be attacked in two directions: either through increasing the goods and services available for the community or through adjusting the population qualitatively or quantitatively to existing production. Available goods and services in turn can be increased in several ways: (1) by a more intensive use of existing resources, (2) by a more equitable distribution of these resources and the income derived from them, and (3) by securing additional resources from the outside. The attack from a second direction, that of population adjustment, also includes several alternatives: (1) emigration, (2) reduction in the birth rate either through the use of contraceptives, later marriages, or other voluntary means, and (3) allowing an increase in death rates. No analysis is required to justify discarding at the very beginning two of the means just enumerated—dependence upon outside increased assistance and an increase in death rates. The former is certainly not practical for any community that wants to be less, rather than more, dependent on the outside world; the latter is

19. Inaugural Address of the Hon. Rexford G. Tugwell as Governor of Puerto Rico, September 10, 1941.

repugnant to both human feeling and most religious doctrines. Although the exposure of infants was practiced until relatively recent times in several savage countries, it disappeared from the civilized world many centuries ago.²⁰

1. *Expansion of Resources*

Perhaps the particular type of increase in productivity, which comes first to the minds of us all, is that associated with the land. Obviously, if over twice the number of people can be supported per arable acre in Java or China as can be supported in Puerto Rico, one wonders whether the land here has not been put to as efficient use as in either Java or China. Thompson writes: "Rough calculations however indicate . . . that in Java (whose population density per arable acre is about four times that of Puerto Rico) there is a net export (of foods) amounting to about 10 percent of the home production, and that in Japan (where the density per arable acre is three and a half times that of Puerto Rico) there is a net import of food amounting to 20 percent of that produced at home, depending upon the abundance of the harvest."²¹

Many people have felt that one explanation of Puerto Rico's position in this respect is that too much of its research and enterprise has been associated with the cultivation of sugar-cane. Surprisingly few practical studies have been made, particularly ones that include cost and income figures, to develop other practical crops, whether for food or for export, which would either supplement or supplant sugar. The Governor has said:

Quinine, teakwood, the mahoganies, various grapes, certain bamboos which are resistant to termites, many plants which bear essential oils and others which are the sources of insecticides, improved citrus varieties, certain promising fibre plants—these and many others need to be planted now on the thousand acre scale. Among them will be found, I am sure, what is needed: substitutes for the tobacco and coffee which are declining, the one because of erosion, the other because of hurricane damage and market failures.²²

When these or similar crops are suggested to supplement or supplant coffee or tobacco, the objection is often raised that they will

20. W. S. Thompson, *op. cit.*

21. *Ibid.*

22. R. G. Tugwell, "Investigation into Administrative Responsibilities under the Five Hundred Acre Limitation on Land Holdings in the Organic Act for Puerto Rico," San Juan, P. R., December, 1941.

not be "profitable" and will not be able to compete with other areas where the land is virgin and labor much less costly. As objective studies of the economics of growing such crops are almost nonexistent and as plantings of these crops on the thousand acre scale are necessary to give sufficient data, such plantings would be justified simply to settle once and for all their commercial feasibility. We do know, however, that there have been increases in the efficiency with which sugar is grown in Puerto Rico. In 1919 seventeen tons of sugar-cane were secured from each *cuerda* and in 1939, thirty-one tons. As sugar was grown on the same acreage in 1919 as in 1939, that is, on two hundred and thirty thousand *cuerdas*, the per capita production of sugar-cane actually increased from 3.1 tons in 1919 to 3.9 tons in 1939. The two other stable crops in Puerto Rico did not do so well. Tobacco production decreased from 15.4 pounds per person in 1919 to 10.8 pounds per person in 1939, and coffee fell drastically from thirty-two pounds to fourteen pounds per person (Table 4).

We personally believe that with continued reliance on agriculture as the basis of her economy Puerto Rico could still support perhaps half again as many people as it now does, if it were willing to work as hard for as little as the Japanese and Javanese peasants. However, we believe, that thorough cost studies would be necessary before it could be safely said that there are other annual or perennial crops that could replace sugar in terms of net income per acre. In view of the relatively weak showing made during the last two decades by tobacco and coffee, there may well exist alternative crops that could produce higher net incomes per acre than these two historic crops. Unless such new crops are found and developed, Puerto Rico's expanding population can only be fed by increasing the intensity and duration of labor applied to the present crops and to their expansion into new areas. Another possibility, that new agrobiologic techniques for growing food may be so developed as to free us forever from the limitations of the soil, still lies in the future. We do believe, though, that it would be a wise procedure for Puerto Rico to base its immediate resources-population policy on this possible problematical and certainly future contingency.

A second possibility for increasing production in Puerto Rico lies in an increasing industrialization. Obviously such countries as England, Belgium, and the Netherlands could maintain their relatively high standards of living with such high population densities only because they produced goods and services that did not require

agricultural land. We have often said—though it must be confessed that it is stretching the truth a little—that if the barren and foggy Island of Manhattan can support two million residents and give work to another million “foreigners” from the Bronx, there is no reason why the much larger and much more fertile Island of Puerto Rico cannot do likewise. New York City has no agricultural land, no minerals and no water power, but it maintains a population of seven million people by performing certain services for which others are willing to pay and by manufacturing many miscellaneous objects for which design and merchandizing are more important than the economies resulting from large-scale operations.

There exist, however, more probable ways in which the industrialization of Puerto Rico, and therefore the expansion of its resources, might take place. These involve an intensification in the use of the Island’s agricultural, mineral, forest, and fishery resources, and some production based on imported raw materials. For instance, at least a dozen new industries can be based on cane, such as:

Acetone	Industrial alcohol:
Butanol	Fuel
Candies	Bay rum
Carbonic acid (dry ice)	Medicinal products
Molascwit (livestock feed)	Perfumery
Cellulose products:	Power from bagasse
Alpha cellulose	Refined sugar
Building board	Rum
Containers	Syrup
Paper for wrapping, etc.	Yeast for baking and as a cheap
Oils	protein food
Potash from rum slops	

The following industries can be based on coconuts:

Copra	Margarine	Soap
Edible oil	Shredded coconut	Vegetable lard

There are still others that can be developed from cotton, other fibres, coffee, essential oils, perfumes, and livestock. Puerto Rico could also utilize its silica sand for glass, its clay for flat ware, and could export its ore for iron and steel. Fishing and processing of fishery products could be greatly extended.

It is interesting to remember also that one industry may in reality be the nucleus for several derivative ones. For instance, in connec-

tion with glass the following industries could be developed as by-products:

Thermosetting molding	Paperboard for waste
Soda ash for:	Silicate of soda for:
Laundry soap	Laundry soap
Textiles	Paper
Paper pulp	Corrugated cartons

The following are industries that are dependent on glass containers and, by that very fact, might be initiated or expanded on conjunction with the new glass industry itself:

Tablewares	Syrups	Mineral waters
Tumblers	Milk	Fruit and vegetable packing
Beer	Pharmaceuticals	Fruit juices
Soft drinks	Bay rum	Jams and jellies
Rum	Candies	Vinegar

An objection to certain of these industries has been based on the fact that they might be “uneconomic.” This is the same argument that has been used against the development of new agricultural products but, as long as two hundred thousand persons are out of work in Puerto Rico, nothing should be considered “uneconomic” that might utilize these hands and these brains in the production of commodities required by the people of Puerto Rico. It is only after full utilization of all productive facilities has taken place that the question of “economic feasibility” should be a deterrent to embarking on marginal enterprises. Anything which is required in Puerto Rico and which otherwise idle men, land, or capital can produce would to that extent increase production of the Island.

A third method under the general category of resources development is the redistribution of present income. Aside from the data previously mentioned, we have no facts to guide us, and income considerations should not be based on guesses.

2. Adjustment of Population

Under existing circumstances and, unless such circumstances are changed in the near future by startling scientific discoveries in the field of chemical food production, it has been suggested that the people of Puerto Rico must inevitably suffer a lowering of their living standards unless there is either an increasing productivity in goods and services, or a stable population. Personally we do not

feel that it would be realistic to trust that during the next ten to twenty years productivity in Puerto Rico can be increased sufficiently to maintain current living standards for the present annual net increment to the population. This has averaged thirty thousand a year while, for instance, it is estimated that a proposed glass factory could directly employ one hundred and seventy-five persons only. It would appear conservative, therefore, to suggest that a second approach to the problem be considered—that of dealing with the population itself.

There are several ways to “adjust” population to resources. The two most normal and automatic ways in the past have been either by increasing living and educational standards, or by lowering them to the degree where Malthus’ principle begins to operate. If living standards are raised, as happened in most western European countries after the Industrial Revolution, individuals will apparently be psychologically induced to reduce their family sizes voluntarily either by later marriages or the use of contraceptives. On the other hand, if living standards are sufficiently lowered, increasing death rates eventually counterbalance high birth rates. It is obviously more desirable, however, to adjust population and resources rather by raising living and educational standards than by more conscious means, though sometimes the vicious circle cannot be broken by increases in these standards alone. Population increases will continue to outstrip them.

Under such circumstances it appears that the population-resources spiral must be broken by a conscious policy of emigration and of birth control. Whatever the theoretical advantages in emigration, there has actually been a net emigration of only sixty thousand persons from the Island during the thirty year period between 1910 and 1940. In view of the fact that much larger groups of people, who also spoke a differential language but were not citizens, emigrated in the past to the United States, it is surprising that more Puerto Ricans have not done so, too. A possible explanation is that they have not been forced out by famine or political or religious persecution. Mass emigration of Puerto Ricans has been attempted several times in the past, but it has generally turned out so badly that it can be contemplated again only under the most careful recruitment, placement, and supervision. Mass emigrations to new territories, in addition, require a great amount of capital and initiative. It might therefore be better to concentrate on preparing selected Puerto Ricans for individual emigration into higher skilled positions in the

States or elsewhere in the Caribbean,²³ so trying to control even this type of migration that new Puerto Rican communities similar to the one in Manhattan may not develop.

Of course, the most direct way of adjusting population to resources is through the use of contraceptives. Although in “advanced” industrial countries this method seems to be the result of higher living standards rather than the cause of smaller families, in less “advanced” countries birth control would presumably have to be incurred as a government policy. The cost of supervising it would be considerable. Indeed, whether contraceptive techniques might be effective in countries with a low income has long been questioned. Their applicability among a population such as Puerto Rico’s in which, besides the income factor, 31 percent of the people ten years and older are illiterate, would ordinarily be considered as extremely doubtful. The practical difficulties of applying contraceptives where the water supply may be a quarter of a mile from the home, where whole families sleep in the same room, and where a trip “to town” is an event, need no elaboration.

Yet in Puerto Rico an interesting experiment has been under way since 1939, whose results will determine whether this type of birth control can be made effective under such unfavorable conditions. The program has been carried on under the Bureau of Maternal Health and Child Hygiene of the Department of Health, operating through eighty-six clinics, forty rural dispensaries, six tuberculosis clinics, five institutions and hospitals, and one venereal diseases clinic. In accordance with federal and insular laws regarding contraceptives, the teaching of contraceptive methods in Puerto Rico has been restricted to mothers who require freedom from pregnancy or spaced pregnancies for their physical health. Although thus restricted and although its funds for personnel and materials are severely limited, the Bureau has increased its case load of reporting mothers, who practice contraception, from 19,740 to 30,387 in ten months. Each case is fully documented and carefully followed up. The education of the mother is considered of equal, if not more, importance than the actual supplying of material. No accurate cost figures per case are available, but a rough estimate might be based on the assumption that one-half of the budget of the Bureau is devoted to maternal health, and that of this half more than half again

23. It is interesting to note that in the Virgin Islands and in the Dominican Republic, Puerto Rican emigrants have been relatively successful as small *entrepreneurs* and artisans.

is devoted to general hygiene work, such as pre- and post-natal care and supervision of midwives. Under these conditions, the cost for the spaced pregnancy program would be a fourth of the budget for maternal and health, or about \$7.50 a case.²⁴

It is not supposed that anything like full coverage of all health cases would in practice be desirable, even if feasible, but a continued expansion of the present work by ten to twenty thousand cases a year should be possible at an increased annual cost of \$75,000 to \$150,000, attaining an eventual annual total of only \$2,250,000 for 300,000 cases.²⁵ This would indeed be a very small sum to pay annually for the stabilization of Puerto Rico's population long enough to allow other more basic factors, such as increased living standards and universal education, to affect the birth rate. It is understood that there has been little opposition to date, whether religious or social, to the contraceptive program. It would require, however, careful selection and training of the specialized nurses who are so important an element in the success of the Bureau's effort assuming, of course, that such a program would be positive and not negative—a proper encouragement of births is as important as their limitation.

To be successful, the two approaches outlined above—that of industrialization and that of population adjustment—require a certain environment which perhaps does not exist at this time in Puerto Rico. This environment is one of social responsibility. We believe that, unless it is somehow developed, neither industrialization nor population adjustment can ever be effected. The inadequate feeling of social responsibility is perhaps due to two factors: (1) that Puerto Rico is not politically responsible for its own destiny, and (2) that its education has until recently deliberately ignored, rather than developed, a consciousness of the basic problems of the Island and their possible solutions. This is made clear in a recent Department of Education letter:

Formerly the directive personnel of the school system prepared in advance the material to be taught in the different subjects—elementary science, social science, and physical education—and the teacher taught this subject

24. G. W. Beebe and J. S. Belaval, "Fertility and Contraception in Puerto Rico," *Puerto Rico J. Pub. Health & Trop. Med.*, 18:3-53, 1942.

25. There are about 400,000 women in Puerto Rico between the ages of fifteen and forty-four.

matter without considering its function as an aid in solving the pupils' problems. Sometimes it was useful material; many times it was superfluous.²⁶

It is therefore suggested that present new trends in educational policy be strengthened and that the expanded educational program be not limited to schools. It should touch many aspects of the life of all ages and occupations; it should use all available means of communications, from the radio to traveling exhibits. It should couple the teaching of specific techniques with the basic subjects of family life, marital relationships, physical hygiene, relationships between individuals, social organization, and an appreciation of the lessons to be learned from other countries and peoples. Finally, it should be carried out on a grand scale. Perhaps the most important single postwar public work in Puerto Rico would be such an intensive campaign as that described. If \$10,000,000 were spent additionally per year on such a program for five years (or \$5.00 annually for each man, woman, and child on the Island), untold misery might be avoided. In practice this would go a long way towards making people aware of living standards and the need for improving them. Education alone cannot improve a condition when the economic and social level prevent it, but education can teach awareness and can indicate solutions. If such awareness encourages the application of such solutions, education in Puerto Rico will have accomplished its obligation to society.

Of course, Puerto Rico's solution of this problem will depend upon the improvement of physical health, which is just as important as improvement of mental health. We believe that people who are undernourished and otherwise physically below par cannot assume obligations either for increased work or for greater social responsibilities. For these reasons an expanded public health program is as much a present requisite to the expansion of production and the development of a new social outlook as political responsibility, educational advancement and, finally, an increased standard of living itself.

Puerto Rico, to conclude, faces a problem which is as old as mankind itself—how to feed, clothe, and shelter its people. As history also points out, there are only three solutions to this ancient problem: to allow a part of its people to perish through starvation, disease, and war; to increase the exploitation of its own resources; and to reduce the pressure of increasing births. Only the latter two,

26. Department of Education, "Educational Philosophy and Reforms in the Curriculum of the Elementary School," San Juan, P. R., 1942. The italics are added.

however, can be considered in an era when human intelligence has advanced to the point of recognizing the problem.

In terms of resources we can:

1. Intensify the use of the land.
2. Intensify the productivity of labor.
3. Develop new crops or new methods of growing old ones.
4. Use fully what minerals, hydroelectric power, and fishery resources are available.
5. Sell clerical and other services to others.
6. Take in our own washing, even if this may be less efficient in monetary terms than trying to exchange goods with the outside world.
7. Redistribute present income.

In terms of people we can:

1. Increase basic education.
2. Increase health.
3. Encourage emigration.
4. Encourage a balanced expansion in population through offering advice in spacing pregnancies.

These are the basic ways by which the fundamental problem of Puerto Rico may be solved.

ACKNOWLEDGMENT

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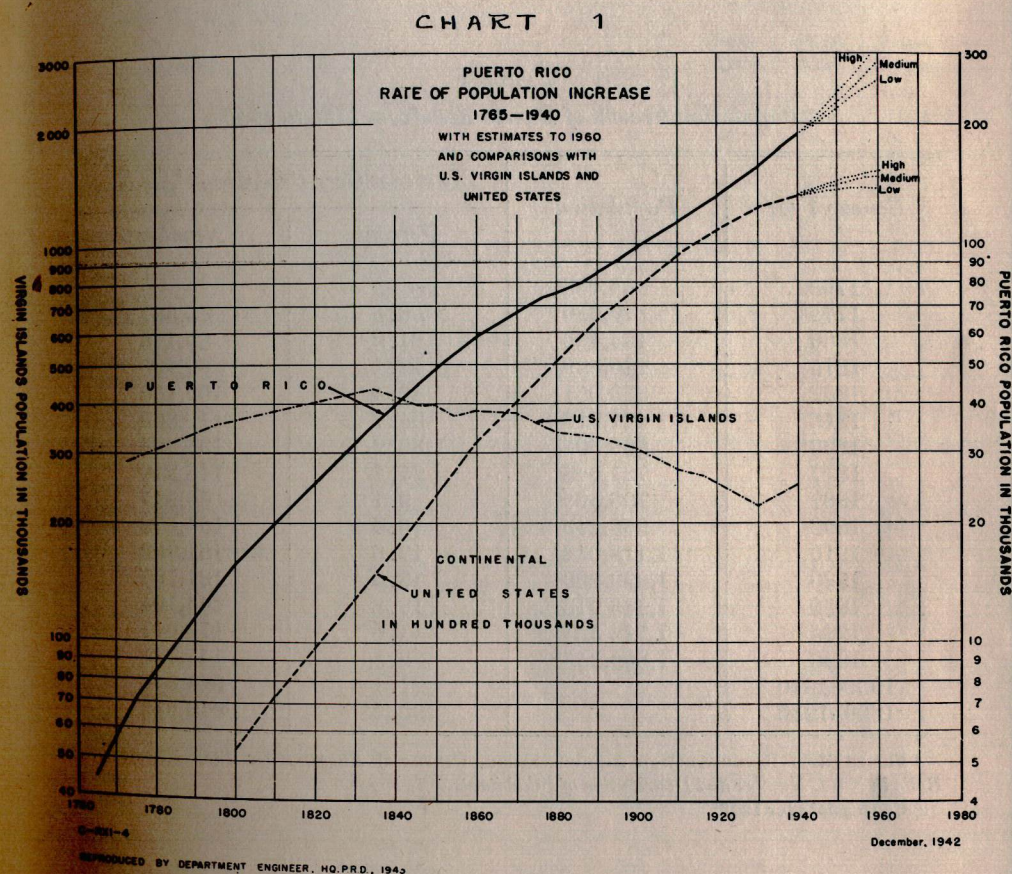


TABLE 1

Population Growth of Puerto Rico from 1765 to 1940^a

Census Year	Population	Increase Over Preceding Census	
		Percent	Number
1765	44,883	—	—
1775	70,250	56.5	25,367
1800	155,426	121.2	85,176
1815	220,892	42.1	65,466
1832	330,051	49.4	109,159
1846	447,914	35.7	117,863
1860	583,308	30.2	135,394
1877	731,648	25.4	148,340
1887	798,565	9.1	66,917
1899	953,243	19.4	154,678
1910	1,118,012	17.3	164,769
1920	1,299,809	16.3	181,797
1930	1,543,913	18.8	244,104
1935	1,723,534	11.6	179,621
1940	1,869,255 ^b	8.5	145,721
1930-1940		21.1	325,342
1899-1940		96.1	916,012

^a Puerto Rico Reconstruction Administration, *Census of Puerto Rico: 1935 Population, Bulletin No. 1, Number and Distribution of Inhabitants.*

^b Census data for 1940.

TABLE 2

Population Characteristics of Independent Countries and Possessions of Caribbean Region in Order of Birth Rate^a

States	Population	Area (Sq. Miles)	Density Persons per sq. m.	Birth Rate	Death Rate	Natural Increase
St. Christopher (Br.)	18,000	68	264.7	43.2	33.8	9.4
Costa Rica	639,000	23,000	27.8	42.3	18.3	24.0
El Salvador	1,745,000	13,176	132.4	41.8	18.3	23.5
Guatemala	2,420,000	45,452	53.2	41.2	20.9	20.3
St. Vincent (Br.)	60,000	150	400.0	40.3	15.3	25.0
Antigua (Br.)	34,000	108	314.8	40.1	24.2	15.9
(Mexico)	(19,479,000)	(787,746)	(24.7)	(40.0)	(23.8)	(16.2)
Puerto Rico (U. S.)	1,869,255	3,423	546.1	39.8	17.8	22.0
Bahamas (Br.)	68,000	4,404	15.4	35.8	20.4	15.4
Virgin Islands (U. S.)	25,000	133	188.0	35.8	20.9	14.9
British Honduras	58,000	8,598	6.7	35.5	20.3	15.2
Curaçao (Neth.)	101,000	384	263.0	35.0	11.6	23.4
Venezuela	3,615,000	352,143	10.3	34.3	18.6	15.7
Anguilla (Br.)	6,000	34	176.5	34.2	12.5	21.7
Montserrat (Br.)	14,000	32	437.5	32.8	15.3	17.5
Dominican Republic	1,655,000	19,325	85.6	32.6	8.8	23.8
Jamaica (Br.)	1,174,000	4,404	266.6	32.4	16.3	16.1
Virgin Islands (U. S.)	6,000	67	89.6	32.2	8.9	23.3
Colombia	8,702,000	439,997	19.8	31.5	17.6	13.9
Trinidad and Tobago (Br.)	465,000	1,978	235.1	31.0	16.0	15.0
St. Lucia (Br.)	69,000	233	296.1	30.7	14.8	15.9
Dominica (Br.)	51,000	305	167.2	30.4	14.5	15.9
Nevis (Br.)	14,000	50	280.0	29.9	13.3	16.6
Grenada	89,000	133	669.2	29.8	15.2	14.6
Nicaragua	850,000	60,000	14.2	27.4	9.7	17.7
Barbados (Br.)	193,000	166	1,162.0	27.3	19.4	7.9
Panama	548,000	32,380	16.9	26.7	10.9	15.8
(United States)	(131,669,000)	(2,973,776)	(44.2)	(17.9)	(10.7)	(7.2)
Cuba	4,253,000	44,164	96.3	16.7	10.6	6.1
Canal Zone	45,000	362	124.3	11.3	5.8	5.5
Honduras	962,000	44,275	21.7	—	—	—
Haiti	2,600,000	10,204	254.0	—	—	—
Guadeloupe (Fr.)	243,000	688	353.2	—	—	—
Martinique (Fr.)	255,000	385	662.3	—	—	—
Total	32,783,000	1,110,233	53.2	—	—	—

^a Forrest E. Linder, "Population and Population Statistics of the Caribbean Area," U. S. Department of Commerce, Bureau of the Census, *Special Reports*, 12:568-569, 1941.

Except for Martinique, population figures represent latest official estimates varying between 1935 and 1940.

TABLE 3

Births, Deaths, and Natural Increase in Population of Puerto Rico and Their Rates, 1900-1941, and Rates for the United States, 1916-1941^a

Year	Natality		U. S. Rate	Mortality		U. S. Rate	Natural Increase		U. S. Rate
	Live Births	Rate		Deaths ^b	Rate		Numerical	Rate	
1900	19,930	20.4	—	35,781	36.7	—	15,851	16.3	—
1901	25,898	26.3	—	24,447	24.8	—	1,451	1.5	—
1902	30,123	30.3	—	25,552	25.7	—	4,571	4.6	—
1903	40,053	39.9	—	22,694	22.6	—	17,359	17.3	—
1904	28,472	28.0	—	23,050	22.7	—	5,422	5.3	—
1905	32,226	31.4	—	25,927	25.3	—	6,299	6.1	—
1906	34,778	33.6	—	27,132	26.2	—	7,646	7.4	—
1907	34,701	33.2	—	23,530	22.5	—	11,171	10.7	—
1908	33,088	36.1	—	22,049	20.9	—	16,039	15.2	—
1909	37,343	33.4	—	24,751	22.1	—	12,592	11.3	—
1910	37,692	33.2	—	26,579	23.4	—	11,113	9.8	—
1911	39,874	34.6	—	27,607	24.0	—	12,267	10.6	—
1912	41,002	35.1	—	26,034	22.3	—	14,968	12.8	—
1913	45,609	38.6	—	21,775	18.4	—	23,834	20.2	—
1914	46,947	39.2	—	23,664	19.7	—	23,283	19.5	—
1915	45,590	37.6	—	26,572	21.9	—	19,018	15.7	—
1916	42,259	34.4	25.0	34,939	28.4	14.8	7,320	6.0	10.2
1917	43,261	34.6	24.7	34,457	27.7	14.2	8,804	6.9	10.5
1918	53,348	42.6	24.6	39,974	31.7	18.3	13,374	10.9	6.3
1919	50,729	39.0	22.3	30,280	23.2	13.0	20,449	15.8	9.3
1920	47,961	36.4	23.7	29,396	22.3	13.1	18,565	14.1	10.6
1921	52,033	39.0	24.2	30,098	22.5	11.7	21,935	16.5	12.5
1922	50,348	37.2	22.3	28,533	21.1	11.8	21,815	16.1	10.5
1923	51,722	37.4	22.2	25,886	18.7	12.3	25,836	18.7	9.9
1924	54,556	39.0	22.4	31,350	22.4	11.7	23,206	16.6	10.7
1925	53,059	37.1	21.5	33,519	23.4	11.8	19,540	13.7	9.7
1926	56,675	39.0	20.7	32,946	22.6	12.2	23,729	16.4	8.5
1927	50,746	34.3	20.6	30,500	20.6	11.4	20,246	13.7	9.2
1928	56,708	37.7	19.8	35,467	23.6	12.0	21,241	14.1	7.8
1929	52,468	34.4	18.9	38,534	25.3	11.9	13,934	9.1	7.0
1930	54,574	35.2	18.6	28,870	18.6	11.4	25,704	16.6	7.2
1931	65,700	41.7	17.8	32,146	20.4	11.1	33,554	21.3	6.7
1932	66,433	41.5	17.3	35,610	22.3	10.9	30,823	19.2	6.4
1933	61,655	38.0	16.6	36,763	22.6	10.7	24,892	15.4	5.9
1934	65,595	39.8	17.2	31,703	19.2	11.1	33,892	20.6	6.1
1935	67,585	40.4	17.0	30,753	18.4	11.0	36,832	22.0	6.0
1936	68,962	40.6	16.8	34,788	20.5	11.6	34,174	20.1	5.2
1937	67,919	38.3	17.1	37,132	20.9	11.3	30,787	17.4	5.8
1938	69,823	38.7	17.6	33,870	18.8	10.7	35,953	19.9	6.9
1939	73,044	39.8	17.3	32,631	17.8	10.6	40,413	22.0	6.7
1940	72,388	38.7	17.9	34,477	18.4	10.8	37,911	20.3	7.1
1941	76,130	39.8	—	35,551	18.6	—	40,579	21.2	—

^a Department of Health of Puerto Rico and U. S. Census.

^b Does not include stillbirths.

TABLE 4

Land, Agricultural Production, and Population in Puerto Rico, 1909-1939

	1909		1919		1929		1939	
	Thou- sand		Thou- sand		Thou- sand		Thou- sand	
Total land area of Puerto Rico in cuerdas ^a	2,256		2,256		2,256		2,256	
Population of Puerto Rico ^b	1,106		1,291		1,526		1,837	
Cuerdas per person		2.04		1.75		1.48		1.23
Improved land area in cuerdas ^c	1,570		1,304		1,222		1,354	
Cuerdas per person		1.4		1.0		.8		.74
Local food crops area in cuerdas ^d	155		164		251		219 ^f	
Cuerdas per person		.14		.13		.16		.13
Cash crops area in cuerdas	380		496		536		513 ^f	
Cuerdas per person		.34		.38		.35		.30
Production: ^e								
Sugar cane in tons	3,181		3,962		5,602		7,238	
Area in cuerdas	145		228		238		230	
Tons per cuerda		21.9		17.4		23.6		31.5
Tons per person		2.9		3.1		3.7		3.9
Tobacco in pounds	10,828		19,363		30,358		19,885	
Area in cuerdas	22		39		53		29	
Pounds per cuerda		489.0		495.6		573.4		695.7
Pounds per person		9.8		5.0		19.9		10.8
Coffee in pounds	52,718		53,209		7,332 ^g		32,652	
Area in cuerdas	187		194		192 ^g		181	
Pounds per cuerda		282.		274.		38.2		180.
Pounds per person		48.		41.		4.8		17.8

^a U. S. Department of Commerce, Bureau of the Census, *Population, Number of Inhabitants, Puerto Rico, First Series*, Washington, D. C., 1942. One cuerda equals 0.9712 acre

^b From Insular Department of Health.

^c U. S. Department of Commerce, Bureau of the Census, *Agriculture, Puerto Rico*, Washington, D. C., 1932, for 1909 to 1929; 16th Census of the United States, 1940, *Agriculture*, for 1940. To "cropland" in 1940 has been added "plowable pasture" to obtain a figure most nearly comparable to "Improved Land" in the earlier years, the definition of the latter being: "All land regularly tilled or mowed, land in pastures that has been cleared or tilled, land lying fallow, land in gardens and orchards, and land occupied by building yards and barnyards."

^d E. B. Hill and S. L. Descartes, *An Economic Background for Agricultural Research in Puerto Rico*, Bulletin 51 of the Agricultural Experiment Station, Rio Piedras, P. R., 1939.

^e Low production of coffee in 1929 is mainly due to the cyclone of September, 1928. The land harvested comprised 162,489 cuerdas, or 157,809 acres, and the land on which the crop was damaged totaled 29,223 cuerdas, or 28,381 acres. The area in the table is a total of the two.

^f All figures for local food crop and cash crop areas in the 1939 column are for 1935.

TABLE 5
Population Estimates for Puerto Rico, 1960

Factors	Estimated for 1960 by Census Bureau		
	Actual 1940	High	Medium Low
I. Population	1,869,255	3,153,000	2,869,000
II. Determined by:			
Birth rate	38.7	40.0	39.4
Death rate	18.4	14.1	18.3
III. Rates based on:			
Fertility factor		As at present	The 1948 "low" fertility rate ^a
Mortality factor		As in Arizona and in New Mexico	Between "high" and "low"
Migration factor		No net migration	Net emigration of 3,000 a year
			As in Northwest Europe, 1875-1900
			As at present
			Net emigration of 6,000 a year

^a Based on 1939 birth rate of 39.8, for actual 1940 rate of 38.7 is actually lower.

TABLE 6
Summary of Economic Data for Puerto Rico 1909 (or 1910) and 1939 (or 1940)

	1909 (1910)	1939 (1940)	Percent Change
I. INDUSTRY ^a			
Salaries and wages in industry	4,898,228.	12,675,698.	+158.8
Value added by manufacturer	15,249,124.	35,218,868.	+131.1
II. AGRICULTURE ^a			
1. Physical production			
Sugar-Cane—tons	3,180,750.	7,237,717.	+127.5
Tobacco—pounds	10,827,755.	19,885,377.	+83.8
Coffee—pounds	52,717,727.	32,652,044.	-38.1
Cotton—pounds	630,400.	1,637,067.	+158.3
All other field crops—435	45,827,100.	270,884,767.	+493. ^b
Cattle and calves—No.	313,886.	299,734.	-4.5
Other work animals—No.	60,779.	39,887.	-34.4
Sheep, goats, hogs—No.	154,548.	143,655.	-7.1
Chickens—No.	599,070.	769,934.	+28.4
2. Value of agricultural exports ^c			
Sugar	18,432,446.	53,604,381.	+191.
Tobacco—Unmanufactured	1,250,237.	7,554,490.	+503.
Fruit—Fresh and canned	1,261,484.	1,351,746.	+7.2
Coffee	3,725,744.	527,101.	-85.8
3. Total value of exports	30,391,225.	86,486,570.	+185.
III. EMPLOYMENT—Gainful workers ^d			
Agriculture and forestry	240,845.	248,849.	+3.3
Extraction of minerals	116.	543.	+368.
Manufacture and mechanical industries	53,075.	132,315.	+149.4
Persons engaged in industries ^e	(18,122.)	(26,711.)	(+47.4)
Transportation	9,089.	20,686.	+128.
Trade	25,579.	38,323.	+49.9
Public service	3,585.	5,937.	65.5
Professional service	4,275.	15,346.	+258.9
Domestic and personal	54,960.	42,810.	-221.
Clerical occupations	2,624.	18,016.	+586.1
Total gainful workers	394,148.	522,825.	+32.6
IV. POPULATION ^f	1,118,012.	1,869,255.	+67.2
Wholesale price index—U. S. ^g	67.6	77.1	+9.5

^a 1909-1939.

^b Cowpeas, pigeon-peas, sweet potatoes, ñames, Irish potatoes, yautías, yuca not included in 1909. Data not available.

^c Annual Book of Statistics of Puerto Rico, 1941, p. 113.

^d 1910-1935 (not 1940).

^e Taken from Census of Manufacturers, not included in totals.

^f 1910-1940.

^g 1926=100, Statistical Abstract of the United States, p. 355.

APPENDIX A

Average Weekly Income Per Economic Family, Puerto Rico^aA. *Money Income*

1. Nonrelief

Earnings of economic family	\$6.70
Income from roomers and boarders	.10
Gifts in cash	.13
Sale of poultry, livestock or garden produce	.10
Other nonrelief money income	.17

 \$7.20

Deductions (other than family expense)	.11
--	-----

 Total Nonrelief \$7.09

2. Relief Earnings .38

 Total Money Income \$7.47
B. *Income in Kind*

1. Nonrelief

Value goods and services as pay	\$.14
Value goods and services as gifts	.58
Value home crop, animal product, food from wild plants consumed by family	.32
Value rent of owned home, less current expenses	.44

 Total Nonrelief Income in Kind \$1.48

2. Relief Income in Kind .21

 Total Income in Kind 1.69

 Total Current Family Income \$9.16

^a I. W. Jacobs, *Survey of Incomes and Expenditures*; Joint Survey of the W.P.A. and the Department of Labor, San Juan, P. R., 1942-1943.

¹ Based on the total aggregate income of 2,000 families of the principal industries, both field and factory.

² Random sample.

³ Data taken during period March to November, 1941.

⁴ Persons per family 5.53; earners per family 1.58.

⁵ Based on an estimate of approximately one-half time full employment, estimated annual earnings per family are \$341.