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OF THE
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WASHINGTON, U. S. A.

FEBRUARY, 1896.

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OF THE
BUREAU OF THE AMERICAN REPUBLICS.

FEBRUARY, 1896.

BRAZIL.

* MONAZITE DEPOSITS.

[From advance sheets of United States Consular Reports for March, 1896.]

I have the honor to submit herewith a translation of a letter from the director of the School of Mines, at Ouro Preto, the capital of Minas Geraes, which gives some valuable information concerning monazite. As will be seen by the analysis, which shows the percentage of the different component parts of the Brazilian monazite, not even the element of thorium is encountered.

HENRY C. SMITH,
Consul.

SANTOS, August 17, 1895.

DIRECTOR MIDRADOS TO CONSUL SMITH.

OFFICE OF DIRECTOR, SCHOOL OF MINES,
OURO PRETO, July 26, 1895.

Consul Henry G. Smith:

SIR:—In reply to your letter of June 15, I herewith transmit you all the information that I am able to furnish about monazite in Brazil.

This mineral is encountered in alluvial deposits in the precincts of Caravellos, near the seacoast, in the State of Bahia. I am unable to tell

*Previous reports on monazite printed in CONSULAR REPORTS No. 179, pp. 541-551, and in No. 181, p. 241.

you anything positively about the extent of the working of these deposits, or of their commercial value, but I am told that monaziferous sand is exported in large quantities to Germany.

Monazite is also found in the neighborhood of Prado, in the same State, and in Corrego das Varas, near Diamantina, State of Minas Geraes, samples of which I send you. Here is the result of an analysis made in this school by Professor Gorceic of the monazite from Caravellos:

SiO ₃	*3.4
ZrO ₂	*6.3
CaO.....	1.1
PhO ₅	25.7
CeO.....	28
DiO+(LaO?).....	35.8
Total.....	100.3

Monazite is found also in the auriferous sand of Casca River, an affluent of Rio Doce, a sample of which I am unable to furnish you. Its analysis, made in this school, gives the following result:

PhO ₅	31.5
CeO.....	36.8
DiO+LaO.....	31.5
Total (parts).....	99.8

This analysis only refers to parts attacked by sulphuric acid.

As it might interest you to know that xenotime exists in Brazil, I send you a sample of this mineral, taken from the sand of Datts, near Diamantina, Minas Geraes. The result of three analyses made in this school is as follows:

ELEMENTS.	FIRST.	SECOND	THIRD.
PhO ₅	35.64	35.9	35.6
YtO+ErO.....	63.75	64.1	62.6
Remainder insoluble.....	0.4	0.6	0.86
Total.....	99.79	100.6	99.06

Always at your disposition, and with my high esteem and consideration,

I am, etc.,

A. MIDRADOS.

*Parts not attacked by sulphuric acid.

CHILE.

THE CITY OF TALCAHUANO

It is stated that, in order to meet the increasing need of further docking arrangements, the Chilean Government has decided to enlarge the present facilities at the port of Talcahuano. It is the purpose of the Government to convert Talcahuano into a first-class naval and commercial port, necessitating the expenditure of \$6,000,000 or \$8,000,000. The attention of contracting firms in the United States interested in this kind of work is directed to this enterprise.

ECUADOR.

ADDITIONAL EXPORT DUTIES.

The Government of Ecuador, with a view to meet increased expenditure and to pay off the two loans contracted on July 15 and September 30, 1895, issued a decree on the 13th of December last, creating extra duties on certain articles of export.

The following is the tariff of such extra export duties :

	Sucres.	Cts.
Cotton, per 46 kilogs. (gross weight).....	..	10
Coffee, " " " ".....	1	50
Rubber, " " " ".....	1	..
Hides, " " " ".....	1	..
Paja Toquilla (hat straw), per 46 kilogs. (gross weight).....	2	50
Split canes, per 100.....	1	..
Ordinary Panama hats, per dozen.....	..	10
Fine Panama hats, per dozen.....	..	40
Ivory nuts, per 92 kilogs.....	..	5
Cacao, per 46 kilogs. (gross weight).....	..	50

Sucres 2s.

From the moment this tariff is enforced the recently-imposed tax of 50 cents upon each quintal (100 lbs.) of cacao and coffee exported ceases to have effect.

Four-fifths of the income derived from cacao and coffee, under the present arrangement, is to be paid over each fortnight to the Bank of Ecuador, until the loan of sucres 200,000 (£20,000) raised on July 15 last is liquidated, and the remaining fifth is to be handed to the Banco Comercial y Agricola, in a like manner to pay off the loan contracted from that bank on September 30 last.

The foregoing additional customs tariff will continue in force until July 30, 1896.

ECUADOR.

NUEVOS DERECHOS DE EXPORTACIÓN.

El Gobierno del Ecuador con el objeto de sufragar nuevos gastos en que había incurrido y de pagar dos empréstitos contraídos en 15 de Julio y 30 de Setiembre de 1895, expidió un decreto con fecha 13 de Diciembre último, por el cual se impone un derecho adicional de exportación á los artículos siguientes :

	Suces.	Centavos
Algodón, por cada 46 kilos, peso bruto .....	..	10
Café, id. id.	1	50
Goma elástica, id. id.	1	..
Cueros, id. id.	1	..
Paja toquilla (para sombreros), id. id.	2	50
Cañas de bambú, cada 100.	1	..
Sombreros de Panamá, ordinarios, por docena. ..	..	10
Sombreros de Panamá, finos. id. ....	..	40
Marfil vegetal, por cada 92 kilos. ....	..	5
Cacao, por cada 46 kilos, peso bruto. ....	..	50

El sucre es equivalente en valor á dos chelines, de moneda inglesa.

Desde el momento en que la anterior tarifa se puso en observancia cesó el impuesto de 50 centavos por quintal que se había establecido sobre el cacao y el café exportados del país. Las cuatro quintas partes de la renta derivada por la imposición de los nuevos derechos han de satisfacerse quincenalmente al Banco del Ecuador hasta que se liquide el préstamo de 200,000 suces (£20,000) contraído en 15 de Julio último. La otra quinta parte se ha de entregar al Banco Comercial y Agrícola, de la misma manera, para satisfacer el empréstito contraído con dicho Banco en 30 de Setiembre último.

Todas estas alteraciones del Arancel de aduanas continuarán en observancia hasta el 30 de Julio de 1896.

EQUADOR.

DIREITOS ADDICIONAES SOBRE A EXPORTAÇÃO.

O governo do Equador, em previsão de um augmento nas despezas publicas, e a fim de soldar os dous empréstimos contractados respectivamente a 15 de Julho e 30 de Setembro de 1895, expediu o seguinte decreto; por cujo effeito ficam augmentados os impostos sobre certos artigos de exportação, sendo para os mesmos a tarifa seguinte :

	Sucres. Centavos.	
Algodão, por 46 kilos, peso bruto .....	..	10
Café, id. id. id.	1	50
Borracha, id. id. id.	1	..
Couros, id. id. id.	1	..
Palha para chapéos, por 46 kilos, peso bruto.	2	50
Cannas divididas, por 100.....	1	..
Chapéos de Panamá ordinarios, por duzia...	..	10
id. id. de melhor qualidade, por duzia.	..	40
Amendoas de cabonegro (taguas), por 92 kilos	..	5
Cacao, por 46 kilos, peso bruto.....	..	50

Desde a data de esta tarifa entrar em vigor, cessam os effeitos do imposto de 50 centavos por quintal, com que foi recentemente gravada a exportação do cacao e café.

De conformidade com as disposições da presente lei, quatro quintas partes das rendas provenientes do dito imposto devem ser entregues quinzenalmente ao Banco do Equador, até ficar pago o empréstimo de 200,000 de 15 de Julho ultimo passado; e uma quinta parte ao Banco Commercial e Agricola, para, de igual modo, satisfazer o empréstimo contractado com o mesmo banco a 30 de Setembro.

Estas disposições additionaes da Tarifa aduaneira continuarão em vigor até o dia trinta de Julho de 1896.

MEXICO.

TROPICAL PRODUCTIONS.

Many inquiries have been received at the Bureau in regard to the cultivation of cacao, vanilla, India-rubber, indigo, bananas, and other products of the warmer sections of Mexico. The following is the substance of a report on these industries made by the Mexican Bureau of Information, and will be found of interest to those seeking such information :

THE CACAO OF MEXICO.

The tree that produces the "food of the gods" (chocolate), "*theobroma cacao*" of Linnæus, "cacari," or "cacava quahuil" of the ancient Mexicans, and "cacao" of the Spaniards, is a native of Mexico.

Long before the Conquest, the Aztecs and other ancient Mexican tribes used the fruit as one of their alimentary beverages. They prepared a drink called *chocolatl* by mixing the seeds, after having crushed them on the *metatl*, together with fine cornmeal, vanilla ("*tlixochitl*"), and a species of spice called "*mecaxochitl*," and those that drank it were a picture of health, preserving handsome and vivid features even to old age. All nations subjugated under the Aztec eagle had to bring, among other valuables, a certain number of bags of cacao to the palace in the great Tenochtitla as an annual tribute to the Emperor. It was so highly prized amongst the ancient natives that in trade it was utilized as currency among the lower classes.

The varieties cultivated were, namely, the "*quauhcahuatl*," "*mecacahuatl*," "*zochicucahuatl*," and "*tlacacahuatl*." The bean of the last one was very small, analogous to the kind found at present at Soconusco, Chiapas. The fruit produced in Zoconochco, in the provinces of Tabasco and Chiapas was considered the best.

The followers of Hernan Cortez endeavored in vain to maintain the plantations then existing, but it is a well-known fact that in the conquest of this country by the Spaniards agriculture and the industries then retrograded to such an extent that the cultivation of the cacao as

well as that of the cotton plant suffered to such an extent as almost to reduce both to a wild state. The conquered Mexicaus were compelled to work in the mines and serve in slavery, and were thereby obliged to neglect their plantations. And as the conquerers were not versed in the culture the industry was nearly abandoned, and did not take a new life until some Spaniards started one or two large plantations in Choutalpa, Tabasco, a few years before Mexico threw off the Spanish yoke. Other plantations were established in different sections of Tabasco and Chiapas.

Chocolate, the product of the fruit, was first introduced into Europe (Spain) by the Spaniards from Mexico. Portugal followed in the use of it; France and England did not appreciate its full qualities until the latter part of the seventeenth century. After the year 1778 it came into vogue in all the cities in Europe. Its alimentary virtues became more generally known, and Doret, a Frenchman, invented a hydraulic machine to manufacture it on a large scale. Since then all civilized nations have consumed this rich American product of Mexican origin, which up to date is not produced in sufficient quantities to meet the world's consumption.

This tree is found growing wild and in cultivation in the States of Colima, Michoacan, Guerrero, Oaxaca (districts of Jamiltepec and Tuxtepec), Chiapas (districts of Soconusco, Mezcalapa, Pichucalco, Simojovel, and Palenque), Tabasco, and central and southern Vera Cruz, where the elevation is from 100 to 1,200 feet above sea-level, but Chiapas and Tabasco are noted as being its home, the climate and soil there being more particularly adapted to its culture and development than any other portion of the globe.

The production of cacao in the year of 1893 was 2,147,730 kilos., valued at 837,197 dollars. In 1870, the States of Tabasco, Colima, Chiapas, Guerrero, Michoacan, Oaxaca, and Vera Cruz had 569,795 trees in cultivation, producing an annual crop of 31,285 quintals, worth to the planters 782,125 dollars.

Cacao is an evergreen tree of medium size, which if grown in a good soil and left to itself will reach a height of 20 to 30 feet, and spread out to an extent of 10 feet or more on each side. At the height of a few feet from the ground it sends out three to six lateral branches ("horquetas") without any sign of a leading stem, and it is only when the branches are matured that a leader or leaders ("rama chupona") spring out from the side, and not from the centre of these branches. The leaves are smooth, alternate, lanceolate, pendent, of a deep green color, 9 to 10 inches long by 3 inches across. The flowers are small, of a pale yellow or very light red color, and they come off in a bunch from the stem, branches, and the place where a leaf formerly existed. It is rarely that more than one of them develops into fruit, and thus many more flowers are borne on the trees than fruit pods. The cucumber-shaped pods are 5 to 9 inches long, and nearly 4 inches in diameter at their widest part with a thick, almost woody rind. They are pinched in at the top and pointed at the

end, the point being curved to one side. The skin is first light green, then of a yellowish red color, with ten furrows and tuberculated ridges. These indicate a five-celled fruit, which contains on an average 38 seeds embedded in its sweetish pulp.

The species most cultivated in Mexico are *cacao* or *Theobroma ovalifolia*, *T. bicolor*, and *T. angustifolium*. There are other kinds known, generally found growing wild, which come under the head of the *guazuma* or *guacima*, *guazuma polybotrya* being the principal species.

Practice and study have shown us that the chocolate tree will thrive well in virgin lands recently cleared, but rich in organic matter and minerals, and as it has a long tap root the surface soil needs to be deep and thick with humus. The best soil, however, is that occurring in valleys and undulating lands, along the banks of rivers or streams made by years of alluvial deposits, or by the decomposition of volcanic rocks. A proof of this is shown in the department of Soconusco, Chiapas. It will also grow well in loams and the richer marls, but it will not thrive in stiff, heavy clay.

A warm moist climate, having a mean temperature between 76 and 77° Fahr., is necessary for the cultivation of cacao if large crops are expected, but, when the soil is suitable, the tree will grow and give fair returns in a moderately dry and well drained location. The ordinary cacao plant will not do well in the mountains above 600 metres (1,968 feet), and even at that height it becomes stunted, and is fruitful only for a few years. The best elevation is from 300 to 500 feet, and in sheltered situations near the seashore good crops are to be obtained, but the tree will not thrive if exposed to the direct influence of the sea-breeze. Cacao will not bear much exposure, hence sheltered lands and valleys should be selected, and on the Gulf side of Chiapas, Tabasco and Vera Cruz northerly and easterly aspects should be avoided. Still, locations in Colima, Michoacan, Guerrero, and Oaxaca, on the Pacific side, having a south and south-westerly exposure, must not be preferred for the formation of successful plantations.

Cacao plants are obtained from the seed, which germinates readily and quickly. The best looking pods from the April or May crop which are not over ripe should be picked for the purpose. Those known as hechas are generally preferred by the planters. These are distinguished from the viches by their light color, solid appearance, and the seeds not rattling inside. After selecting the largest seeds from healthy pods, the former are soaked in lukewarm water for 12 or 18 hours, avoiding those assuming a reddish tint, and likewise those floating on the water. The rest are left to dry.

A virgin spot close to a spring or stream whose soil is not porous, in the immediate vicinity of the plot to be planted, should be selected for the nursery. For the convenience of handling, more than one nursery

should be formed along the plot, 300 feet distant, if a large-sized plantation is to be established. The spot is prepared by hoeing the soil, extracting the weeds and roots and pulverising the earth with a rake; then beds are made 5 feet wide by any length, separating each one by a walk 3 feet wide. Small furrows are made, about an inch in depth and about 12 inches apart, and the seeds are sown in them 8 inches one from the other. That part of the seed attached to the stringy centre of the pod is the one to be placed downward in sowing. The seed is covered with vegetable mold or loose loam mixed with horse manure and over that banana leaves. The bed is sprinkled every day for 12 or 15 days, when seedlings appear. Then the banana leaves are removed, and sheds, made of palm leaves and sticks, so fixed that they can be raised as the seedling grows, should be placed over the nursery as shade and shelter; no weeds or grass are allowed on the beds.

The sprinkling should be continued when necessary, or on rainless days, and the palm leaves are gradually taken off, but not altogether until the plants are ready to transplant. The operation of forming the nursery is done in some places in the months of April and May, and in other localities as late as September.

Either in the month of February or March the planter's attention must be directed to the preparation of the land; in some places, where the rains cease early in the season, that is done in December or January. The forests having been cut down (*tumba*) the branches must be lopped and strewn (*rozada*) evenly over the ground before they are burnt (*quemada*). But when the forest is cleared, shade belts should be left, or afterwards planted in exposed places so as to shelter the cacao trees from the wind.

Of course the felled forest trees must be allowed to remain for a time exposed to the sun, otherwise the smaller branches will not catch fire properly. Where possible it is better not to burn the bush, but to pack it in lines between the young plants or *madres*, in order that, by its rotting, it may add to the richness of the soil, otherwise the nitrogenous compounds so beneficial to plant life are sent off into the atmosphere by the burning.

Immediately after the burning, which should take place in April, or a month after the land is cleared, corn and beans are sown on the plot. If the land has no natural trees suitable for shade, mother cacao (*madres*) are looked for, such as *mataraton*, *pito*, *cocoite*, *chipilcoite*, and *chontal*. The last-named, a broad-leaved tree, is not good for anything but to give shade and shelter. *Cocoite* and *chipilcoite*, small-leaved trees, are hard wood, and are used by preference for posts for houses. These trees are obtained from forests in the shape of cuttings or young plants, and planted in the beginning of the rainy season and at a distance of from 15 to 18 feet apart on rich flat land; but on poorer soil and on hillsides, from 12 to 16 feet will be the proper distance. Rubber can also be

planted as shade, but it requires more scientific work and care. In July and August, the corn and beans are harvested, and the plot thoroughly cleaned. The banana-suckers can then be planted between every four madres, providing rubber has not been thought of and no preparations made to raise it. In the spring of the following year, another crop of corn can be sown between the madres, leaving a hill close to the place destined for the cacao seedling, which will serve as chichihuas, temporary shade, to the young plant when transplanted. In Chiapas and Tabasco, trees called challa and madre serrana are utilized for this purpose. A year after sowing, seedlings are 50 centims. (20 inches) high and ready to be transplanted.

In the beginning of the rains, on a cloudy day, the operation of transplanting is proceeded with. A peon with a machete cuts a square line around the seedling, and with a spade (coa) lifts up earth and seedling. This is done in 15 to 20 minutes. Then, another peon wraps up the whole mass with a large leaf grown on a plant called hoja blanca, found in those sections. In the meantime the holes are being made; they are dug $8\frac{1}{2}$ feet away from the madres, if these are set 17 feet apart, so as to form a square with a mother cacao in the middle. The holes should be 2 feet square and 2 feet deep, that is, 8 cubic feet of earth must be taken up. This can be done by a practical man in five minutes, in soft soil. The earth around the seedling after transplanting must be well pressed with the foot, but at the same time, before finishing that operation, dried leaves are mixed with the soil to be placed on top.

Of course, land under cacao cultivation, as under all proper and successful cultivation, should be kept clear of weeds. In the first place, the plot should be drained off to ensure quick crops; and then proper tillage will improve the soil and do good to the trees. To accomplish this, 4 weedings (ladeas) are necessary in the first 3 years, 3 in the second 3 years, and 2 in the following years. On steep hillsides, cutlassing will be sufficient, and on level places hoeing will be required. When the trees are grown so that their branches shade the land, the weeds will not grow very fast, and as a rule they are so loosely rooted that they may be easily pulled up. The cultivation and harvesting of the side crops must be attended to in due time. The cacao planter should give careful attention to the pruning of the trees and trimming of the madres, if he wishes to get a large yield. As the pods are borne on the larger branches, the principle is to develop such branches by judicious pruning, and to see that they are not covered up by a mass of foliage and small twigs. A typical cacao tree should have one stem, giving off at a few feet from the ground three to five branches which spread in an open manner and are free from leaves except at the top; thus the leaves shade the open inner portion without interfering with a free circulation of the air. If the young plants throw out more than one main stem, the surplus ones (mamones or chuponas) must be pruned off when the moon is on the

wane, and after the lateral branches are formed no upward prolongation of the stem must be allowed to grow. If the tree be left alone these upward growing branches will come off from the stem just below the laterals, in the form of suckers, and to leave them on is to cause the strength to be taken from these fruitful laterals, as well as to allow the trees to run up, perhaps for 30 feet or more, thereby causing much trouble in picking the pods. When the suckers are pruned off fresh ones will grow in a short time, generally in a month, so that the trees will require frequent attention until they are mature, when the tendency to throw out suckers will be stopped. In gathering the pods, the suckers may be taken off at the same time, but the trees should not be pruned in the flowering season.

Unless in the case of sickly plants on poor soil the trees will not require manuring until the crops are taken off, when, as may be imagined, it will be necessary to restore to the soil, in a cheap way, what has been removed in the valuable produce. A good deal will depend on the nature of the soil and the yield of the trees. Should crops which were abundant be found to be falling off, it is an indication that manure is necessary. A compost of yard manure and bone dust in the proportion of 5,000 cart loads of yard manure and 500 lbs. of bone dust per hectare of land applied every three years is all that is required. The successful harvesting of cacao requires great care and watchfulness, as it is a fruit that has many enemies, the principal being parrots, squirrels, tusas (a species of gopher), tepeiscuintle, another animal of the rodent class, and ants, especially those known under the name of arrieras. But damage by these can be obviated by proper cultivation and care.

Returns from a cacao plantation (motelar) cannot be expected until five years from transplanting. At two years old the tree, in rich soil, stands five or six feet high: when seven or eight feet high it begins to bear (jugar), but it is not in full bearing (cuaja) until it is between ten and twelve feet high. The first flowers under favorable conditions will come out at the third year, but, as the tree is not matured then, they should by no means be allowed to produce pods, otherwise the plant will be so weakened by the fruiting that its growth will be greatly checked. The first flowers, therefore, should all be rubbed off.

After the leaves of the flower fall, a bud appears like the common Mexican chile pepper and takes 3 or 4 months to mature. Peous or mozos must be employed daily until the crop is harvested, as birds and squirrels are apt to eat the bud and afterwards the seed. The cacao tree flowers all the year round and the pickings of the fruit are divided into four harvests or seasons. The first, which covers the first 3 months of the year, is known as *iuvernada*; the second, lasting through April, May and June, is the *cosccha* or harvest proper, and is the most abundant of the four; the product of the third, extending over July, August,

and September, is known as cacao loco; and that of the three last months of the year as alegron.

The average yield of dry cacao from each tree of course varies very much. The limits may be said to be from $1\frac{1}{2}$ to 8 lbs. per tree. Some trees in the plantation of "La Carolina" district of Macuspaua, Tabasco, produce 220 pods, and plantations in Alvarez, Colima, and in Apatzingan, Michoacan, yield on an average 5 lbs. to the tree. Generally, one can reckon on 50 pods (mazorcas) per tree a year, which produce from 30 to 40 kernels (almendras), and 250 dried kernels will weigh 1 lb. The trees of cacao blanco or verdoso and cacao morado yield the most, hence the Tabasco and Chiapas planters prefer them above the other kinds, Chocolate trees last from 30 to 40 years and produce fruit for 20 to 25 years by proper cultivation.

In picking (el corte) the pods care should be taken that they are fully ripe. A little observation and experience is all that is necessary to tell at once by the look whether the pod be ripe or not.

If it be within reach it may be tapped with the knuckles or with the handle of a knife, and if it sound hollow it is ready for picking. The fruit must be cut from the tree with a machete, cacao knife, or cacao hook, and on no account ought it to be twisted or torn off the tree, nor the fruit to be allowed to drop on the ground.

The cut should be clean and as close to the pod as possible; for, if a tree be examined, it will be found that, at the base of the stalk of the pod there is a little swelling called the eye, and it is from this part that the flowers for the next crop will come out. If, therefore, the eye be torn away no more pods can come out from that part of the stem.

The pods, having been gathered, are placed in heaps under the trees; then they are taken to a place called quebradero, where they may be broken at once or left for a day. The kernels or nibs are then taken out of the pods which are either opened with a machete or a knife made from a wood called jahuacte. The seeds may be drawn with the fingers, or by means of a wooden spoon, and at the same time the white fibrous tissue is taken away. This stringy stuff and the broken pods should be put in heaps to rot for manure, or be spread over the roots of the trees, or better still be buried between the trees, and in this way something will be given back to the soil.

As the seeds are extracted from the pods the former are thrown into wooden troughs called tollas, half filled with water to wash them; the beans are now carried away to the cacao house for the purpose of being made to undergo the sweating or fermentation process. This is a very important matter for the planter, inasmuch on its proper performance depends, to a great extent, the value of his produce. In some places the cacao beans are simply dried as soon as they are taken out of the pods, and the cacao thus prepared is sold or shipped to the markets, but it is very inferior stuff with a bitter, unpleasant taste, and it fetches

a low price. Sweating is simple and inexpensive. It may be done in boxes or barrels or in an air-tight room. The cacao is put into a receptacle, it is covered with plantain (platano) leaves, boards are put on the top, and is left to ferment for about 3 days, when it is removed to another receptacle, closed up again and allowed to sweat for 3 days longer. The object of opening the cacao is to cause the fermentation to be equal; for, in changing it, that which is on top at first becomes the bottom layer in the second receptacle, and thus uniformity is secured. When the cacao is sweated in heaps in a closed house the heap must be turned over or stirred up on the third day, and in this way the outside beans will get their full turn of the fermentation process. Some fine kinds of cacao do not require to sweat so long, but experience alone can determine this point. In the fermentation the first stages of the germination of the seed go on. The moisture, warmth, and a certain amount of air cause the seeds to swell, carbonic acid is given off, and the food stored up in the seed for the use of the embryo is converted into soluble matter, and this accounts for the modification of the bitter taste of the raw bean brought about by the sweating process. In some places the beans are sweated without washing them, claiming that thus the aromatic principles of the cacao are not altered. The beans having been properly sweated they are to be dried ready for shipment. The drying may be done in wooden trays or on paved or cemented platforms or yards. Also a fixture can be made where the trays are placed stationary and a roof on rollers placed over them. When the sun is out the roof is rolled back and the cacao beans exposed; during rain and at nights the roof is rolled over the trays and in this way time and labor in carrying out the trays and taking them in again are spared. Where they are dried in yards, the sweated beans are spread out thinly, well-rubbed and exposed to the sun in the morning, and at mid-day they are put back in the sweating boxes or houses to undergo another partial fermentation, for if they be dried straight off they will deteriorate in value. A peon must turn them over once in a while during the day so as to expose the whole seed, otherwise one side only will become red and the other black. The second day they are kept longer in the sun, and the third day they are kept out as long as the sun lasts. They are put out on succeeding days until they are thoroughly dry, which is told by their producing a crackling sensation when pressed between the thumb and forefinger, or when the parchment (outer skin) breaks off easily. To brighten the color to a deeper red the seed is washed in a 33 per cent. solution of lemon or sour orange juice. Sometimes the cacao is elayed, and this can be done by sprinkling the beans with red clay that has been dried and pulverized, immediately after they have been removed from the sweating boxes. On the second day the same process is gone through if the clay has not tinged all the beans. Then the beans are rubbed between the hands for an hour or two in order to clear away the surplus mucilaginous matter.

The drying is afterwards finished as usual. Clayed cacao has a reddish appearance and the color is uniform, and it usually fetches big prices in the markets.

The market classification known in Tabasco and Chiapas consists of cacao colorado as first class, cacao palenque as second class, and cacao pacha as third class. The uses of cacao are many; the broken or empty pods, besides being a good fertilizer, are used by the peons, roasted, in lieu of chocolate on account of their low price. A mixture, called pozol or chorote, made of ground pop-corn, piloncillo (brown sugar), and cacao, is used in water by the weary traveler or by the fatigued peon in the field as a nutritious and refreshing drink. A preparation called bromia or cocoa is manufactured and very much appreciated by the cold-blooded Anglo-Saxon. The cacao nibs ground in paste, sweetened and flavored with vanilla and cinnamon, yield chocolate, so much relished by all the Latin races. Lastly the oil of the seed yields a non-rancid fat, cacao of butter, used in pharmaceutical preparations.

As to cost and expense, generally cacao planters in Chiapas and Tabasco make contracts paying 90 to 100 dol. per 1,000 trees, according to the location, facilities of transportation, etc., to be delivered in a state of production in four years, the plantation to be in good condition and with proper shade. The contractor keeps the products and first crop of the plantation. If the planter has his own laborers he pays them from 5 to 8 dollars per month and rations; then the cost will be from 70 to 80 dollars per 1,000 trees. Where the labor is not done by contract, but by jornales, or tasks, the cost for six years per hectare (2.471 acres) is as follows:

		AT 50C. PER TASK.	
		Dol.	Cts.
10	tasks for the stubbing.....	5	0
12	" for felling trees... ..	6	0
4	" for collecting brush.....	2	0
6	" for collecting trees... ..	3	0
3	" for burning	1	50
2	" to cut 375 madre cuttings.....	1	0
2	" to carry them to the plot	1	0
4	" for planting same	2	0
100	cacao pods for nursery.....	2	0
12	tasks to establish nursery, with shade.	6	0
6	" for weeding the nursery.....	3	0
20	" for hoeing or ploughing plot	10	0
5	" for digging the cacao seedlings.....	2	50
15	" for transplanting and transporting....	7	50
140	" six years' weeding.....	70	0
136	" for replacing and pruning trees.....	68	0
	Cost of the land	1	0
	Consequently there is a cost of.....	191	50

for 750 trees. The expense of collecting, drying and sacking the seed is from 3 to 5 dollars per carga of 60 lbs.

Thus 750 trees will produce the planter 75 cargas (4,500 lbs.), the price of which is from 20 dol. to 22 dol. per carga at the plantation. Deducting the cost of curing, he will have a net annual profit of more than 1,225 dol., besides the product obtained from corn, bananas and vanilla raised as side crops, and bees.

VANILLA OF MEXICO.

At the time of the Conquest of Mexico by Hernan Cortez, the Mexicans used the dry pod of the plant *tlilxochitl* (Spanish vanilla) to flavor chocolate. The Spaniards learned its use from them and introduced it into Europe. Collected at first from the vines growing wild in the forest, it is not known for certain when it was first cultivated; yet there are records to show that as early as 1760 there were vanilla plantations (*vainillales*) in Papantla.

Vanilla is found growing wild in Chiapas, in the municipalities of Amatan, Catazaja, Chilon, Ciutalapa, Concordia, Hidalgo, Huitiupal, Libertad, Mapastepec, Oasingo, Palenque, Pichucalco, Pijijiapan, Quechula, San Pedro Sabana, Santuario, La Reforma, Simojovel, Solistahuacan, Soyatitan, Tecpatan, Tololapa, Tonalá, Trinidad de la Ley, Tumbala; in Guerrero, in the district of La Union; in Hidalgo, in the municipality of Achiotepec; in Jalisco, in the municipality of Autlan and Tomatlan; in Michoacan, in the municipality of Coahuayana; in Oaxaca, in the municipality of Atoyacnillo, Ixcintepec-Yautepec, Jalapa de Diaz, La Candelaria, Nopala, Ozumasin, Pochutla, San Andres el Alto, San Antonio Jicaltepec, San Bartolome Loxicha, Sachixila, Vilanos, San Jose Chiltepec, San Mateo Pinos, San Miguel del Puerto, San Pedro Martir Socoltepec, Santo Catarina Losicha, Santa Maria Zapotitlan, Santiago Tlapeusco, Santos Reyes, Tacatepec, Tuxtepec, Usila, Valle Nacional, and Zadani; in Tabasco, in the district of Comalcalco, and in Vera Cruz, in the municipalities of Acayucan, Acula, Chicontepec, Chinameca, Coatepec, Colipa, Ixhuatlan, Juchique, Mecayapan, Minatitlan, Misantla, Moloacan, Otatitlan, Papantla, Playa Vicente, San Andres Tuxtla, Santiago Tuxtla, Sechliapan, Soteapan, Suchilapan, Tesechoacan, Tinum, Tixcacalcupul, Tuxpan, Valladolid de Juarez. It is cultivated in Michoacan, in the district of Ario; in Puebla, in the district of Tetela de Ocampo; municipality of Pantepec (Hacienda de Atlan), and in Oaxaca, in the district of Zacatlan, the municipality of Ixcatlan and Ojitlan; in Tabasco, in the district of Comalcalco, and in Vera Cruz, in the municipality of Chicontepec, Jalacingo, Jicaltepec, Misantla, Nautla, Papantla, Tuxpan, and Vega de Alatorre. In 1892 Guerrero produced 30,000; Jalisco, 8,000; Puebla, 150,000, and Vera Cruz, 217,365,000, making a total of 217,553, valued at 8,576,650 dollars. The plant thrives in the deuse

forests along the low hills and river valleys in these sections about 25 to 30 miles back of either coast. There it grows in such profusion that the odor from it is sometimes sickening. In its wild state it is considered as common property, and gathered by the natives without cost to them, except the labor of picking.

Vanilla (plant) belongs to the orchid family, has a pulpy stem which grows to several yards in length, attaches itself to trees, and appears to be little dependent on the soil for nourishment. The leaves are lanceolate and pulpy, and its yellow flowers bud from the axilla formed by the leaves with the stem. The fruit is a pod from 6 to 12 inches long and about half an inch in diameter at its thickest part, tapering down towards the stem, curved in its entire length, dark green in its earlier stages and yellow when fully ripe. It is filled with minute black seeds somewhat resembling iron filings. When prepared for market the pod becomes reduced to about a quarter of its original thickness, is black in color, it emits a very agreeable perfume, and is not unpleasant to the taste.

There are six varieties of vanilla known in Mexico, namely, the mansa (*Vanilla planifolia*), the cimarrona (*V. sylvestris*), the mestiza (*V. sativa*), the pompona (*V. rotundifolia*), the puerco and the mono. Of these the mansa and the pompona are cultivated. The cimarrona, or wild vanilla, has a more pointed leaf and a thinner vine (bejucó) than the mansa; the pod (siliqua) is shorter, rounder and thinner. The leaves of the mestiza are more pointed than those of the mansa, but less so than those of the cimarrona; the size of the pods is smaller than of the mansa and larger than of the cimarrona. This variety is not abundant, and when prepared it can hardly be distinguished from the mansa. The pompona, banana vanilla, has a vine one-half thicker, larger and rounder leaves than the mansa; the pod is double the size and triangular in shape, resembling somewhat a badly nourished plantain; it has an extremely pleasant smell, not unlike anise, and is very much used in Havana by the tobacco manufacturers to flavor cigars. The puerco and mono, which grow wild and resemble the cimarrona, have not been used in commerce as yet. Besides these, there is another species called the bamboo (tarro) vanilla, which is considered by many as a distinct species, but virtually is nothing else than the mansa kind grown in the jungles (tarrales) in the depths of the virgin forest, where neither sun nor air reach it.

A rich vegetable soil, such as is found in the dense forests of the tierra caliente, the hot regions, and particularly that on the borders of rivers or streams, is the best for vanilla cultivation and growth. In such localities the vine grows luxuriantly and gives a large pod. Moreover, the moisture is retained better by such lands than by others, which is the most important factor, as there is very little rain on both coasts from February until June. Furthermore, exhausted lands produce very little vanilla, and that with small pods, sands are too light, and clays are either too dry in hot weather or too wet in the rainy season.

Au undrained, water-logged soil will cause the roots to rot, and it is, therefore, quite unsuited to the cultivation of the orchid. The success of a vanilla plantation depends largely upon the ground selected for it; and if this does not possess the qualities already indicated, the plantation will be inevitably more or less a failure, however much care may be bestowed upon it.

The temperature where it thrives best is a mean of 85° Fahr., from 25° to 28° Centigrade, neither too warm nor excessively humid, and away from the sea-breeze. Sheltered situations are indispensable, but the plants must not be too much shaded, or the fruit will not ripen; and as to altitude up to 300 or 400 metres (1,184 or 1,412 feet) above sea-level, it will flourish where the conditions of soil and climate are favorable.

It is customary in the Misantla, Tuxpan, Papantla and suitable localities in Tabasco, 6 months or a year before preparing the land, to cut the creepers or wild bamboo cane which intertwine and grow from one tree to the other so that they may decay, otherwise the trees are so bound together by these creepers that they do not fall singly as cut, but in groups, and in collecting them it is hard to extricate the trees.

The foregoing precautions having been taken, the large trees should be felled in the beginning of the dry season, no later than February, the branches being first cut off, and then the weeds and brush should be cleared off, if this has not already been done. Trees under 10 years' growth, those that are quick growers, and those whose trunks are more than 8 inches in diameter should be felled.

For supports, the best trees are jonote, tecoluiste, conjoinedgato, zapotillo, canella, cordoncillo, guayaba, liguera (used in Jalacingo, Papantla and Misantla), jicaro, cacao, madre cacao (used in Tabasco), mango, dragonero, rubber, aguacate, palo de candela, and jack, which, if not grown already on the plot, could be planted. The supports (tutores) should not be allowed to grow higher than 12 or 14 feet, which can be effected by propping, for the reason that as the fertilization of flowers will have to be done artificially, it will be necessary for the plant to be trained so as to bring the flowers within reach of the hand.

The trees that remain will naturally be distributed more or less unevenly over the ground, that is, in some places they will be close together, and in others scattering. The former must be thinned out so as to leave the space of at least from 3 to 5 yards between the trees, taking into account always the more or less rapidity of the growth, as those that increase rapidly in size require a wider space between them. There may be a group of trees with a space of only a yard between each, but there must be a space of 6 or more yards between this group and another.

In thinning out the trees those should be preserved that are free from the defects already indicated, and those that are not heavily covered with leaves. Trees with small or scarce leaves are the best for vanilla.

such trees affording the vines the advantages of sufficient sun, shade and ventilation at the same time.

It is the custom of the most experienced planters to leave on each lot of land measuring 100 Mexican yards (varas, equal 32.99 inches) on each side (plot equal to 1.74 acres) from 500 to 600 trees.

The trees that are too small to carry a *vauilla* vine are left to grow, and if there are not enough of these, the deficient number are planted at once, so that the land may not lie idle.

After the land is prepared, selection of the cuttings (*estacas*) must be made. These are selected from healthy stems, over 4 years old, and that have at least three axilla (*hojas*), and are developed. These are cut 24 inches long 6 or 8 days before planting.

The months of June and July are considered in Vera Cruz and Tabasco as most appropriate for planting. This operation is performed by digging a hole (*cepa*) or a small trench, 8 inches long by 4 inches deep at the south or west part of the base of each tree. The soil must be heaped up so as to prevent stagnant moisture, indeed it is better to form a bed about 6 inches above the level of the ground. The three lower leaves of the cuttings are removed, and that portion of the stem (consisting of two cuttings) planted 3 or 4 inches below the surface; the remainder of the stems are then tied to the tree (so that they may be perfectly straight) by a flat baid of plantain fibre, *jouote*, or *cocoa-ut* leaflet. Round cord must not be used, as it is liable to cut into and injure the green succulent stem of the vanilla. The ground over the buried part of the cutting is then mulched with leaves of light brushwood; and if dry weather come on, frequent watering will be necessary, until the vine has taken root. It will be advisable, also, in case the humidity of the plot is not sufficient, or a stream should not be close by, to have a small ditch of water running between every two or three groups of trees, especially in dry weather. In some places, a *maguey* leaf is placed over the cutting so as to leave only its point out, in order to protect it from the animals and action of the atmosphere.

The ground must be kept free from weeds, at least two thorough weedings (*chapotes*) must be done during the year, one in spring and the other in fall. The clearing away of the weeds and brush from the plantation must be performed with care to avoid injuring such vines as may have become loose from the trees. The shoots of the vanilla vine must be straightened if found out of position, and where the vines have died they should be replaced (*resembrar*) by new ones. When the vines have reached the tops of the trees, bamboos are fixed horizontally from tree to tree, and the vines trained along them. It is advisable that the trees be kept down low so that the vines do not get out of reach, and the branches must be judiciously lopped off in order to prevent too much shade. No animal or artificial manure should be used, but rotten leaves and vegetables may be applied to the roots after each crop is

gathered. Vanilla can be raised also from seed, but it takes a longer time to come to maturity.

Four or five years after planting, and sometimes earlier, the root end of the vanilla vine rots, at a greater or less distance from the soil; but before this there have grown, far above the part which is about to rot, certain rootlets which cling to the tree, descend to extract nourishment from the earth, taking in this way the place of the old root.

This and a fact that a vine cut through at some distance from the ground does not wither, have given rise to the impression that the vanilla derives its nourishment from the tree. A proof that this is an error can be advanced in the case where the cultivation is carried on in gardens where stone-walls, posts or wooden trellis-work are utilized for supports, and where the vine has been cut in two, the upper section, although almost decaying, has recovered as soon as the newly-formed rootlets have reached the ground. The advantage of a living support depends solely on the shade it gives. If shade could otherwise be provided, it may fairly be assumed in that event there would be less impoverishment of the land at the expense of the crop, and probably the duration of the plantation in profitable condition might be extended by using dead supports.

The plants will commence to flower in the second year after planting, and full crops may be expected between the third and fourth year. Where the orchid grows wild, fertilization of the flowers is effected by means of insects or other agency, hence it is advisable to raise bees close to the plantation. The parts of the flower are so arranged that self-pollination is almost impossible, and, therefore, it must be effected by humming birds, bees, or some other insects. In the cultivation of the plant, however, it will not do to depend on such precarious agencies, and the planter, in order to ensure crops, must know how to fertilize the plants, so as to teach the laborers (women and boys) how it is done. The flower of the vanilla orchid is very different from the regular type of flower, yet, on examining it carefully, the outer floral envelope, consisting of three sepals, and the inner one, consisting of three petals, may be made out. The lowest of the petals is very different from the others; it is called the labellum (labelo) or lip, and it envelops the columnar continuation of the axis (eje) of the plant on which are set the curious anther (antera) and stigma (estigma). This continuation is called the column (guiandro) at the top of which is a hood (tapa) that covers up the anther and pollen masses (estambres), and below this is the viscid stigmatic surface, protected and hidden by a projecting lip sometimes called the lamellum. Thus we see that the pollen is shut in by the hood, and the stigma is shut in by the labellum, so that two obstacles prevent self-pollination. The object of artificial fertilization is to remove these obstacles, and to permit the pollen masses to approach the stigma. This is easily effected: firstly, by detaching the hood, which is accomplished

easily by touching it lightly with a piece of sharpened wood ; secondly, by slipping the labellum under the anther ; and, thirdly, by ensuring contact of the pollen and stigma by gentle pressure between the thumb and forefinger. The operation is performed in a few seconds, after a little practice, and it may be facilitated by holding the column between the thumb and finger of the left hand, whilst it is supported at the back with the forefinger ; the right hand is then free to use the fertilizing instrument, which should be rather blunt and flattened at the end. A tooth broken from an old comb and fixed into a piece of thin bamboo a few inches in length can be recommended as being useful.

If the fertilizing process proves successful, the flower will gradually wither, whilst the pod will grow rapidly. If unsuccessful, the flower will fall off before the second day, and the ovary will remain undeveloped, turn yellow, shrivel up, and drop off the stalk.

The flowers come out in March, April and May in clusters of twenty to fifty, but not more than half the clusters should be fertilized, as, in this way, fine large pods will be secured. Fertilization should be commenced at daybreak before the flower closes, for, if it be left too late, pollination may be incomplete or fail altogether. The fruit goes on growing for a month, but it will take at least 8 months longer to ripen sufficiently for harvesting.

The proper time for ripening of the vanilla in the districts of Tuxpan, Misantla and Papantla is in the months of January, February and March. The pods are to be gathered when they begin to grow yellow at their ends, or when they produce a crackling sensation on being pressed lightly with the fingers, and not all at once regardless of the growth or maturity. Each pod should be gathered separately, by cutting it with a sharp knife or by being bent to one side, when it will snap off the stem. It is very important to gather the pods at the right time, for if they be too ripe they will split open in curing ; and if too green they are dried with difficulty, they will have little or no perfume, the vanilla weighs a pound less in every thousand pounds, is red in color, and easily deteriorates from not having been allowed to hang long enough on the vine. The bean, if allowed the necessary time to ripen properly, is black and juicy, and, when well prepared, will keep good for many years, but if gathered before proper maturity is bound to be defective.

After the beans are gathered they are plunged for half a minute into hot water that is almost boiling. They are then put on mats to drain dry, and afterwards spread out on blankets and exposed to the sun, especially on an inclined paved floor near a wall running from east to west, and 12 feet high. Every evening they are rolled up in the blankets, and shut up in tight boxes to ferment. The box in which the vanilla is to be sweated must be put in the sun during the day to warm it, and must be big enough to hold all the vanilla that has been spread out. The vanilla wrapped in the blankets is put together in the box, and another

blanket well warmed is put on the top. As the vanilla is blackened it is separated from the green; all which is spoiled is taken out or laid away, and the sunning process is continued for a week, or until the pods become brown and pliable, when they are squeezed between the fingers to straighten them, and to cause the seeds and oily substance inside to be evenly distributed. Should any of the pods split, they should be closed up and bound round tightly with silk thread or narrow tape. As they dry and shrivel the thread should be wound and the pods tied up again. To accelerate the baking or browning of the pods which remain green, whenever there is any doubt as to the vanilla having received the proper amount of heat, and to prevent its turning spotted, an oven should be used heated to 118° Fahr. if the vanilla pods amount to 20 bundles of 400 pods each. But if the number of bundles is less the temperature is decreased in proportion. It is not well that the vanilla inside the oven should turn black under 16 or 22 hours.

If there is too much heat the oven must be opened for a while, bearing in mind that while open the heat lowers at the rate of a degree every 3 minutes, more or less, if the oven is in daily use. Nevertheless, it is advisable in 13 or 14 hours after putting in the bundles to open one or other of them to see if the vanilla has turned black or not. If black, it must be taken out, leaving it wrapped up until next day, when it will be spread in the sun, or on racks if there is no sun. When the pods are brown the drying process should be finished in the shade, which may take 5 or 6 weeks. When the pods become mouldy they are smeared with sweet oil, but glycerine is better. Brown pods that are a little hard, but not so hard that they will not give under the pressure of the fingers, may be considered as dry enough, and may be put away in a tin box. Those not quite dry enough, but very nearly so, should be put on the racks and sorted every day until the whole lot is dry.

After the operator is perfectly satisfied as to his work, the vanilla beans are then separated into sizes of length, thickness, color and appearance. The Mexican vanilla dealers have established five grades, namely: First, vanilla fina or legal, the beans or pods from 6½ inches long or upwards, short in the neck, sound and black, the beans which become split or open, provided they have the foregoing qualities and the split does not extend more than a third of the pod. This class is again subdivided into terciada, which is composed of the shortest pods; primera chica, primera grande, marca menor, and marca mayor, the largest of all. Second, vanilla chica, those pods which differ only from the terciada in being shorter, two of them counting as one of the first-class. Third, vanilla zacate, the pods of all sizes which are off-color through being gathered before becoming ripe, or being over-cured, pescozuda, vana, cueruda, and aposcoyonada, names for pods in a more or less damaged condition. Fourth, vanilla cimarrona, the wild vanilla, in good or fair condition, three pods counting as one of the first-class. Fifth, the

rezacate, composed of the very short pods, of those split clear up to the stalk, of the badly-damaged, of the very immature, and of the very much over-cured. Of this six pods count as one of the first-class.

After the sizing and classification is finished the pods are tied up in bunches of 100 to 150, so as to weigh one pound, and wrapped in filtering paper and tinfoil.

The cost of a vanilla plantation in Misantla, Papantla, Michoacau and Tabasco to the time of bearing (3 years) is 45 to 60 dollars per 100 vines. The cost of curing or preparing the bean is in Papantla, Misantla and Tuxpan from 4 dollars to 4 dollars 50c. per 1,000; in Oaxaca, from 5 to 6 dollars; and in Tabasco, 5 dollars.

One hundred vines at 3 years of age yield, on an average, without any cultivation or artificial fertilization, from 50 to 65 pods; at 4 years, 165 to 225 pods; at 5 years, 325 to 500 pods; and thenceforward the production diminishes annually up to the tenth year, when it is necessary to destroy the vines and replace them with new ones.

Some lands produce more and some less, but on the average, taking one year with the other, it may be reckoned that from the third to the tenth year each vine will yield two pods a year. Between the fourth and sixth years the plantation is in its prime. There are vanilla vines which, in their prime, give as high as 85 pods and more, but these are isolated cases. In a good crop under thorough cultivation many of the vines are seen with several fruit-bearing branches, carrying as many as 14 or 16 pods.

Vanilla is generally bought and sold in Mexico by the 1,000 (millar). Green vanilla sells in Oaxaca, Michoacan and Misantla from 5 to 8 dollars per 1,000. Dried vanilla sells in Michoacan from 40 to 50 dollars per 1,000, and in Misantla, Papantla and Tuxpan from 50 to 75 dollars. Statistics show that there is more vanilla exported from the port of Tuxpan than from any other port in the world, thus establishing the fact without a doubt that the Tuxpan valley is the natural home of this valuable orchid. It is worth in New York City at present from 8 to 10 dol. gold per pound, which, as will easily be seen, leaves quite a handsome margin of profit, even after all expenses of curing packing and shipping have been deducted. As much as 300 per cent. profit has been made on vanilla in good years.

THE INDIGO OF MEXICO.

"Juiquilite" (Spanish, añil, *Indigofera*) is a native of this country and Central America.

Indigo is cultivated in Chiapas, in the districts of Chiapa, Libertad, Mezcalapa, Tonalá and Tuxtla; in Colima, Alvarez, Centro and Medellín; in Guerrero, Allende; in Jalisco, Autlán and C. Guzmán; in Michoacan, Apatzingán, Ario, Coalcomán and Tacámbaro, and in Oaxaca, Juchitán

and Tuxtlahuaca. The total production of these districts for the year 1893 was 169,831 kilos.

Three kinds of *Indigofera* are found in Mexico, namely, *I. tinctoria*, *I. disperma*, and *I. añil*. *Indigofera tinctoria* and *I. disperma* are mostly planted. Both are shrubby plants not more than 3 or 4 feet in height; they bear small pods containing numerous small angular seeds, and have long tap roots which penetrate deeply into the ground. The general appearance of the indigo plant is of a young mezquite tree, woody at the base, with deep green oval leaflets and recemes shorter than the leaves.

Indigo plants are hardy and will grow on most well-drained soils in a suitable climate. The best soil, however, for the profitable cultivation of indigo is a rich virgin loam covered with big trees, with a light free subsoil that prevents the running off of all surplus moisture. The soil must not be too dry and sandy, nor too wet and clayey, but a medium between these two. If the subsoil be wet, the plants will either die or grow up sickly, and give very poor returns. In Chiapas and Oaxaca moderately high and dry slopes, free of pasture and having a warm temperature are utilized for indigo fields. The cultivation of it is confined entirely to the tropics, in places where the temperature never falls below 60° Fahr., because in colder climates the yield will be unprofitable. The most suitable lands for its cultivation are those situated between a radius of 15 to 20 miles from the Pacific coast, or 400 to 600 feet, and 3,000 feet above the sea-level, south of Manzanillo, Colima, and down to Guatemala.

The spring is the best time for sowing. In March or April the land is cleared (*desmonte*), the undergrowth and weeds are burnt or forked in, and the timber together with the brush is used for fencing. Two weeks after the land is sown in Indian corn. One almud (25 lbs.) of corn is sown to the hectare (2.474 acres). The planting of the corn is done by placing 15 or 20 grains in medium-sized holes made with the *coa* or *garrocha* (a pointed stake) 16 inches apart, the rows 2 feet distant one from the other. As soon as the young corn comes up, in the first days of May, holes at equal distance are made between the corn, and as many indigo seeds as can be taken up between the thumb and forefinger may be deposited in each hole and covered with an inch of earth. An almud of the seed will be more than sufficient to cover a hectare, 10 lbs. to the acre. It is better that the seed should be as fresh as possible and mixed with sand, in the proportion of 1 lb. of the former to 10 lbs. of the latter. In favorable seasons the plants spring up in 4 or 5 days, in the shape of a thin pliable reed, and then they must be weeded by hand, all the weeds being carefully pulled up so as not to injure the seedlings. When the plants are a few inches high the hoe or *machete moreno* may be used, two or three weedings will be necessary before the indigo is ready to cut; and after the corn has been harvested, the land is thoroughly cleared. In the months of September and October the plants begin to flower, and

in order to save the indigo in it, especially in the leaves, the stems are cut as soon as yellow leaves appear on them or the little buds begin to bloom. A considerable number of the best plants are always left to produce seed pods for the next crop. Ten bushels of pods yield about a bushel of clean seed. The plants are usually cut down (*ciega*) to within a few inches of the ground with machetes or sickles, and then tied up in bundles to be carried away to the place where the indigo is manufactured. As exposure to the sun injures the cut plants, the operation should be begun and finished in the afternoon. In very warm and moderately humid places the plants will grow within two months of sowing, ratoon and grow also in two months sufficiently to be cut down again; and in favorable circumstances, as many as four cuttings have been obtained from the same roots in a year. *I. lespedezioides*, *I. pascuorum*, *I. dominicensis*, and *I. microcarpa* of Cuba, flower inside of 35 or 45 days, and the stems can be cut 3 or 4 times a year if they are sown early in the season.

The fields which the writer has seen in Chiapas and Oaxaca do not ratoon until the next spring, and this is succeeded by another or third crop the next or third year, when the stumps are rooted out and new seed is sown in the next planting. Quicker returns could be obtained in the above districts by using the seed of the Cuba native plants and that of the "*tinctoria*," by selecting favorable situations having long periods of rain, but well drained, by ploughing the land and sowing the seed in the latter part of April or the beginning of May.

The indigo plant is liable to be attacked by insects when it is planted on the same soil in successive years, hence it is advisable that a new site should be chosen every few years. Indigo contains a considerable proportion of nitrogen, and thus when the same land is cropped often, manures rich in ammonia should be used. The refuse of the plant, after the indigo is extracted, is perhaps the best manure, and it makes excellent fuel. Where the refuse cannot be returned to the soil, farmyard manure with a top dressing of lime will answer the purpose very well.

The substances which form indigo reside in the leaves, but the whole plant for the sake of convenience and economy is subjected to the process of fermentation and agitation, by which the dye is manufactured. The fermentation of the plants under water causes the dyeing matters to be dissolved out, and these combining with the oxygen of the air produce the blue coloring substance known as indigo. When manufactured on a big scale, large stone cisterns, one higher than the other, are necessary. Generally the slope of a hill is selected protected from the rays of the sun, and the walls and bottoms are made of brick or tiling covered with cement. The upper cistern or vat, usually called "*pila de carga*," steeper, 8 by 16 feet and 5 feet deep, should have the bottom sloping gradually towards the end from whence the contents are discharged into the second cistern by means of a cock inserted near the bottom. The second cistern, called the beater "*pila de debatir*," should be 12

feet square and 4 feet deep. These cisterns should be sufficient to manufacture the dye from plants growing on 6 acres of land. Below the beater a third cistern may be placed into which the contents of the beater is run and allowed to stand for the dye to settle at the bottom. But, unless the operations be done on a large scale the settling of the dye can take place in the second cistern, which should be furnished with several cocks at different elevations, so as to allow the clear fluid above to drain off from the precipitated indigo.

Bundles (about 125 lbs. each) of freshly cut plants brought from the fields are put into the first cistern or vat in regular layers until they reach to within 10 inches of the trough or cover two-thirds of the vat. This quantity of indigo can be cut by three men inside of 3 hours. Planks are then laid on the plants and wedged down by a contrivance consisting of four posts, having each four or five square holes at the top end, stuck firmly in the bottom of the cistern 11 or 12 inches (half a vara) distant from each corner and boards placed across the cistern above the bundles and fitted in the holes of the post.

Water is then run in so as to cover the plants to a depth of 3 or 4 inches from the top of the cistern. The water must be pure, clear river water giving the best results, and, as a large quantity is necessary, indigo cannot be manufactured with success in a place where an abundant supply of water is unobtainable. In selecting a spot where the cisterns are to be constructed the idea of having the waters of a stream utilised by means of a ditch should be borne in mind. A few hours after introduction the water becomes turbid, then turns into a beautiful emerald green, the solution sets free carbonic acid gas and traces of ammonia, and discolored pellicles float on the surface. The fermentation generally lasts from 12 to 16 hours, and that according to the stage of the growth of the plant; if the plant is fully matured going into seeding, the fermentation should last from 12 to 16 hours, but if the stems are cut when flowering or before the maceration should be stopped in 10 or 12 hours. A sure indication as to the time ("punto") when the solution should be transferred, consists in the gas bubbles disappearing almost altogether, or when the solution by rapidly stirring it in a glass vessel forms small blue flakes which in a little while separate into granules.

Furthermore, if the leaves become of a pale color and the tops are tender, fermentation is gone far enough; and if it be continued after this stage putrefaction will set in and the dye will be destroyed. The solution is run off by the cock to the second cistern, and the refuse plants are then taken out of the first cistern and either dried in the sun for fuel, or at once placed on the land for manure. They have a noxious odor due to the putrefying vegetable matter.

The liquor, now being in the second cistern, is to be constantly agitated for a period of from 1½ to 3 hours. The agitation prevents further fermentation, and by exposing successive layers of the liquor to

the air it enables the whole in time to become oxidised (oxide of indican), and thus causes the formation of the insoluble blue dye. The liquor may be agitated by some mechanical contrivance, a hydraulic wheel, or by men going into the cisterns, beating and churning the fluid with wooden paddles.

As the beating (batida) goes on the green liquor becomes of a deeper color, violet, and then gradually turns to a very deep blue as the insoluble indigo forms into minute particles (grauulos). Then a small quantity of a precipitant called "cuajo," or lime water, is added in order that it may combine with the carbonic acid formed during the process of fermentation and help the precipitation by coagulating the fluid.

To determine the time when this should be done, at intervals of several minutes during the agitation, a little of the liquor a few drops of the precipitant are added, in several experiments, until the fluid becomes white, then orange or wine-colored. The precipitant is prepared from a wild white grape called "olavere," found in the Isthmus of Tehuantepec and Chiapas, from a wild tree known as "quajatinta," and from the leaves of marshmallow (*Althea officinalis*). After introducing the coagulating fluid the whole is stirred up, and then the coloring matter is allowed to settle, and in 2 or 3 hours the indigo will have subsided in flakes (copas) and the amber-colored fluid will remain on top. This clear fluid (suero) is to be drawn off next by means of cocks, the highest one being opened first, and after the liquid has ceased running a lower one is opened, and so on until nothing is left in the cistern but the indigo, which looks like a bluish-black mud. This mud-like stuff is then taken out and put into conical linen bag filters which are hung up so as to allow the surplus moisture to drain away. Afterwards the dye is taken out of the bags and placed in a large cement-lined kiln, where a gentle heat is applied until the whole is rendered dry. It is then subjected to hand-mill pressure, thereby formed into blocks stamped with the plantation mark and placed in heavy boxes each holding 25 lbs.

By proper arrangements the whole process can be repeated every 24 hours.

In Tuxtla, Chiapas, and at the haciendas in the neighborhood of the town of Tehuantepec, the deposit of indigo before drying is boiled for 2 or 3 hours, to prevent further fermentation and then strained through thick filtering cloth, and the paste is dried by pressure. The cakes, weighing an arroba, 25 lbs., are put away in shallow trays to dry slowly in the shade and packed in boxes or sacks.

It has been calculated where the soil and climate are adapted and the process of extraction is carefully and properly performed, 16 pounds of the leaves should produce 1 oz. of indigo; and 300 lbs. of dye may be reckoned on as the average return from an acre of plants. The hacienda of "La Venta," situated on the wagon road from St. Geronimo Station

(Tehuantepec Railway) to Chiapas and Guatemala, in Juchitlan district, Oaxaca, produces 98 piladas (tanks full or cisterns full) to the hectare, and these yield on an average 10 lbs each, making 980 lbs. production per hectare, or 397 lbs. to the acre. Last year's crop up till April (1895) was selling as high as 2 dol. per lb. at the plantation. The ruling price before the depreciation of silver was 80c. to 90c. per lb. Corn planted between the indigo plants, after deducting the total cost, produces from 65 dol. to 80 dol. per hectare. The actual cost of indigo-raising amounts for the first year to 66 dol. 88c. per hectare, consisting of:

	AT 38c. PER TASK.	
	Dol.	Cts.
4 tasks in clearing the undergrowth.....	1	52
12 " felling trees and chopping brush... .	4	56
4 " collecting brush.....	1	52
3 " burning	1	14
24 " for collecting trees and fencing... .	9	12
4 " for sowing corn, including seed.....	1	52
4 " for harvesting corn and clearing land.	1	52
4 " for sowing indigo, including seed, 1 almud (25 lbs.)....	3	52
12 " for weeding and hoeing..	4	46
100 " cutting, collecting, transporting, mace- rating and pressing.....	38	0
Total.....	66	88

The cost in the following years will be 49 dol. 12 c., plus 12 tasks for manuring and ploughing, 4 dol. 56 c., making a total cost of 53 dol. 68 c. Thus a planter will have an annual income of 687 dol. 32 c. per hectare (2.471 acres) by selling his indigo product at an average of 1 dol. per lb.

THE MEXICAN RUBBER.

The rubber tree (*Castilloa elastica* of Cervantes, olquaquitl of the Aztecs, hule of the Spaniards) is indigenous to Mexico, and is found growing wild along both coasts, below 22 degrees north latitude, from sea-level to altitudes running from 1,200 to 1,500 feet, and principally by the river meadows. The regions most favorable for the growth of this most important, yet rarely cultivated, tree are: the plains of Pochutla, Oaxaca, between the Pacific Ocean and the base of the Sierra Madre Cordillera, and also along the banks of the Copalita River; in Sonocusco, Chiapas, below the coffee belt, and in Pichucalco and Mezcalapa along the great Grijalva River clear down to Tabasco; in the Papaloapan and Tuxtepec Valleys clear up to the Rivers Tonto and Quiotepec, and the lands on the gulf side of the isthmus, covering an extension of

1,100 square miles, where the tree is found in astonishing numbers throughout the forests that skirt the Coatzacoalcos, Uspanapa, Coachapa, Chalchijapa, Del Corte, Chichilina, Malatengo, Sarabia, Junuapa, Jaltepec, San Juan, Trinidad and Colorada Rivers.

Few are the plantations of rubber existing in the Republic. The principal one is "La Esmeralda" in Juquila, Oaxaca, which has over 200,000 trees eight years old, and the next is a plantation in the hacienda, "Doña Felipa Ortiz," in Pichucalco, Chiapas, consisting of 10,000 trees seven years old.

The hule tree belongs to the Urticaceæ, grows from 45 to 50 feet high, and has branches only at its upper section; has smooth, yellow bark; its leaves are 6 to 10 inches long, oval, oblong, entire, thick, smooth, bright green and glossy above. The umbrella-like form of the tree, which covers 10 square feet, is often seen among the mamey-zapote, striving to free itself, and rising majestically over the neighboring trees. The tree is a hardy one; nothing affects it, not even parasites or animals. There are eight kinds of rubber-tree that grow wild in the country, but the kind known under the name of *Castilloa elastica*, is the most important and the best, as it is very much sought for its sap and for propagation; an example may be seen in the botanical garden of the preparatory school in this city.

The best soil for rubber cultivation is a deep, rich loam, such as is found along the alluvial banks of the above mentioned rivers, and in the plains between the sea and the foothills of the coast ranges.

Rubber is essentially a tropical tree; hence it requires a hot and moist climate. The temperature most adapted for its vigorous growth is above 86° Fahr., and the rainfall should be at least 60 to 70 inches per annum; however, salt air does not hurt it. A plot in the vicinity where natural trees are in abundance should be preferred for starting a plantation. Generally, under favorable conditions, the tree will there grow faster, thicker, and consequently produce quicker results and a larger amount of juice.

In most cases the trees are found in the above places in sizes from seedlings to 18 and 36 inches in diameter. The tree propagates itself from the seed which drops from the tree in the months of May and June, to the ground, and there watered and nurtured by the warm rains which soon follow, the young plant some time after comes up to take its place amongst the varied tropical life.

If the land set aside for the plantation is covered with trees, these must be felled and the undergrowth cleared only where the young trees are to be planted, providing no side planting is to be made. This work must be performed in the months of March and April, and immediately after, corn should be sown in the open spaces 15 inches apart. This operation is simply done by making a hole in the ground, dropping in a few grains, and covering over with the foot. Should the planter wish to

adopt the most economic system, and thereby obtain the greatest return for the money invested, it would be advisable for him to plant besides corn, cotton, bananas and coffee. But the attempt to plant Mocha coffee must not be made in elevations less than 1000 feet above sea level, neither on plains, nor where the temperature exceeds 85° Fahr.

In the latter case the acreage to be planted must be stubbed and the under brush forked in, or burnt before sowing the corn; then line and stake the plot in rows 15 feet apart. Peons who are posted in this kind of work, especially in coffee planting, have a long cord of rope (24 to 36 varas in length) on which they mark the divisions with inks made from dye-woods of the forests in these sections; the cord is held by two men and another one marks the holes with his garrocha, leaving a stake in the excavated place, every 15 feet in the row. This rule of setting the trees at such distance would insure larger size and a greater flow of rubber-making fluid. As to shade, if the young plants have been taken from woods under shelter, then natural trees must be left on the plot before clearing to protect them from the strong rays of the sun, until they are ten or twelve feet high and have a prosperous appearance.

This must not be overlooked, as the plant will suffer a great deal from transplanting, even when the operation is done under the best circumstances. But if the young plants are obtained from unsheltered places, or from a nursery established in an open space, they having grown stronger and stouter will require no shelter and will flourish more rapidly and vigorously than if they had shade.

If the seedlings or cuttings can be obtained within a few miles from a plot, it is advisable even to pay 2 dol. 50c. per 100 rather than to wait 12 months for the seed to grow in the nursery. When the place where the supply of young plants or cuttings is to be had is too distant, the expense of transportation would be enormous, and they would suffer to such an extent as to render them unfit and risky for transplanting; the only practical method in that case is to start a nursery. For this purpose a rich, sandy loam should be selected. Beds are made 6 feet wide by 15 to 20 in length, leaving a walk 2 or 3 feet wide. The seeds are sown 8 inches apart in rows 10 inches distant from one another. This operation is done in the beginning of June or a few days after the rains have started and by merely marking the ground about an inch deep with a stick, dropping the seed in and covering it with vegetable mould.

In 12 months the seedlings are about 24 inches high and ready for transplanting. All weeds and grass must be carefully removed with the hand from the bed as they appear and the earth watered when it seems dry, which is best done in the afternoon.

In the latter part of May or in the first days of June, when the rainy season commences, the seedlings, young plants, or cuttings are transplanted in the cleared plot between the corn and cotton, 15 feet each way. In removing the seedling or young plant, as much of the original

soil should be left attached to it, in accordance with the system known as "pilon." The earth must be opened sufficiently to place the plant at the same depth as in the seed bed, and then press down the earth with a spade so as not to leave any hollows around the tree. The plot planted with rubber trees should be inspected every now and then, in order to know how they are progressing, and to replace the plants that have withered and died. In July or August it will be necessary to clean the corn, weed the plot, and, after harvesting the corn, banana suckers, (hijos) can be planted 7 feet apart between the rubber rows.

In Chiapas and Tabasco cacao trees are set a few feet from the 2 or 3 year old rubber trees, the latter acting as shade for the former, in lieu of the regular madre protector or shade tree. Vanilla trees can be attached to the cacao, and by that means, after the lapse of 6 or 7 years, the planter has three or four different crops to harvest. Furthermore, bees could be raised on the place, which would act as a medium to fertilize the vanilla flowers and give a handsome profit from honey and beeswax. Again, should the proprietor not want any side planting, cattle, which bring a good income in those sections, may be permitted to graze on the land as soon as the young trees are well rooted and have grown over 20 feet high.

After going through the work of transplanting, the only care in the cultivation of the tree thereafter is that of keeping the ground free from all weeds and the rank vegetation of the tropics.

As to the expense and cost, the preparation and cultivation of an acre for 5 years, when a tree is ready for production, will require the services of a laborer working 51 days, or its equivalent of 51 laborers each working one day. The work consists of clearing the ground, so as to render it fit for general crops requiring 26 days; collecting the seedlings or cuttings 193 trees, $1\frac{1}{4}$ days; planting same, $2\frac{1}{2}$ days; hoeing and staking, 2 days; sowing corn, $1\frac{1}{2}$ days; harvesting same, $1\frac{3}{4}$ days; planting banana suckers, $2\frac{1}{2}$ days; establishing nursery, 1 day; and 5 years' cultivation, weeding, &c., 12 days. Estimating each day's labor at 50c., it is seen that 193 trees on an acre of ground will have cost the planter at the time they are ready for planting less than 12c. a piece. If a plantation of 100,000 trees is wanted, 517 to 529 acres or 5 caballerias of land will be required, and the total cost at the end of 5 years, exclusive of the first cost of the land, will be 12,000 dollars. The wild land will cost from 1 dol. 50c. to 2 dol. per acre in small tracts; supposing that the 5 caballerias of land cost 1,200 dol, including the expense of drawing up documents, stamps and recording; administration for 5 years 5,000 dol.; gathering of the crop will be about 5c. per tree, or 5,000 dol. for 100,000 trees; gathering of banana bunches from $\frac{3}{4}$ to 1c per piece; collecting, drying and sacking the cacao, $8\frac{1}{2}$ c. per lb.; collecting and curing vanilla beans, 5 dol per 1,000 pods. Hence, the total expense for the rubber plantation of 100,000 trees will not exceed 25,000 dol. Mexican currency.

Regarding the work of extracting the rubber, one man will tap from 20 to 25 trees per day if the operation is performed carefully and methodically. In most places the tapping is done in the month of May and sometimes again in October, but it is not advisable to repeat the operation as often as that. The process generally consists of making two or three incisions in the lower part of the trunk of the tree and collecting the sap that flows from them in clay vessels placed next to the trunk. Others make a spiral cup from 6 feet above the ground down the trunk of the tree, collect a portion of the juice at the bottom and the rest is allowed to dry in the concavity of the incision and later on is taken off. The best and most advisable system is to make low incisions.

The process can be repeated every year for 25 years or more especially if the wound is covered with wax or clay after the flow of the sap has ceased. When there is a large quantity of milk gathered, it is dumped into a barrel having a faucet, and a solution of 5 ozs. of chloride or sub-carbonate of sodium in sufficient water to cover the whole mass, which is agitated with a stick every now and then. After the lapse of 24 to 36 hours the water is allowed to run out through the faucet, this operation of washing is done until the rubber becomes white.

About 44 per cent. of rubber remains from the original amount of milk after the water and other matters have been eliminated by evaporation.

Trees planted on lands having the soil, climate and elevation adapted for the culture will produce from 5 to 6 lbs. of juice on the first year that they are tapped, which amount is equivalent to 2.4 lbs. of pure rubber.

This product will be gradually increased every year for the next 4 or 5 years and will sell for 50 c. per lb. on the plantation. Thus 240,000 lbs., the yield of 100,000 trees at the first year's harvest, will bring the planter 120,000 dollars besides the product obtained from the corn, vanilla, bees, cacao and bananas raised from side planting. The net profit on the investment, after deducting the entire cost of the land and all expenses up to the first year of harvesting, will be 95,000 dollars, and each of the succeeding harvests for 25 or 30 years will bring a steady income of over 100,000 dollars.

THE MEXICAN BANANA.

The first banana (*Musa Sapientum*) was brought into America by a Dominican, in 1516, from the Canaries to Haiti, from whence it was transplanted to the Continent, but the plantain (*Musa paradisiaca*) is indigenous to tropical America,* and was cultivated by the aboriginal inhabitants long before the coming of Columbus. Before the Spanish Conquest the latter, besides corn, Chile pepper and potatoes, formed the Mexican staple article of diet.

* This theory is regarded as exploded by the best authorities. It is practically certain that both bananas and plantains originally came from the East Indies.—ED.

Almost everywhere on the Mexican coast region and on the lower borders of the temperate zone, this plant grows spontaneously and in very great abundance. While the plant is not altogether tropical, it will produce in higher elevations, but there its fructification will be very much retarded.

The plant like the Agave (maguey) and cocoa-palm is useful to man in many ways. Besides producing delicious fruits, it furnishes material from stalk and leaves for paper and cordage, a wine is manufactured from its fruit which rivals the Guadalajara orange ferment, and a brandy more delicate and with finer bouquet than that of the peach, the stems furnish a fine forage, the white of the stalk is a splendid food for the peon, a fine flavored vinegar and essential oil are made from the skin of the fruit; the juice of the stem, on account of its astringent qualities is a magnificent medicine for intestinal troubles; and from the pulp of the fruit a flour is made which produces a bread more substantial than that of corn or wheat. More than one company in the United States are now engaged in converting the fruit into flour; the price at which it sells is 25c. gold per 1 lb. In the State of Vera Cruz the banana plant is largely used as a shade for coffee trees, and in the State of Tabasco and parts of Chiapas it is also used as shade for chocolate (cacao) trees.

As to its productive qualities, 1 hectare planted with banana can feed 100 men during a year; it produces 133 times as much as wheat, and 14 times as much as potatoes.

The production of the banana fruit in the Republic for the year 1893 was 19,735,108 kilos., valued at \$12,960 dol.

The banana plant properly belongs to the Scitamineæ family. A full blown banana appears as the grandest of the herbaceous products. It makes a remarkably rapid growth, reaching the height of from 9 to 12 feet in as many months. Its stem-like trunk from 4 to 6 inches in diameter is formed of thick sheathing leaf stalks, from the top of which spreads a loose cluster of immense long leaves. These are often 15 inches in width and 6 feet in length, and when first unfolded are transparent and of a bright green color. Their edges are smooth and unbroken until the broad green surfaces exposed to the sun, wind and rain become lacerated into transverse ribbons wrecks only of early symmetry. Its majestic so-called stem composed of the succulent leaf stalks rolled one over the other and its splendid crown of enormous light-green leaves radiating from the centre, from which issues the bunch of fruit gracefully curving downward, make it one of the glories of tropical Mexico.

There are about nine species planted in this country, of which the following are the principal:—Platauo largo (*Musa paradisiaca*); platauo de Guinea (*Musa Sapientum*); platano hija or manzano (*Musa regia*), having the most delicate fruit, small in size and of a yellow color, and platano manilla (*Musa textilis*) which has a short and thick fruit of dull red color. The many varieties of the plant are the result of

long cultivation and the successful introduction (principally by the Spaniards) of different species from the Philippine Islands, and Canaries, and Africa. The plant is cultivated in all the States, excepting in the Distrito Federal, Baja California, Sonora, Coahuila, Chihuahua, Aguas Calientes, Mexico, Tlaxcala, and Campeche.

The banana will grow in nearly every soil, except those composed almost wholly of sand or of calcareous matters. The best soil for the cultivation of the plant is a warm, well-drained, but rather moist, deep loam, with a good proportion of humus and little lime. In such a soil and with a favorable climate, bananas will yield enormous crops.

The climate essential to the growth of the plant is a tropical one, but many varieties do extremely well at moderate elevations in the mountains, provided they are protected from the withering blasts of high winds. The best elevation for the banana is 700 to 1,500 feet above sea-level.

The underground stem of the banana sends off a number of side shoots, or suckers, which if left to themselves will grow up into numerous stems. The banana seeds only in very exceptional cases. However, the plant is easily propagated by the suckers, which are detached from the stem by means of a sharp spade (coa) or cutlass, the earth being first of all removed carefully so as to expose the junction of the offshoot with the parent plant.

The best size of the sucker for planting is about 2 feet over all, and 4 to 6 months old. The land selected for the banana plantation should be dug with hoes or well ploughed, where possible, after the weeds have been hoed up, and the bushes and roots of trees stumped out. On hill sides and on broken ground the weeds may be buried in trenches dug with the coa, or hoe, for it is far better to bury the weeds than to burn them on the land, as by the latter plan a considerable portion of the plant food is carried off into the atmosphere.

The suckers should be set in rows 9 feet apart, the plants in the rows being at distances of $7\frac{1}{2}$ feet one from the other. This will give about 647 plants to the acre. However, in many places they plant 1,000 to the acre, especially in Vera Cruz. Between each third or fourth row a drainage trench may be dug, which should be done before the plants are put out. The sucker must be planted about 1 foot deep in a specially prepared hole, and, when the land is poor, a little manure can be put at the bottom of the hole. After planting, the earth should be firmly pressed down by the feet all around the sucker.

Its cultivation is very easy and cheap. The suckers having been cut at the commencement of the rainy season, are deeply rooted in the rich soil, and watered by copious showers, warmed by the rays of a genial sun, they grow most rapidly. In 7 months a long spike bearing clustering flowers, surrounded by colored bracts, shoots forth from the clustered leaves, and minute bananas soon appear at its base, leaving the sterile

plummet-shaped portion of the spike to extend beyond the bunch that is now rapidly forming. During the growth of the plant the land must be kept free from weeds; an occasional turning up of the soil will prove beneficial. Before the plant throws out its flowering stem suckers will make their appearance above the ground, and these will require some attention.

Whilst the plant is young all the suckers except one should be cut away. Thus all the vigor of the plant is thrown into the fruiting of the first stem, and the growth of the one to supplant it, and in this way fine large bunches can be reckoned on. Afterwards, when the stool has matured, from three to five stems may be allowed to grow, which after being 3 or 4 months old may be sold or transplanted in a new plantation, but on no consideration should a larger number be allowed to shoot up if fine bunches of fruit are looked for. The second stem usually produces a finer bunch of fruit than the first, but as the land becomes exhausted the bunches, of course, decrease in size, and this will probably show the necessity for manure in some form or other, unless the soil is very fertile. After the stool has borne a crop or two the earth should be loosened around the stem, and manure or decayed leaves and banana stalks forked in, the whole being moulded up with surface soil from the vicinity. When the stool shows signs of exhaustion or decay, as it probably will after a few years, it should be stumped out, and a fresh sucker planted in its place, or, better still, in the intervening space between the old stools, the fertility of the soil being restored, if required, by a free application of manure. When the land is intended to be kept in permanent banana cultivation a good plan, after lining out, is to plant each alternate hole one season, and to plant the vacant spaces another season. In this way the stools will not become exhausted at the same time, and by judicious application of the system continuous crops may be expected. The chief drawback to this plan is that the land at first carries only one-half the usual number of plants, while the cost of weeding and cultivation is much the same.

With proper cultivation, a rich soil, and suitable climate, the first crop may be gathered in 10 or 12 months from the time of planting, and, as some plants may be backward whilst others are forward in growth, bunches will be gathered at all times thereafter. The bunch must be cut with a portion of the stem for the convenience of handling, and the terminal flower buds should be removed at the same time. The trunk must then be cut down to within a few feet of the ground, and if it be chopped into short lengths and arranged around the remaining trunks, it will rot and help to manure the soil. The fruit should be cut about a week or ten days before it is ripe, to keep it a longer time, and also to obtain better flavor and less fibrous fruit. From the time it leaves the stem until it is placed on the market it must be handled with the greatest care and gentleness, otherwise its value will be much lessened.

As to the expense, large plantations in Vera Cruz, including the Isthmus, in the districts of San Blas, Acapulco, Poehutla, Tehuantepec, and San Juan Bautista in Tabasco, can be made at a cost of 3½ to 5c. per plant, if planted a thousand to the acre. The cost of clearing the land is from 6 dol. 50c. to 8 dol. 50c. per acre; the price of 1,000 suckers or shoots (hijos) from 20 dol. to 25 dol., staking, holing and transplanting will cost 8 dol. 25c. per 1,000; weeding and trimming, 6 dol. 25c. per acre; and gathering the fruit, 6 dol. 25c. per acre. Ten men can gather a thousand bunches per day, prepare them for shipping and get 62½c. a piece for their work. At the end of the first year a thousand plants will yield a thousand bunches, which sell at the plantation at 25c. a piece, producing 250 dol. The following year the yield is double that amount and the expenses less than half, consisting only of weeding and gathering the fruit.

The United States is an important market for Mexico for the exportation of this fruit. New Orleans is very favorable as a port for the entry of bananas. Among the importations of fruit made to the United States during 1893, 5,025,217 bunches entered that port; New York comes next with 4,280,139; Philadelphia follows with 2,121,435; Boston with 1,885,040; Baltimore with 1,180,278; Mobile with 613,444; Savannah with 120,000; and Norfolk with 87,173; making an aggregate of 15,312,726 bunches. The freight to these ports from Vera Cruz and Tampico averages 50c. gold per 100 lbs.

NOTES.

The following information about Mexico is from the *Mexican Financier*:

It is probable that the contract for the city of Zacatecas water-works will be taken by Messrs. S. Pearson and Son, of London. Sir Weetman D. Pearson, the chief of the firm in question, conferred on the subject recently with the Governor of Zacatecas, General Aréchiga, and Mr. Juan Goldman, the present concessionaire.

Mr. R. R. Symon, of London, has obtained a concession for the establishment of a steamship service between the Pacific ports of Mexico, and for the purpose of inaugurating such service at an early date, has purchased the "Diego" from Mr. Joaquín Redo. The Diego will be refitted with new boilers, which Mr. Symon has ordered from England, and will

be re-christened the "Guaymas." Another steamer to be known as the "Manzanillo" has been ordered from England.

Visible progress has been made in the port works of Vera Cruz since the firm of Messrs. Pearson took hold of them, thanks to the competence, of the engineers in charge. Without a doubt the presence of the contractor in person, and the arrival of the full equipment of machinery, will give renewed impetus to the work, and Vera Cruz, which at one time seemed likely to sink to the level of a wretched village, will witness the revival of its prosperity and the opening up of new sources of wealth. And this beneficent transformation will be owing largely to the energy of Mr. Pearson, and of his subordinates.

NICARAGUA.

CONTRACT FOR BUILDING A RAILWAY.

Under date of December 1st, Mr. Walter J. Chambers, Her Majesty's Consul at Grenada, informs the Foreign Office that Mr. F. K. Morris, a resident of the Republic of Nicaragua, of German nationality, has made a contract with the Nicaraguan government for the construction of a railroad from Masaya through the villages of San Juan, Niquinohomo, Masatepe, San Marcos, Jinotepe and Diriamba. The length of the road will be about twenty-six miles.

The contract requires that Mr. Morris shall provide good telephonic communication along the entire route, also necessary stations at the different towns. The gauge of the road will be 2 feet 6 inches (English measure), with a maximum grade of $2\frac{1}{2}$ per cent. All the bridges are to be made of iron, firmly placed on cement columns, sufficiently strong to sustain the weight of two locomotives of twenty tons each.

The rails are to be of steel, weighing 30 pounds to the yard.

A barb-wire fence will be placed on both sides of the track, supported by posts $2\frac{1}{2}$ yards distant and $2\frac{1}{2}$ yards high. The necessary machine shops, forges, iron water tanks sufficiently large to contain 6,000 gallons of water, and an artesian well will be erected in the town of Diriamba.

The work is to be commenced within one month after the contract is signed, and the line finished and opened to the public within two years after the same date. In payment, Mr. Morris will receive 620,000 silver dollars, which will be paid to him in installments of \$18,000 at the end of each month, commencing October 31st, 1895.

PARAGUAY.

SETTLEMENT OF THE FOREIGN DEBT.

A meeting of holders of the foreign debt bonds of Paraguay was held in Antwerp, simultaneously with a similar meeting in London, on the 13th Of February, for the purpose of considering a proposition from the Government of Paraguay for the settlement of the external debt of that country. It is reported that the proposition was unanimously accepted. The basis of the settlement is as follows: The Government will pay from January 1st, 1896, interest at the rate of one per cent. for three years, after which the rate will be increased by one-half per cent. every three years until January 1908, from which time three per cent. will be paid until the extinction of the debt. A sinking fund of one-half per cent. per annum will commence in January 1900. The payment of the debt is guaranteed by setting apart nine and ten cents, (gold) per ten kilos of the export dues on yerba mate.

PERU.

IMPORTATION OF CHILEAN WHEAT.

[From advance sheets of United States Consular Reports for March 1896.]

For the benefit of the wheat growers of our States of the far west, principally, says Consul Jastremski, of Callao, under date of January 18, 1896, I have the honor to call attention to the accompanying statement of the importations of wheat from Chile to the port of Callao during the year ending December 31, 1895. This statement was made in the Callao correspondence of the Lima Comercio, January 10, 1896; Imported by Milne & Co., 115,034 fanegas; Camine & Co., 81,397 fanegas; J. V. Peral, 78,387 fanegas; J. Revoredo, 70,921 fanegas; La Libertard Milling Company, 56,477 fanegas; B. Sesarego, 18,891 fanegas; S. Fernandez & Co., 11,795 fanegas; Ferrari, 6,846 fanegas; J. Bissi & Sons, 5,953 fanegas; B. Baglieto & Co., 4,580 fanegas; A. Musso, 4,710 fanegas; Chiarella & Chiape, 3,258 fanegas; P. Ferrando, 1,255 fanegas; Carbone, 698 fanegas; total, 460,202 fanegas. As a Chilean fanega is equivalent to 2.575 bushels, the above quantity would make 1,185,020 bushels.

The value of this quantity of wheat may be readily calculated.

This wheat was brought to Callao by sailing vessels and by the Chilean and English steamships, which monopolize the coasting trade from Valparaiso to Panama. How much more was brought to the other ports of Peru and Ecuador I am unable to state.

Chilean wheat, though nutritive and sweet, is generally dark brown in color, and unsuited for making white bread or pastry. It cannot bear successful comparison with the white wheats of California and other Western States.

A duty on flour favors its importation and milling in Peru. This, combined with the total lack of steamship transportation from San Francisco and other ports of our west coast with the Pacific coast of South America, save through a prohibitive re-shipment of cargoes at Panama, has effectually shut out American wheat and flour from the probable successful competition that might, under favorable conditions, exist.

Whenever the establishment of an American steamship line between one or more ports of our Pacific coast with Valparaiso and intermediate ports comes to be seriously considered, as it is to be hoped it will soon be, the item of wheat might perhaps enter into the calculations of the cargoes that would go to sustain such a line, as well as to increase the exportations of breadstuffs from the United States.

URUGUAY.

MODIFICATIONS OF TARIFF.

The following important changes in the import duties of Uruguay, taking effect January 11, 1896, have been officially announced.

Tobacco, cigars and cigarettes are subject to the following *specific* duties, including the packages or wrappers :

Havana tobacco, in leaf.....	\$	30	the kilo.
Havana tobacco, cut.....		70	"
Black tobacco, in twist		30	"
Black tobacco, cut		60	"
Tobacco from other parts, excepting Rio Grande and Paraguay,.....		30	"
Tobacco from other parts, excepting Rio Grande and Paraguay, cut		60	"
Tobacco from Paraguay and Rio Grande....		15	"
Havana leaf cigars.		3 00	"
Cigars not from Havana—Italian, Swiss and others.....		1 00	"
All cigarettes.....		2 50	"

From this date the following articles shall pay duties as below, based on their *official valuation* :

Plows and parts thereof... ..	5 per cent.
Wire for fencing and vines, up to No. 14.....	5 "
Glass bottles	15 "
Unmounted boxes	15 "
Undressed hemp and jute.....	5 "
Dynamite.....	20 "
Empty flasks	15 "
Binding thread	5 "

Machinery for industrial establishments, and parts thereof	5 per cent.
Agricultural machinery, and parts thereof.....	5 "
Potash and potassic chlorate, for industries....	5 "
Wicking	10 "
Posts, half-posts and standards for fencing.....	10 "
Common and double soda	5 "

All vegetable oils imported shall pay a uniform and specific duty of 10 cents per kilogramme of net weight.

Additional General Duty.

From this date, and for a term of two years, all importers shall pay an additional extraordinary license (*patente*) of 2½ per cent. on their importations. By importer shall be understood anyone who introduces merchandise or any class of articles into the country. This tax shall be collected fortnightly by the Direction General of Direct Taxes, or by the Departmental Revenue Officers, who shall be supplied by the customs authorities with a statement of the articles imported and the respective importers.

NOTE.—That portion of the modified tariff published above, under the head of Official Valuation, appeared in the January number of the Monthly Bulletin.

URUGUAY.

ALTERACIONES DEL ARANCEL DE ADUANAS.

Varias alteraciones de importancia, algunas de las cuales se han dado á conocer en el anterior Boletín, han sido hechas recientemente en el Arancel de Aduanas de la República del Uruguay. Todas ellas han empezado á regir desde el 11 de Enero de 1896.

Los tabacos torcidos, los cigarrillos y todos los artículos ó artefactos de tabaco están sujetos á derechos específicos, que se calculan, incluyendo las cubiertas de todas clases, del modo siguiente :

	POR KILO.	
	Pesos.	Centavos.
Tabaco en rama de la Habana... .. .		30
Picadura de id		70
Tabaco negro retorcido		30
Picadura de id.....		60
Tabaco en rama de otros países, excepto Rio Grande y Paraguay.....		30
Picadura de id.....		60
Tabaco en rama de Paraguay y Rio Grande...		15
Tabacos ó puros de la Habana	3	00
Tabacos ó puros, no de la Habana sino italianos, suizos ó de otros países.....	1	00
Cigarrillos de todas clases.....	2	50

Los siguientes artículos que hasta la fecha se introducían libres de derechos pagarán ahora, como ya se ha publicado en el anterior Boletín, los siguientes derechos ad valorem.

Arados y sus piezas... .. .	5	por ciento.
Alambre hasta el No. 14.....	5	“
Máquinas de todas clases para propósitos industriales, y sus piezas.....	5	“

Máquinas é instrumentos para la agricultura, y sus piezas.....	5	por ciento.
Brauante ó cordón de atar, para eneuader- nadores y segadores.....	5	"
Cáñamo y yute, en bruto	5	"
Pábilo para velas	5	"
Cajas de madera en piezas.....	25	"
Postes de todas clases para cereas.....	10	"
Botellas vacías	15	"
Clorato de potasa	5	"
Soda simple, ó doble.....	5	"
Dinauuta.....	20	"

Además de lo expuesto, se ha determinado que desde esta fecha y durante el término de 2 años todos los comerciantes importadores satisfagan un derecho adicional de patente equivalente á $2\frac{1}{2}$ por ciento del valor de sus importaciones. Se considerará comerciante importador todo el que introduzca en el país mercancías de cualquiera clase procedentes del extranjero. Esta contribución se recaudará quincenalmente por el Director General de contribuciones directas, ó por los empleados de la renta departamental, á quienes se proveerá por las autoridades de la Aduana con una lista de los artículos importados y de los respectivos importadores.

URUGUAY.

REFORMA NA TARIFA.

As mudanças mais importantes na tarifa são as seguintes, que entrarão em vigor desde o onze de Janeiro de 1896 :

Tabaco, charutos e cigarros ficarão sujeitos aos seguintes direitos especificos :

	Pesos.	Centavos.
Tabaco de Havana em ramakilo.	0	30
O mesmo cortado. "	0	70
Tabaco preto torcido. "	0	30
Tabaco preto cortado. "	0	60
Id. de qualquer proveniencia, com excepção do Rio Grande e Paraguay. "	0	30
Id. cortado. "	0	60
Id. do Paraguay e Rio Grande. "	0	15
Charutos de folha de Havana "	3	00
Charutos de outra proveniencia. "	1	00
Cigarros de toda a proveniencia. "	2	50

Novos Direitos sobre Avaliação Official.

As mercadorias pagarão direitos de importação de :

5%.

Arados e suas partes avulsas.
 Arame para cercas e vinhas, até o n. 14.
 Canhamo e juta em rama.
 Barbante para segadeiras engaveladoras.
 Machinas e machinismos, e suas partes avulsas, para estabelecimentos
 industriaes.
 Machinas agricolas e suas partes avulsas.
 Potassa e chlorato de potassa para a industria.
 Carbonato e bicarbonato de soda.

10%.

Mechas ou pavios.
Postes e estacas para cercas.

15%.

Garrafas de vidro.
Caixas abatidas.
Garrafas ou frascos vazios.

20%.

Dynamite.

Todos os oleos vegetaes pagarão o direito especifico de 10 centavos por kilo, peso liquido.

Desde a data referida e pelo prazo de dous annos, todas as mercadorias que se importarem, ficarão sujeitas ao direito de expediente de $2\frac{1}{2}\%$, o qual será cobrado quinzenalmente aos importadores das mesmas.

NOTA.—A parte do antecedente que se refere aos novos direitos sobre a avaliação official já foi publicada no Boletim de Janeiro; mas, considerando que o mesmo forma parte do total das reformas realizadas na tarifa, julgamos conveniente apresental-a no lugar em que naturalmente cabe.

URUGUAY.

[Report from Senor Prudencio de Murguiondo, Consul-General of the Oriental Republic of Uruguay.]

It gives me pleasure to give you below the volume of business done between the United States and the Oriental Republic of Uruguay for the six months ending 1st of January, 1896, as for the whole year of 1894, showing increase over the business of 1894, which information I will be pleased that you give to the readers of the Bulletin issued by the Bureau.

Value of exportations from the United States from July 1, 1895, to January 1, 1896.....	\$ 906,765 01
Value of importations from Uruguay for the same period..	\$1,968,136 69
Value of exportations from United States from January 1, 1895, to July 1, 1895.....	\$578,297 30
Exportations from July 1, 1895, to January 1, 1896.....	906,765 01
Total exportation for 1895.....	\$1,485,062 31
Importations from Uruguay from January 1, 1895, to July 1, 1895.....	\$1,641,753 00
Importations from Uruguay from July 1, 1895, to January 1, 1896	1,968,136 69
Total importations for 1895.....	\$3,609,889 69
Value of importations to the United States for 1895.....	\$3,609,889 69
Value of exportations to Uruguay.....	1,485,062 31
Importations over exportations for 1895... ..	\$2,124,827 38
Exports from the United States for 1894.....	\$1,374,293 83
“ “ “ 1895.....	1,485,062 31
Increase over year 1894	\$110,769 48
Imports from Uruguay to the United States in 1894.....	\$1,424,295 80
“ “ “ “ 1895.....	3,609,889 69
Increase over year 1894	\$2,185,593 89

The exportations from the following ports were :

	1894.	1895.
New York	\$972,885 00	\$1,140,972 00
Boston	134,732 00	87,522 38
Portland, Me.	89,045 00	54,940 00
Philadelphia		9,000 00
Total	\$1,196,662 00	\$1,292,434 38
		1,196,662 00
Eastern States—increase for 1895		\$95,772 38

	1894.	1895.
From Savannah	\$56,221 35	\$56,715 52
Pascagoula	28,705 48	18,591 45
Mobile	20,394 00	50,551 00
Pensacola	64,250 00	31,100 00
Brunswick	8,105 00	11,111 12
Sabine Pass		24,179 84
Baltimore (via Saltilla River)		379 00
Total	\$177,630 83	\$192,627 93
		177,630 83

Middle and Southern States—

Increase for 1895	\$14,997 10
Increase of exports for 1895 from Eastern States	\$95,772 38
“ “ “ Middle and Southern States	14,997 10
Total increase for 1895	\$110,769 48

The last tables show the change in the volume of business at the different ports and the opening of other shipping points during 1895.

As to the business for 1896 between the two countries, I have reason to believe that both imports and exports will be materially increased. The free entry of wool from Uruguay to the United States has been the cause of the great increase in importations, and manufacturers accept it with an increased demand for our raw products.

I will here state what is not generally known, that large quantities of Uruguayan wool come to this market (United States) that has been bought in Buenos Ayres, and the Argentine Republic gets the credit for it. Shipments are made from Uruguay to Buenos Ayres on a large scale, both of wool and wheat.

THE COFFEE TRADE.

The following statement bearing on the world's production and consumption of coffee is taken from the *American Grocer*, published in the City of New York :

The history of the movement of coffee during the trade year ending June 30, 1895, shows increased deliveries in Europe and the United States over 1894, but for this country not as large as in 1893. The sales on the Coffee Exchange were larger than for the previous year, but still far behind the record several years ago.

The total deliveries of all kinds of coffee in 1894-95, compare with the deliveries of three preceding years as follows :

EUROPE AND UNITED STATES.	
Year.	Bags.
1894-95.....	11,212,851
1893-94.....	10,571,533
1892-93.....	10,946,228
1891-92.....	10,804,451
Total four years.....	43,535,163
Yearly average (640,223 tons).....	10,883,791

The above shows a remarkable steadiness of the consumptive demand. In view of the high cost of the bean, the depression in trade and commerce, the record is a good one. Had prices ruled low and prosperity been the universal experience, there would probably have been a marked increase in deliveries. Possibly the steadiness of deliveries is the precursor of a notable drop in prices as the result of production overlapping consumptive requirements.

The use of substitutes and mixtures has been stimulated by high prices, and this has tended to reduce the use of the pure article.

In Europe the deliveries in 1894-95 show a gain over 1893-94 of 544,217 bags, or 8.6 per cent. They compare with the preceding years as follows :

DELIVERIES IN EUROPE.	
Year.	Bags.
1894-95.....	6,816,905
1893-94.....	6,272,688
1892-93.....	6,547,679
1891-92.....	6,392,719
Total four years.....	26,029,991
Yearly average.....	6,507,498

This is a very flattering record, much more so than that made by the United States, where the deliveries run behind the record 1892-93 and still further behind 1891-92, the year of maximum commercial activity. The deliveries in the United States compare with the three preceding years, as follows:

DELIVERIES IN UNITED STATES.	
Year.	Bags.
1894-95.....	4,395,946
1893-94.....	4,298,845
1892-93.....	4,398,549
1891-92.....	4,411,832
Total, four years.....	17,505,172
Yearly average.....	4,376,293

The above tables confirm the estimate of 11,000,000 bags, or 647,000 tons, as the measure of the world's present requirements. Thus far they have been slightly under the estimates and will probably show little or no increase over the 11,000,000 bags until the crops reach a total export capacity of 12,000,000 bags. In 1892-93, the yield exceeded the estimates of requirements, but in 1894 crops fell far below, recovering in 1895, while for 1896 it is questionable if they will equal the average deliveries of the past four years. The production of the world is estimated by W. Schoeffer & Co., Rotterdam, as follows:

Year.	Bags.
1895-96.....	10,270,000
1894-95.....	11,129,000
1893-94.....	9,202,000

THE BRAZIL CROP.

Brazil continues to hold the key to the situation and therefore unusual interest attaches to the crop reports from that vast Empire:

The receipts of coffee in Rio and Santos, for the years ending June 30, for nine years, compare as follows:

Year.	Rio. Bags.	Santos. Bags.	Total Bags.
1894-95.....	2,706,000	3,989,000	6,695,000
1893-94.....	2,587,000	1,722,000	4,309,000
1892-93.....	2,989,000	3,213,000	6,202,000
1891-92.....	3,722,000	3,675,000	7,397,000
1890-91.....	2,413,000	2,945,000	5,358,000
1889-90.....	2,389,000	1,871,000	4,260,000
1888-89.....	4,189,000	2,638,000	6,827,000
1887-88.....	1,912,000	1,121,000	3,033,000
1886-87.....	3,497,000	2,581,000	6,078,000
Total, nine years ..	26,404,000	23,765,000	50,159,000
Yearly average	2,933,778	2,640,556	2,574,334

The crop receipts of 1894-95 were 2,386,000 bags in excess of the short crop of 1893-94, which followed the big yield of 1892-93 and that in turn the maximum out-turn of 1891-92. It is notable that only once since 1889-90 have the receipts exceeded that year; that the crops are variable in spite of the increased number of trees; that the yearly average for nine years has been passed five years out of nine.

The exports from Rio and Santos for the year ending June 30 and the preceding five years, compare as follows:

		To U. S. Bags.	To Europe. Bags.	Tot. expts. Bags.
1894-95	{ Rio.....	1,816,000	687,000	6,401,000
	{ Santos ..	1,347,000	2,551,000	
1893-94	{ Rio.....	1,641,000	606,000	4,016,000
	{ Santos....	797,000	972,000	
1892-93	{ Rio.....	1,972,000	953,000	6,295,000
	{ Santos.....	1,102,000	2,208,000	
1891-92	{ Rio.....	2,556,000	1,148,000	7,267,000
	{ Santos.....	997,000	2,556,000	
1890-91	{ Rio.....	1,556,000	750,000	5,537,000
	{ Santos.....	798,000	2,253,000	
1889-90	{ Rio.....	1,767,000	724,000	4,570,000
	{ Santos.....	512,000	1,567,000	

The above shows a total export in six years of 34,086,000 bags (2,005,059 tons), or a yearly average of 5,681,000 bags (334,177 tons). The above table shows that of annual average deliveries of 10,883,791 bags (640,223 tons) in four years, Brazil furnished 5,994,750 bags (352,632 tons) yearly average, representing 55.08 per cent. of the world's total deliveries.

Until there is a succession of big crops there can be no return to very low prices. Trade and commerce is improving and likely to increase the requirements of 1895-96, and unless the crops permit of larger exports than are now estimated it is difficult to find a basis upon which to predict lower prices.

Possibly the results of speculation or some great disaster, such as a widespread European war, may upset all calculations, but under normal conditions we look for no marked change in the general position of coffee.

STOCKS.

The total stocks in the United States on July 1, 1895, were 549,015 bags, an increase over July 1, 1894, of 251,885 bags; in Europe, 1,673,655 bags, against 1,284,293 bags July 1, 1894, a gain of 389,372 bags, but a decrease as compared with July 1, 1893, of 216,374 bags.

The total visible supply of the world on July 1, 1895, as reported to the New York Coffee Exchange, was 3,115,680 bags, against 2,146,423 bags July 1, 1894, an excess of 969,257 bags, which is enough to offset the estimated decrease in the Brazil crop of 1895-96 as compared with 1894-95.

THE EXCHANGE MOVEMENT.—1894-1895.

The total sales on the New York Coffee Exchange for 1894-95 were 4,351,000 bags, against 3,963,500 bags in 1893-94, 7,911,500 bags 1892-93, 6,949,000 bags in 1891-92, 7,700,750 bags in 1890-91, and 13,011,500 bags in 1889-90. These figures show a slight increase in transactions and indicate a continued freedom from speculative deals quite in contrast to previous years. The most active month in the year was October; the dullest February. The highest price paid was 15.75 cents in July for that month's delivery; the lowest, 10.45 cents in October for May delivery.

The average monthly price of No. 7 Rio for the trade year ending June 30, 1895, and for the year, was as follows :

1894.	Cents.
July	16.41
August	16.12
September	15.72
October	15.03
November	15.52
December	15.80
1895.	Cents.
January	15.90
February	16.50
March	16.50
April	16.24
May	15.88
June	15.61
Average for the year 1894-95	15.94
Average for the year 1893-94	16.13
Average for the year 1892-93	16.05

The above shows a very steady market for three years; and that is likely to be the record of 1895-96.

LIST OF THE PRESIDENTS OF THE AMERICAN
REPUBLICS.

		Executive Residence.
Argentine Republic	Señor Don José Evaristo Uriburu....	Buenos Aires.
Bolivia.....	Señor Don Mariano Baptista.....	Sucre
Brazil.....	Señor Doctor Don Prudente de Morães	Rio de Janeiro.
Chile.....	Señor Don Jorge Montt.	Santiago.
Colombia.....	Señor Don Miguel Antonio Caro.....	Bogota.
Costa Rica.....	Señor Don Rafael Iglesias.....	San José.
Ecuador.....	Señor General Don Eloy Alfaro	Quito.
Guatemala...	General Don José María Reina Barrios	Guatemala City.
Haiti.....	L. M. F. Hyppolite.....	Port au Prince.
Honduras.....	Señor Don Policarpo Bonilla.	Tegucigalpa.
Mexico	General Don Porfirio Diaz	City of Mexico.
Nicaragua.....	Señor General Don José Santos Zelaya	Managua.
Paraguay.....	General Don Juan B. Egusquiza.....	Asunción.
Peru.....	Señor Don Nicolás de Piérola.....	Lima.
Salvador.....	Don Rafael Antonio Gutierrez	San Salvador.
Santo Domingo	Señor Don Ulises Heureaux	Santo Domingo.
United States	Grover Cleveland.....	Washington, D.C.
Uruguay.....	Señor Don Idiarte Borda.....	Montevideo.
Venezuela.....	General Don Joaquín Crespo.....	Caracas.

UNITED STATES CONSULATES.

Frequent application is made to the Bureau for the address of United States Consuls in the South and Central American Republics. Those desiring to correspond with any consul can do so by addressing "The United States Consulate" at the point named. Letters thus addressed will be delivered to the proper person. It must be understood, however, that it is not the duty of consuls to devote their time to private business, and that all such letters may properly be treated as personal and any labor involved may be subject to charge therefor.

The following is a list of United States Consulates in the different Republics.

ARGENTINE REPUBLIC—

Buenos Aires.
Cordoba.
Rosario.

BOLIVIA—

La Paz.

BRAZIL—

Bahia.
Para.
Pernambuco.
Rio Grande do Sul.
Rio de Janeiro.
Santos.

CHILE—

Antofagasta.
Arica.
Coquimbo.
Iquique.
Talcahuano.
Valparaiso.

COLOMBIA—

Barranquilla.
Bogota.
Cartagena.
Colon (Aspinwall).
Medillin.
Panama.

COSTA RICA—

San José.

DOMINICAN REPUBLIC—

Puerto Plata.
Samana.
Santo Domingo.

ECUADOR—

Guayaquil.
Bahia de Carragues.
Esmeraldas.
Manta.

GUATEMALA—

Guatemala.

UNITED STATES CONSULATES.

HAYTI—

Cape Haitien.
Port au Prince.

HONDURAS—

Ruatan.
Tegucigalpa.

MEXICO—

Acapulco.
Chihuahua.
Durango.
Ensenada.
Guaymas.
La Paz.
Matamoras.
Mazatlan.
Merida.
Mexico.
Nogales.
Nuevo Laredo.
Paso del Norte.
Piedras Negras.
Saltillo.

MEXICO—*Continued.*

Tampico.
Tuxpan.
Vera Cruz.

NICARAGUA—

Managua.
San Juan del Norte.

PARAGUAY—

Asunción.

PERU—

Callao.

SALVADOR—

San Salvador.

URUGUAY—

Colonia.
Montevideo.
Paysandu.

VENEZUELA—

La Guayra.
Maracaibo.
Puerto Cabello.

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11. Import Duties of Costa Rica.....	10
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15. Commercial Directory of Colombia (contained also in Hand-book)	5
16. Commercial Directory of Peru	5
17. Commercial Directory of Chile	5
18. Commercial Directory of Mexico.....	15
19. Commercial Directory of Bolivia, Ecuador, Paraguay and Uru- guay (contained also in Hand-books).	5
20. Import Duties of Nicaragua (contained also in Hand-book).....	10
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23. Import Duties of Salvador (contained also in Hand-book).....	5
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25. Import Duties of Ecuador (contained also in Hand book).....	5
26. Commercial Directory of Argentine Republic (contained also in Hand-book).....	5
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CLINTON FURBISH,
Director.

WASHINGTON, D. C. March 1, 1895.

These publications may be purchased from Rand, McNally & Co., Chicago and New York.

VALUE OF AMERICAN COINS.

The following table shows the value in United States gold, of coins representing the monetary units of the Central and South American republics, and Mexico, estimated quarterly by the Director of the United States mint, in pursuance of act of Congress :

ESTIMATE JANUARY 1, 1896

COUNTRIES.	STANDARD.	UNIT.	VALUE OF U. S. GOLD AND SILVER.	COINS.
ARGENTINE REPUBLIC..	Gold and Silver.	Peso.	0.96,5 (fixed).	{ Gold—Argentine (\$1.82,4) and 1/2 Argentine { Silver—Peso and divisions.
BOLIVIA.....	Silver.	Boliviano.	0.49,1.	Silver—Boliviano and divisions.
BRAZIL.....	Gold.	Milreals.	0.54,6 (fixed).	{ Gold—5, 10 and 20 milreals. { Silver—1/2, 1 and 2 milreals.
CENTRAL AMERICA.....	Silver.	Peso.	0.49,1.	{ Gold—Onza and divisions. { Silver—Peso and divisions.
CHILE.....	Gold and Silver.	Peso.	0.91,2 (fixed).	{ Gold—Escudo (\$1.82,4), doubloon (\$4.56), { condor, (\$9.12,3) { Silver—Peso and divisions.
COLOMBIA.....	Silver.	Peso.	0.49,1.	{ Gold—Condor (\$9.64,7), double condor. { Silver—Peso and divisions.
CUBA.....	Gold and Silver.	Peso.	0.92,6 (fixed).	{ Gold—Doubloon (\$5.01,7). { Silver—Peso.
ECUADOR.....	Silver.	Sucre.	0.49,1.	{ Gold—Condor (\$9.64,7) and divisions. { Silver—Sucre and divisions.
MEXICO.....	Silver.	Dollar	0.53,3.	{ Gold—Dollar (\$0.98,3), 2 1/2, 5, 10 and 20 dols. { Silver—Dollar (or peso) and divisions.
HAITI.....	Gold and Silver.	Gourde.	0.96,5.	Silver—Gourde.
PERU.....	Silver.	Sol.	0.49,1.	Silver—Sol and divisions.
VENEZUELA.....	Gold and Silver.	Bolivar.	0.19,3 (fixed).	{ Gold—5, 10, 20, 50 and 100 bolivars. { Silver—5 bolivars.

Uruguay has the gold standard without a gold currency. One million dollars in silver of various denominations were coined two years ago.

VALUE OF AMERICAN COINS.

and \$1,000,000 more are now being issued. This currency is accepted as legal tender.

Paraguay has no gold or silver coins of its own stamping. The silver peso of other South American republics circulates there, and has the same value as in the countries that issue them.

WEIGHTS AND MEASURES.

The following table gives the chief weights and measures in commercial use in Mexico and the republics of Central and South America, and their equivalents in the United States:

DENOMINATION.	WHERE USED.	U. S. EQUIVALENTS.
Arc	Metric.....	0.02471 acre.
Aroba.....	Paraguay.....	25 pounds.
Arroba (dry).....	Argentine Republic.....	25.3175 pounds.
do	Brazil.....	32.38 pounds.
do	Cuba.....	25.3664 pounds.
do	Venezuela.....	25.4024 pounds.
Arroba (liquid).....	Cuba and Venezuela.....	4.263 gallons.
Barril.....	Argentine Republic and Mexico..	20.0787 gallons.
Canja.....	Mexico and Salvador.....	300 pounds.
Centavo.....	Central America.....	4.2631 gallons.
Cuadra.....	Argentine Republic.....	4.2 acres.
do	Paraguay.....	79.9 yards.
do	Paraguay (square).....	8.077 square feet.
do	Uruguay.....	2 acres (nearly).
Cubic Meter.....	Metric.....	35.3 cubic feet.
Fanega (dry).....	Central America.....	1.5745 bushels.
do	Chile.....	2.575 bushels.
do	Cuba.....	1.599 bushels.
do	Mexico.....	1.54728 bushels.
do	Uruguay (double).....	7.776 bushels.
do	Uruguay (single).....	3.888 bushels.
do	Venezuela.....	1.599 bushels.
Frasco.....	Argentine Republic.....	2.5096 quarts.
do	Mexico.....	2.5 quarts.
Gram.....	Metric.....	15.432 grains.
Hectare.....	do	2.471 acres.
Hectoliter (dry).....	do	2.838 bushels.
do (liquid).....	do	26.417 gallons.
Kilogram (kilo).....	do	2.2046 pounds.
Kilometer.....	do	0.621376 mile.
League (land).....	Paraguay.....	4.633 acres.
Libra.....	Argentine Republic.....	1.0127 pounds.
do	Central America.....	1.043 pounds.
do	Chile.....	1.014 pounds.
do	Cuba.....	1.0161 pounds.
do	Mexico.....	1.01465 pounds.
do	Peru.....	1.0143 pounds.
do	Uruguay.....	1.0143 pounds.
do	Venezuela.....	1.0161 pounds.
Liter.....	Metric.....	1.0567 quarts.
Livre.....	Guiana.....	1.0791 pounds.
Mauzana.....	Costa Rica.....	1.5-6 acres.

WEIGHTS AND MEASURES.

DENOMINATION.	WHERE USED.	U. S. EQUIVALENTS.
Marc	Bolivia.....	0.507 pounds.
Meter	Metric.....	39.37 inches.
Pie	Argentine Republic.....	0.9478 foot.
Quintal	do do	101.43 pounds.
do	Brazil.....	130.06 pounds.
do	Chile, Mexico and Peru.....	101.61 pounds.
do	Paraguay.....	100 pounds.
do	Metric.....	220.46 pounds.
Suerte.....	Uruguay	2,700 Cuadras (see cuadro).
Vara	Argentine Republic.....	34.1298 inches.
do	Central America.....	38.874 inches.
do	Chile and Peru	33.267 inches.
do	Cuba.....	33.384 inches.
do	Mexico.....	33 inches.
do	Paraguay.....	34 inches.
do	Venezuela.....	33.384 inches.

METRIC WEIGHTS AND MEASURES.

METRIC WEIGHTS.

- Milligram (1/1000 gram) equals 0.0154 grain.
- Centigram (1/100 gram) equals 0.1543 grain.
- Decigram (1/10 gram) equals 1.5432 grains.
- Gram equals 15.432 grains.
- Decagram (10 grams) equals 0.3527 ounce.
- Hectogram (100 grams) equals 3.5274 ounces.
- Kilogram (1,000 grams) equals 2.2046 pounds.
- Myriagram (10,000 grams) equals 22.046 pounds.
- Quintal (100,000 grams) equals 220.46 pounds.
- Millier or tonne—ton (1,000,000 grams) equals 2,204.6 pounds.

METRIC DRY MEASURE.

- Millimeter (1/1000 liter) equals 0.061 cubic inch.
- Centiliter (1/100 liter) equals 0.6102 cubic inch.
- Deciliter (1/10 liter) equals 6.1022 cubic inches.
- Liter equals 0.908 quart.
- Decaliter (10 liters) equals 9.08 quarts.
- Hectoliter (100 liters) equals 2.538 bushels.
- Kiloliter (1,000 liters) equals 1.308 cubic yards.

METRIC LIQUID MEASURE.

- Millimeter (1/1000 liter) equals 0.27 fluid ounce.
- Centiliter (1/100 liter) equals 0.338 fluid ounce.
- Deciliter (1/10 liter) equals 0.845 gill.
- Liter equals 1.0567 quarts.

METRIC WEIGHTS AND MEASURES.

Decaliter (10 liters) equals 2.6417 gallons.
Hectoliter (100 liters) equals 26.417 gallons.
Kiloliter (1000 liters) equals 264.17 gallons.

METRIC MEASURES OF LENGTH.

Millimeter (1/1000 meter) equals 0.0394 inch.
Centimeter (1/100 meter) equals 0.3937 inch.
Decimeter (1/10 meter) equals 3.937 inches.
Meter equals 39.37 inches.
Decameter (10 meters) equals 393.7 inches.
Hectometer (100 meters) equals 328 feet 1 inch.
Kilometer (1,000 meters) equals 0.62137 mile (3,280 feet 10 inches).
Myriameter (10,000 meters) equals 6.2137 miles.

METRIC SURFACE MEASURE.

Centare (1 square meter) equals 1,550 square inches.
Are (100 square meters) 119.6 square yards.
Hectare (10,000 square meters) equals 2,471 acres.

The metric system has been adopted by the following named countries: Argentine Republic, Bolivia, Brazil, Chile, Costa Rica, Ecuador, Mexico, United States of America, United States of Colombia and Venezuela.



