

the crop, making arrangements with a New York corporation to manage the operations. Partly as a result of this control and partly as a result of large grain crops in war time, the price of sisal advanced from 6 5/8 cents per lb. to 14 cents in 1916 and in 1917 to as high as 33 cents. The United States Government took action against the New York corporation which was handling the marketing, and partly on account of this action, partly because of the use of substitute fibres and partly in connection with general post-war deflation, the price broke in 1920 to 2 1/2 cents per lb., but has since recovered to about 9 cents.

The World Market.

The relative usage of the different hard fibres in the United Kingdom cordage manufacturing is indicated by the following table:

	Average annual Imports 1924-1927, in tons.
Manila Hemp (Philippine Islands) - - - - -	52,500
Sisal (Africa and Dutch East Indies) - - - - -	8,600
Hennequen (Mexico) - - - - -	400
Mauritius Hemp (Mauritius) - - - - -	700
New Zealand Hemp (New Zealand and St. Helena) - -	6,500

The manufacturers in the United States have been using hennequen and sisal to a much larger extent, but as already stated it has been mainly for a special purposes. Manila is used largely for higher class cordage.

Imports of Vegetable fibres to United States. (in tons)

	1910-1914	1927
Jute, Unmanufactured - - -	93,200	92,400
Flax, Unmanufactured - - -	10,800	4,500
Hemp, Unmanufactured - - -	6,600	1,700
Manila hemp, raw - - - - -	71,900	51,400
Sisal and hennequen - - - -	140,300	118,800
Kapok - - - - -	2,200	9,200
Other - - - - -	25,000	23,500

Possibilities in Panama.

There is no reason to doubt that the sisal or hennequen plant will do well in Panama, and experiments now under way by the United States Department of Agriculture and the United Fruit Company in the Bocas del Toro region point

to the probability that abaca (Manila hemp) may prove to be a profitable replacement for bananas on disease-infected soils. A close relative of the banana, and having the same soil and climate requirements, it appears to be subject but slightly if at all to the disease affecting bananas. It has been found that indifferent results from earlier experiments were due to inferior varieties brought from the Philippines. The better varieties now growing are showing quality, yields, etc., apparently equal to the best in the Philippines, and point to the beginnings of an important abaca industry in this part of the world.

CITRUS AND OTHER FRUITS.

In this review of tropical products we cannot undertake to include all, and have mentioned above only those which are distinctly tropical products, and which ~~may be considered to~~ afford the basis of important export business. There are many other products of minor importance, comparatively, and some which are not exclusive to the Tropics.

Citrus fruits are especially deserving of mention. Oranges, lemons, limes and grapefruit are fruits which are meeting a large and growing demand throughout the temperate zones. Although the markets of the United States are protected for the benefit of producers in the Southern states and California, the latter are shipping large quantities of these fruits to European markets where they must compete on common ground. A recent pamphlet issued by His Majesty's Stationery Office, London, containing an official report upon "Grapefruit Culture in the British West Indies and British Honduras," gives a remarkable showing of the growth of imports of grapefruit into the United Kingdom from 1921 to 1927, and the sources of the shipments. We reproduce it herewith:

Imports of Grapefruit into the United Kingdom in Boxes.

	South	British	Other		Other	
	Africa.	West	British	U.S.A.	Foreign	
Year.		Indies.	Countries.		Countries.	Total.
1921	2,440	8,770	254	17,923	4,931	34,318
1922	10,216	8,854	--	30,689	800	50,559
1923	12,509	16,877	1,170	45,105	4,418	80,238
1924	15,768	15,787	925	93,689	4,018	130,186
1925	21,837	28,171	784	200,071	17,353	268,186
1926	20,997	43,486	2,688	239,847	25,939	332,956
1927	23,907	47,493	8,926	501,314	24,829	606,468

The report says that grapefruit is produced in Florida and California with high priced labor, on high priced land and land of inferior quality in comparison with similar conditions in the British Caribbean possessions, and urges that the latter have the opportunity to obtain a larger share of the business. Panama has the same opportunities, and worse of all is not supplying her home consumption.

Beside these fruits and others which need no introduction in world markets there are many fruits and food products peculiar to the Tropics which as yet are but little known and have important possibilities. The avocado pear is a salad fruit of rapidly increasing popularity. The mango, papaya and tamarind may be mentioned as having possibilities already far beyond what is yet realized.

Plantain and Cassava.

The plantain is a tropical plant almost unknown abroad which deserves to be mentioned, if ~~not~~ for no other reason, because it has so important a place in the diet of the country people of Panama. It is as common to them as the potato in the temperate zone. The plantain is generally regarded as belonging to the banana family, but unlike the banana, must be cooked to be palatable. The plants sprout every eighteen months after bearing a cluster of fruit. Plantains require very little cultivation and grow best in rich, peaty soil. They are little known outside of tropical countries, but there is a small importation into the United States, notwithstanding a duty of thirty-five per cent ^{when coming} from all foreign countries but Cuba. A petition has

been submitted recently to the Tariff Commission from Honduras asking for removal of the duty. In a brief submitted by the largest owner it is attested that 40,000 bunches of plantains had been exported to the United States in the preceding eight months.

Cassava is another plant which has had an important place as food in the Tropics and is well known ~~in other parts~~ as tapioca. It is a bushlike plant, indigenous to the northern part of South America, growing in alluvial or sandy soil, well-drained. It is planted by cuttings, cultivated much like corn, and after about seven months the plant develops white, soft, tuber-like roots sometimes attaining the length of three feet and weighing as much as thirty pounds.

These roots must be ground to pulp before cooking and the juice, which is poisonous, carefully pressed out. The flour which remains has many uses. It may be pressed into thin round cakes and baked into a sort of bread, or it may be worked into the grains which come on the market under the name of tapioca. The starch of cassava is known under the name of Brazilian arrowroot. The juice of cassava when boiled ceased to be poisonous and is known as cara-reep.

Cassava has been introduced into many tropical countries and is now an important staple food in Africa and the East Indies. Most of the tapioca which comes on the markets of Europe and United States originates either in Java or other islands of that region.

Very little of cassava in either state (tapioca, cara-reep, Brazilian arrowroot) comes from Caribbean countries. There is no reason, however, why Panama or other Central American countries could not compete.

Tagua Nuts, Chicle, Tannin, etc.

Tagua or Ivory nuts are a novelty to most persons, but they usually rank as the third or fourth largest item of exports from Panama. This country, however, does not have a monopoly of them, for they figure in the exports of practically all the countries of tropical America. The largest single producer of

tagua nuts is the Republic of Ecuador, which furnished more than half of the world exports.

The nut is a vegetable ivory, and, according to one authority, the product of the corozo palm; according to another, the nut of the cohune plant. In other South American countries the plant is simply called Tagua palm. The nut, edible when young, when ripe and thoroughly dry becomes a hard, white, fine grained substance, closely resembling the ivory of the elephant tusk. The palm grows wild, scattered in the tropical forests. The gathering requires, therefore, a vast amount of walking and carrying baskets along forest trails or no trails at all, and is usually done by the native Indians.

The importance of the tagua nuts as a commercial article increased with the decline in supply of tusk ivory. Having the same properties and being much cheaper, the vegetable ivory is now used in the manufacture of buttons, play dice, chess players, ornaments, umbrella handles, and a score of other articles. It is beginning to be used also in the jewelry trade for manufacturing of numerous small articles.

There are about forty factories at present in the United States, located mostly in New York area which have been importing tagua in increasing quantities. It is claimed that the only button material which can successfully compete with tagua is the Bakelite, which is more expensive. In New York a quintal of tagua is selling at twenty to seventy-five dollars, depending on size and quality.

Aside from the Tagua palm, there are numerous trees yielding products of commercial value, such as the chicle tree, various Brazil woods used for dyeing, woods whose bark or fruits contain high percentage of tannin, such as divi-divi or mangrove, various palms producing oil or wax. Although the trees are here these products are not systematically gathered or exported from Panama.

Kapok, a delicate cotton-like fibre, produced by the great Oliba, or "silk-cotton tree," is becoming an important article of trade. Although very similar to cotton, it is too short for cloth-making, but is good for stuffing pillows, mattresses and other upholstery. Of this material the United States in 1927 imported 9,221 short tons valued at \$4,498,423. Much more would be used if the price was not so high, and if systematically produced the price might be lower and still compensatory. Kapok is twenty per cent more buoyant than cork, the cells being full of air and impermeable to moisture. The tree is a native of the Caribbean region, but cultivated only in the East Indies. Ninety per cent of our imports come from Java and the balance from other Netherlands East Indies, British India, the Philippines and Ecuador. At this time much interest has been aroused by the discovery in Mexico of another species which is thought to be still better adapted to cultivation. Its production could be facilitated by finding an effective method of separating the fibre from the seed upon which it grows.

The gathering of ~~the~~ chicle, which is used in manufacturing chewing gum, is one of the sources of income for the natives of several countries of this region. Chicle comes from a species of the rubber tree. All of the present production comes from wild trees which are tapped during the rainy season from June to December. The milky sap which flows from the trees is condensed to a gum by boiling. Unlike other rubber producing trees, the chicle trees are tapped only once in five years, and a percentage of trees dies as a result of the tapping, so the collections have to be pushed constantly into new areas. The foresters of British Honduras have undertaken to improve the present conditions by cutting out competing trees and vines. Plantation methods have been considered, but are thought to be impracticable unless a better system of tapping can be worked out.

With the decline of the production of tannin from the native trees of North America (hemlock, oak, etc.) more attention has been paid to the tannin-producing trees of tropical America. Outside of the quebracho tree, which grows mostly in Argentina and Paraguay and is probably the most important source of tanning materials, the countries around the Caribbean are the homes of mangrove trees, whose leaves and bark are rich in tannin. Mangrove jungles can be found from Florida to Southern Brazil. Only few countries, notably India, East Indian Islands, Madagascar and Australia have developed the gathering and shipping of the mangrove bark into a standard industry. Colombia has perhaps developed the mangrove industry further than any other country in South and Central America and ships her product mainly to the United States. In other countries, Brazil, Ecuador and Venezuela, the domestic product is chiefly used for tanning native hides.

Among the other future sources of strong tannins is the pod of the tree called divi-divi which grows on the shores of islands and countries washed by the Caribbean. The pods contain as much as 40-45 per cent of tannin. A New

York firm making a 42° baume extract containing about 25 percent tannin, originating from divi-divi, sells this extract at five to six cents per pound wholesale. Naturally the trade in these pods has been developing steadily. Venezuela and the Dutch Islands off the Venezuelan coast are the largest exporters of divi-divi pods. Other less known sources of tannin are the plants cascalote and canaigre, growing of which is practically limited to Mexico.

In the latest year for which foreign trade figures are available, there were declared exports ^{from Panama} of medical products, B35,658; of Liche de Nispero, B1,167; of pearls, B30,630; of tortoise shell, B51,201; mother-of-pearl, B58,643; Tagua nuts, B76,741; Bolata, B2,784; Rubber, B7,288. All of these items, most of which would be unusual in the export of another country, appear regularly as products of Panama.

REVIEW OF TROPICAL PRODUCTS. (B)

The foregoing review of the principal tropical products affords ample support for the belief that tropical products have entered upon a period of rapidly increasing demand in world markets. They are becoming more widely known and appreciated. Sugar has been known for a long time, but sugar cane has had to contend with the sugar beet, its inferior for the sugar-making purpose, although valued for other reasons in crop-rotation in the north temperate zone, and especially valued by the countries of Europe as a means of home production of one of the necessities of life secure from the hazards of foreign wars. There is reason to believe that a better day is coming for sugar, when the world will want it produced where it can be produced most economically. The varying per capita consumption of different countries is due to varying rates of taxation upon it and to varying levels of economic welfare. The mass of mankind would like to double its consumption of sugar.

The consumption of coffee has nearly doubled in twenty years, and cacao in its several forms in less than that time. Rubber has leaped into the front rank as one of the most important commodities in world trade, suitable for many uses to which it has not yet been applied. The forests of the world outside of the Tropics are being rapidly cut away, and increasing demands are certain to be made upon the forests of the Tropics.

The most important development, however, affecting the world demand for tropical products has been the demonstration of the fact that the vegetable fats and oils are obtainable from them more cheaply than from any other source. This is a discovery of vast importance to the human race, because it means a lowering of the cost of the most important item in living expenses to the masses, to-wit, foodstuffs. In so far as animal fats are produced in natural proportions in animals grown chiefly for the lean meat, the production may be considered incidental and necessary, but beyond this supply the cost is far beyond that of producing vegetable fats in the Tropics. Even the highly-bred dairy cow is an expensive machine for producing fat in comparison with the cacao bush or the coconut tree. The latter is direct production and the former is indirect, animal fat coming originally from the vegetable products which the animal has eaten. Drs. Alsberg and Taylor in their valuable book from which we have already quoted say:

"In the production of the fats of the palm and coconut there is, so to speak, much more of nature and much less of man than in the production of fats and oils in the temperate zones. Originally palm and coconut fats were secured from native growths and the elements of costs were largely those of labor and transportation. Latterly, plantation development of tropical oil seeds has come to pass, enlarging the producing area. The labor requirements are widely different from those in temperate zones and the labor is of different type. Though some groves are cultivated, for the most part palm nuts and coconuts receive only harvesting and preparation for the market.

The oil-bearing plants of the temperate regions (apart from olive and tung) must be planted, cultivated, and harvested, often when other crops compete for labor."

It is true that there is prejudice and antagonism to overcome, in order that these vegetable products may have their rightful opportunity in all

markets, but when account is taken of the progress made in the last dozen years no doubt can be entertained of a rapidly increasing demand. The masses of the people everywhere will have cheap food, if assured that it is also wholesome food, and upon this point the testimony is convincing.

In reflecting upon this growth in favor of tropical products, it has to be considered that many of the tropical countries, particularly of Asia, are densely populated and that in the past these populations have played a comparatively small part in world production and trade. They have had little economic development and little knowledge of how to produce anything that would enable them to buy the products of other countries. For this reason, labor in these countries has been almost without commercial value, but this is changing. All of these populations are being induced to exert themselves in some way to aid in making use of the natural resources of their countries.

In the first period of increased demand for tropical products the countries of dense and idle populations offer a certain inducement to the owners of capital over the countries where the labor for rapid development is not to be had. The construction of the Panama Canal lifted Panama out of the group of cheap labor countries, as labor had been rated in the Tropics, and the demand ever since has been sufficient to keep it from going back. No considerable amount of unemployed labor is to be found in Panama. The United Fruit Company has been obliged to bring it in, and Mr. Firestone went to Liberia to launch his enterprise in rubber production because the labor available was there. The great cacao development in British West Africa is due to the fact that an idle population was there which could be taught to produce the cacao bean in exchange for British goods.

The situation, however, tends to change in all the Tropics with the increasing demand for tropical products. Already it is stated that labor for new enterprises is difficult to obtain in the Philippine Islands, and that there is little probability of rapid expansion for copra production in

Ceylon or Java, because of the expansion of the tea, rubber, sugar and other growing industries. Statisticians of the rubber industry are saying that the production of that commodity will not increase rapidly hereafter because of the scarcity of labor in Sumatra and the Malay states. The tropical regions are becoming industrialized and their products are now in sufficient variety to make competitive demands for labor. Moreover, as these populations become used to money incomes and familiar with imported goods they develop new wants and speedily demand more wages as a means of satisfying these wants; which means, furthermore, that the increase of purchasing power among these peoples reacts in a stimulating way upon the industries of the temperate zone, increasing the demand for labor there and more than counteracting any ill effects arising from the competition of tropical products with the products of the more advanced industrial countries. In short, the tropical peoples are being brought into the industrial circle, and all peoples who are members of that circle are enriched by the greater variety of the exchanges and the increased utilization of the world's natural resources.

We have referred to the rapid development in recent years of exports from the Philippines and Hawaii, but inasmuch as they have an advantage in free access to the markets of the United States, we will call attention to ^{an} increase of exports from the Netherland East Indies and the development of native agriculture there. The figures given are from the volume, "Les Indes Néerlandaises," by an eminent French author, G. Angoubrant, Honorary Governor-General of the French Indian Colony. The book was published in French in 1926, with an introduction by Edouard Herriot.

In the following statement "European Agriculture" refers to production upon plantations owned and carried on by Europeans, and "Native Agriculture" refers to plantations owned and carried on by Natives. The values are in Netherland florins, the florin being the equivalent of 40 centaves in Panaman-

ian money or 40 cents in United States Money.

European Agriculture

L'(\$	1894	F1.154 millions (88.7% of the aggregate)
	1922	F1.683.5 " (78.2% " " " ")

Native Agriculture

	1894	F1. 17.5 millions (11.3% of the aggregate)
	1922	F1. 162 " (23.8% " " " ")

According to the above figures, the total exports in
 1894 were 171,500,000 Fl.
 1922 " 845,600,000 Fl.

The principal agricultural products of Netherlands India produced by European management are, sugar, rubber, coffee, tea, tobacco, cocoa, quinine, palm oil, textiles. The native agricultural products are rice, manioc, potatoes, arachide, pepper, nutmeg, cloves, kapok, coffee, rubber and tobacco.

While labor in parts of Africa and Asia is cheaper than in Panama, the labor of Panama, in efficiency, teachability and wage rates, ranks between that most primitive labor and the more highly advanced labor of Europe and the United States. Moreover, the geographical position which a country holds in respect to world trade, accessibility to markets and to the financial centers where capital is to be found, nearness to great consuming populations, are all factors in determining the order and rapidity of development.

It would be a serious omission to close this brief statement upon the expanding importance of the tropical regions without referring to the great change in the outlook which has resulted from the demonstration that diseases identified with the Tropics are subject to control by hygienic regulations and latter-day medical treatment. This has changed the attitude of the world toward the tropical countries as fields for enterprise and investment, which indeed, has been the most revolutionary of all the changes witnessed in the last twenty-five years. ~~have witnessed~~

SCIENTIFIC RESEARCH IN TROPICAL PRODUCTION (C)

In the early trade between the North Temperate Zone and the Tropics the offerings of the latter were almost wholly natural products, obtained from

the wild animal or plant life of those regions. Gradually the valuable species were domesticated or given some kind of cultivation, until the principal products are now being made the basis of organized industry, involving the investment of large sums of capital. The sugar industry of only two tropical countries, Cuba and Java, represents an aggregate investment of B1,000,000,000, by far the greater part of which has come from outside sources, within the last twenty-five years, and for the purpose of supplying outside markets. The cultivation of rubber is not twenty-five years old, but invested capital in rubber plantations aggregates B900.

With the development of tropical industries proceeding in this manner it follows that modern industrial methods are being introduced for the purpose of accomplishing results with the greatest possible economy. ^{various} The /species of producing-plants are studied scientifically and experimentally for the purpose of improving them and protecting them against their natural enemies. This is necessary in order to give protection to the investments and stability to the industries, and necessary also as a means of reducing costs and enabling the competing groups of the several countries to hold their own against each other.

Since we have been in Panama we have heard dismal reports about foreign investments in the country which have gone badly because of unexpected difficulties encountered in the various enterprises, usually said to be due to tropical conditions of some kind. / ^{In many such instates the} management of such enterprises ~~frequently~~ has been unfamiliar with the characteristics of the Tropics. Moreover, it is a well known fact that when plants are subjected to cultivation they often develop diseases and pests which did not trouble them in the wild state. If one was readily influenced by such reports he might be led to believe that the swarming insect life of the Tropics raised an insuperable obstacle to crop-production of every kind.

Before accepting this view, however, it is well to recall the fact that there is not a single product of temperate climates which does not have to fight for its life against just such enemies. Witness as a few examples the wheat rust, the chinch bug, the corn borer, the potato bug, the cotton boll weevil, the gypsy moth, the Japanese scale, and the latest arrival in the United States, the Mediterranean fly. There is a struggle for survival everywhere, and when man undertakes to change the conditions under which plants have lived in a state of nature he must make a thorough study of all the attendant conditions. This is being done in an important way in nearly all countries, not only in the Tropics but in the North Temperate Zone. The United States Government spends approximately \$150,000,000 per year upon its Department of Agriculture, a large part of which is for research work, combating the enemies of animals and plants and improving the existing species. ~~of the existing~~ The several States of the United States maintain research staffs of their own to deal particularly with the studies in which locally they are most interested. We might mention some of the notable achievements of this research work, but the public is generally familiar with them.

Perhaps more impressive even than the expenditures of Governments upon this class of research work are the voluntary expenditures of large corporations, ~~as~~ such as the United Fruit Company, not only with special regard to the banana industry but to all the products of the Tropics. We have referred also to the Tropical Plant Research Foundation of Washington, D.C., an organization formed for the purpose of undertaking specific tasks of scientific research work in the Tropics. This organization has been sponsored by public-spirited individuals who believe that great benefits will come to the world by the development of the resources of the Tropics. It aims only to be as nearly self-sustaining as possible while accomplishing the scientific purpose ~~which it has~~ in view. All its results are published for the benefit of the scientific world, and its accounts are audited by the National Research

Council, a body authorized by the Congress of the United States and appointed by the President of that country.

Work of the Tropical Plant Research Foundation in Cuba. (C)

The Tropical Plant Research Foundation is conducting in Cuba, for the Cuba Sugar Club, investigations on the production problems of sugar cane. This work lies in the fields of plant pathology, entomology, agronomy, chemistry, and soils, and has included, up to the present time, studies of the mosaic-disease, root-rots, and other diseases of sugar cane; moth stalk-borer, grass-root mealybug, corn stalk-borer, and the mosaic-transmitting insects; a reconnaissance soil survey of the Island; the propagation and distribution of improved and disease-resistant canes, including the new Java canes; and the maintenance of an information service. This work, which was begun in 1924, is supported by an appropriation from the Cuba Sugar Club, of \$100,000 per annum, 80 per cent of which is expended for field and laboratory work, and 20 per cent for general supervision and other services rendered by the central office of the Foundation in Washington and the Foundation's Board of Trustees, technical advisory committees, and other cooperators. The fieldwork is administered by a local director, and is centered at the Experiment Station which has been established by the Foundation for the Cuba Sugar Club, at Central Baragua, Cuba. The Cuba Sugar Club, organized in 1922, is a non-political association devoted to the study and development of the cultivation of cane and its manufacture in Cuba. Its membership in 1924 included about 150 of the 180 sugar mills on the Island. Since then, some new members have been added and some of the old ones have been forced out of business. Fifty-seven of these member mills contribute to the support of the work carried on in Cuba by the Tropical Plant Research Foundation, at the rate of 3/4 cent per bag of sugar (of 325 lbs.). In addition to supporting the research conducted by the Foundation on sugar cane, the Cuba Sugar Club compiles and

distributes among its members manufacturing results obtained by its member mills, instructions for the standardization of laboratory practice, legislation affecting the industry, estimates of the Cuban sugar crop, and statistical information on rainfall, new plantings, and other matters of interest to its members. These activities are carried on by its Havana office and are supported by funds other than those contributed to the Tropical Plant Research Foundation. All of this work is supported by the voluntary contributions of the sugar industry. The Government of Cuba also maintains a Department of Agriculture and Experimental Station, which of course is not confined to research in sugar.

Hawaiian Sugar Planters' Experiment Station. (C)

This station is a private institution supported by the plantation members of the Hawaiian Sugar Planters' Association. It was founded in 1895 as a small organization, but has gradually developed to an institution of six departments, namely, entomology, plant pathology, agriculture, forestry, sugar technology, and chemistry. The membership of the Association comprises the forty-six sugar companies operating in that territory and sixty other persons directly interested in the sugar plantations or mills. The cost of the activities of the Association amounts to nearly half a million dollars a year, and is met by contributions from the plantations or mills according to their production. The amount to be contributed by each member is fixed from time to time by the governing board. The individual members pay \$25.00 per year. The cost of maintaining the Experiment Station averaged for the years 1923 to 1926, \$337,980 per year. Hawaii's sugar crop in 1928 amounted to 904,000 short tons of the value of approximately \$77,000,000.

The Java Sugar Experiment Stations (C)

In Java the General Syndicate of Sugar Manufacturers in the Netherlands East Indies, an organization comprising 161 of the 179 sugar mills operating in Java, maintains the Sugar Experiment Station at Pasaroean (Pasaroean

Proefstation). The Station is supported entirely by the members of the Association, who annually subscribe approximately one and one-half million guilders (B600,000) for the maintenance of this station and the furtherance of its work of investigation and its effort to increase the efficiency of the industry as a whole. There is also a small sugar experiment station at Cheribon, but this is not connected with the one at Pasoeroean. It is maintained by private support on the part of certain estate owners in the residencies of Cheribon and Pekalongan. The General Syndicate of Sugar Manufacturers of Netherlands India was appointed by the Government of Netherlands India as its official adviser in all matters pertaining to the industry in Netherlands India, and now the industry is in a position to act with a united front whenever this is necessary. The management of the Syndicate is in the hands of the representatives of the thirteen leading companies and three plantation managers. Java's 1928 sugar production amounted to 2,939,200 long tons, which is an increase from 2,360,100 tons in 1927 and 1,991,400 tons in 1926. This increase has been accomplished with a relatively small increase of acreage in cane, by the general adoption of a new cross-bred variety of cane, known as P.O.J. 2878, which was developed at the sugar experiment station. This is a striking example of the achievements of scientific research.

So far as we know the Government of Java does not contribute towards the support of the sugar planters' experiment station, nor does the Hawaiian Sugar Planters' Association receive any funds from the Territory of Hawaii or from the United States Government. The United States Government, however, supports a Federal experiment station in Hawaii, which contributes important supplementary support to agriculture in the Hawaiian Islands by investigation of problems affecting other crops than sugar.

By a like policy the Government of the Netherlands East Indies maintains an important series of experiment stations in Java and Sumatra covering work

on all of the important crops of the colonies, such as coffee, cacao, cinchona, and general agricultural problems such as agricultural economies, plant-breeding, plant diseases, etc.

The British Empire maintains an extensive scientific service in support of Agriculture and Horticulture in Great Britain and the dependent colonies. The center of this system is the Imperial College of Tropical Agriculture in Trinidad. There is also a Cotton Research Station in Trinidad, a Tropical Research Station in Addis Ababa, East Africa, and important research stations are maintained for rubber in Kuala Lumpur, Malaya, and in Ceylon, India, and other possessions.

There is a growing tendency to have experiment stations maintained by plantations or crop industries in the case of crops like rubber and sugar, where the production units are large, but it has not been found practicable to extend the principle of private support to general experiment stations, especially in undeveloped countries. An interesting variation of this rule is found in Peru, where the Government sanctions a tax on alcohol and turns over all the proceeds to the National Agrarian Society for the maintenance of an experiment station. This plan was recommended by the Tropical Plant Research Foundation after a survey of the situation.

We have reviewed the organizations doing research work in the Tropics for the purpose of conveying some idea of the extent of the scientific work now being done for the development of production in the Tropics. Panama has a very real interest in all this work, for the problems related to particular plants are very much the same in all the tropical countries and the results of research work will be quickly known everywhere.

We do not advise that the Government of Panama should attempt investigational work of the character carried on by the Experimental Stations named, but we believe it advisable to establish relations with a scientific organi-

zation which is keeping abreast of developments in tropical production around the world, and which is competent to give advice to new industries, like the coffee industry, which are making a beginning in the country, and also advise the Government in the management of the natural resources of which it is trustee for coming generations. It is too late in the application of Science to industry to ignore the importance of the latest knowledge in every field of production, and it is highly desirable to have authentic information in regard to the country's resources.

Pan-American Cooperation. (C)

In compliance with two resolutions adopted by the Sixth International Conference of American States, at Havana, February 7, 1928, the Governing Board of the Pan American Union appointed a Permanent Committee on Inter-American Agricultural Cooperation. The Governing Board consists of the Ministers representing the members of the Union in Washington, and the new Committee consists of His Excellency the Minister for Colombia; His Excellency the Minister for Nicaragua, and the Charge' de' Affaires for Paraguay. The Committee formulated a plan the principal bases of which are:

1. Holding of an Inter-American Conference on Agriculture, Forestry and Animal Industry.
2. Organization in each country member of the Union of a National Cooperating Committee to collaborate with the Pan American Union in the preparation of the Conference and in the carrying out of plans for continental agricultural cooperation;
3. Organization in the Pan American Union of an Office of Agricultural Cooperation.

By way of carrying out this plan, the Committee formulated the program of the Inter-American Conference on Agriculture, Forestry and Animal Industry which was approved at the meeting of the Board on May 1, 1929. The Office of Agricultural Cooperation has been organized in the Pan American Union and since March, 1929 has been rendering important services to agriculturists in all countries of America and cooperating in the preparatory work for the Conference.

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In twenty out of the twenty-one countries of America, National Cooperating Committees have been organized and are now functioning and rendering service in collaboration with the Pan American Union.

The place and date of holding the proposed Inter-American Conference have been fixed upon as Washington, D.C., May 12, 1930. The movement is attracting considerable attention, not only in the Americas but in Europe and especially the countries having tropical colonies. One of the leading journals of the Netherlands, the Haagsche Post, recently has commented as follows:

"An Inter-American Congress will be held in Washington, D.C. on May 12, 1930 to deal with the agricultural and forestry interests of tropical American countries. One point of discussion will be of specific interest to other tropical territories. The point to be made is, that the production and export of various agricultural produce is in process of removing itself more and more to Asia and Africa. Attention is pointed to the fact that only a relative short time ago South America produced the main supply of the world rubber consumption. At present the main supply comes from the European colonies in East Asia. Another example is cacao, originating in America, half the world production of which is now supplied by the Gold Coast in Africa. Quinine is also a product originally of America which does not exist there any more and for which the world now is dependent upon Java, Kapok, an American growth is now produced for the world's markets, mainly in the Philippines and in the Dutch East Indies. The highest grades of vegetable oils from the British possessions in Africa, and from the Dutch East Indies, drive American vegetable oils from their markets. It is planned to recoupe the lost field in the same manner as employed by the competitors which gained them their headway. For that purpose it is advised that better application of scientific training shall be used, also speedier and more economic means of transportation and close cooperation of scientific test and model farms and laboratories with those engaged in practical agricultural pursuits. These methods undoubtedly warrant the hope that through their application success may be expected, but even so, persistent work and many years and large capital investments will be engaged."

One of the subjects on the program for discussion is the establishment of a Pan American Union Agricultural Tropical Research Station. The idea is a good one, and no more eligible location for such a station could be found than Panama.

NEED FOR CAPITAL AND POPULATION (B)

Benefits of Capital -- Efforts of Many Countries to Attract Immigration (C)

Panama needs capital and needs labor. Neither can do anything without the other. The country is rich in natural resources, but as yet these are but little developed. Population is needed to supply labor for the work of development, and capital is needed to provide the equipment required to enable labor to be advantageously employed, and to pay regular wages while the work of development is going on. Population is wanted not only to provide labor for new industries but to create a home market for new industries. The cities of Panama need a country population behind them to produce commodities for export and to buy the products and services which the cities have to sell. A growing population creates rising property values and no end of new business opportunities.

There are people in every country who view with more or less alarm or misgiving an influx of foreign-owned capital, on the ground that either literally or in effect it creates a mortgage or first claim on the earnings of the inhabitants of the country, and thus, it is sometimes said, puts them in bondage to the foreign capitalists. Of course, this is looking at but one side of the situation. Nobody would want foreign capital to come into his country unless it was to be used in ways which would yield benefits to the country. It is true that if a nation borrows capital and squanders it the results will be like those of a similar wasteful proceeding by an individual, but investments that are prudently made, and especially investment in which the foreigner develops a new business, are of another class. If wisely invested the capital will create the new wealth with which dividends are paid, and in doing so, will create new employments for the people, new income for the country, and new revenues to the Government.

It goes without saying that foreign investors always hope that their

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investments are well founded, which means that the business will render useful service, employing labor and producing things that will be wanted at home or abroad, thus establishing permanent business. In that case, even though the original investor sells out and retires, the business will go on and be a permanent possession of the country. The wage-payments and other operating expenditures of an enterprise absorb so large a portion of its receipts that the profits are a relatively small share of the total results. Therefore, the country in which a new enterprise is located is the principal gainer by its activities, no matter who owns it.

The Labor Problem (C)

There can be no investment or employment of capital without the employment of labor, and since there is little surplus labor in Panama, new enterprises of any magnitude will be under the necessity of bringing labor into the country, as the United Fruit Company has done. If immigration is to be or aided promoted at all, instead of being left wholly to the initiative of the immigrant, this would seem to be the best way of having it managed. The employing company naturally will guard against incurring expense for bringing in persons who will not be able to earn wages or be self-supporting after they arrive, and it is an important consideration that employment is immediately provided for newcomers. While the Government of Panama certainly would not want to lend its authority to the enforcement of unfair or unreasonable contracts between employers and immigrants, it could properly recognize and lend its aid in the enforcement of reasonable contracts under which employers have made advances for the transportation of immigrants from foreign countries with an agreement for stated services in reimbursement. Whether the Government should give any financial aid in such cases is a subject for careful consideration, taking account of the circumstances of each case, including the state of the Treasury.

Certainly the Government should be ready and prompt to perform its

proper function of affording the protection of organized government in the localities where immigrants are settled, with schools, sanitary regulations and other provisions necessary to health, order and contentment.

It is well to consider that there is a good side to the lack of population, for there is no serious problem of unemployment to deal with, as in many of the congested countries of the world. There is room in Panama for everybody to have some kind of a shelter and a piece of ground. The Republic offers ten hectares of land free to anyone who will become a citizen and make his home upon it, which is land enough to provide the means of livelihood for a family, granted willingness to work and knowledge of how and what to produce. Undoubtedly there are many people in the world so situated that they might be better off on the now idle lands of Panama, provided they could make the change and know how to make a living when they got here.

No doubt the country would gain by the acquisition of the right kind of immigrants, but past experience in attempting to promote immigration has taught the lesson that great caution should be exercised in such efforts.

The Republic has placed an inhibition upon what it regards as undesirable immigration and in this we think it is justified. If a substantial class of non citizens of Spanish extraction or from Italy could be obtained, experimental promotion on a small scale might be justified under careful supervision. Such immigration should be of the class experienced in the production of garden crops, fruit, poultry, pigs, dairy products, etc., and able to give some evidence of success where they have lived. Families of such practical experience would make a good living for themselves, supply the wants of the cities now supplied by importations and by adding plots of

bananas could increase their incomes substantially. The United Fruit Company or other buyers will take all of the bananas that such growers would produce, on a contract basis. Furthermore, every such producer would be affording the most practical demonstration of small farming methods that could be devised, and enough of them could constitute an educational system in practical affairs. If such a plan should be thought worthy of trial the Chambers of Commerce of all cities having such bodies might well be invited to take an active part in the direction of it. Elsewhere we have suggested that the Chiriqui Railroad, if given the kind of management which the investment calls for, might give a study to the immigration problem as a means of stimulating the settlement of Chiriqui Province and thus increasing its own resources.

The immigration which is most desirable in all countries is that which results from letters written by immigrants back to their old homes, telling with satisfaction of their new homes. Immigration which does not result in such letters is not worthwhile.

Porto Rico as a Source of Immigration (C)

We would suggest that consideration be given to the feasibility of promoting in some manner a movement of immigration from Porto Rico to Panama. The Island has a population about three times as large as that of Panama, while the area is only about one-ninth that of Panama. The population is mainly of Spanish descent, there being no other Island in the West Indies in which this element is so strongly in the ascendancy. They are a kindly, peaceable and law-abiding people. The population has been unduly large for the area from which sustenance is drawn, and it has suffered in physical vigor from this fact and from anaemia and hookworm. Experience has shown, however, that upon a liberal diet the individuals gain in strength and vigor and are able and willing to give a good account of themselves at labor. Coffee culture

has been one of the leading industries of the Island, which is another reason for thinking the people may be well-suited to serve the needs of Panama. Porto Rico has a law, passed by the legislature of the Island regulating emigration under contract, but the purpose of it is simply to require guarantees against mistreatment of Porto Ricans who are induced to migrate under representations as to employment elsewhere. If anything is done to obtain Porto Rican immigrants, precautions should be taken for protection on both sides, i.e., on the part of the employers by obtaining selected individuals and on the part of the immigrants by obtaining regular employment according to representations.

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Immigration to Argentina. (C)

All new countries want immigration and the countries of South America have been striving to attract it ever since they became independent of European sovereignty, but the results of their efforts have been only moderately successful. Argentina has received the largest number of immigrants, having in the fifty-six years from 1857 to 1913 an excess of arrivals over departures of 3,297,000, or an average of not quite 60,000 per year. Brazil received from 1820 to 1915, a period of ninety-five years, a total of 3,363,456, without counting emigration. Migration in the past 100 years has been mainly from Europe, in the North Temperate Zone, and has flowed naturally across the Atlantic into North America where the greatest similarity of climate was to be found and with which the most ample facilities of communication existed. The ^{stringent} restrictions that have been placed upon immigration by the United States ^{recently} may operate favorably to the desires of Latin America, but Canada still is an active competitor.

Italians have predominated in the immigration of Argentina, with Spaniards second. It has been characteristic of these, especially the Italians, that many return to resume ^{permanent residency} ~~life~~ in their native lands, or come and go frequently.

of Argentina

In 1925 the Minister of Agriculture/in a public statement said that in the preceding ten years 881,632 immigrants had entered Argentina but there had been 774,669 emigrants, leaving a balance in the period of only 106,963. This period, however, included the war time, ~~and~~ when conditions were abnormal. The Minister stresses the idea that Argentina should do more to promote immigration and compared the increase of wheat production there with that of Canada. He said that in 1904-5 Argentina had 4,903,124 hectares sown to wheat, and Canada had only 1,792,000. For the last harvest Argentina had 6,966,843 hectares and Canada 9,174,800. That is to say, Canada, which twenty years before had only one-half of the wheat acreage of the Argentine Republic, had now surpassed that Republic to the extent of fifty per cent.

The Argentine Government has not for many years paid a direct subsidy for immigrants, although it has done much for their care and protection upon arrival. It has built and maintains in Buenos Aires a great hotel, with accommodations for 6,000 persons, where immigrants are cared for free, with medical attention if needed, for a period of five days. While in the hotel the immigrant is given full information about the different parts of the country, to assist him in determining where he wishes to locate, and efforts are made to obtain employment for him. If the immigrant decides to settle in the interior of the country, government agents see that proper arrangements are made for the journey and the immigrant is met upon arrival at his destination by a local committee. The immigrant is left free to decide what he wants to do, the government acting in an advisory capacity only. Dissatisfaction has been manifested over the fact that in recent years most of the immigrants have settled in the cities, which are considered disproportionately large to ~~comparison with~~ the total population of the country.

In 1927 Argentina entered upon a more aggressive policy, prompted by the need for a larger rural population to sustain her growing cities and for larger revenues to meet the growing costs of government. The President of