

A FRUIT INDUSTRY FOR THE GOLD COAST*

THE GOLD COAST CLIMATE

THE Gold Coast is situated wholly within the torrid zone and has a mean annual rainfall between 24 inches in the coastal savannah and 88 inches in the rain forest. There is a marked double rainy season.

The mean annual shade minimum temperature in the coastal savannah lies between 71 and 75 degrees, the mean annual shade maximum for the same type of country being 83°-87°. In the rain forest mean shade minimum falls between 67° and 71° with a mean maximum of 83°-89°.

The mean temperature range in the inland savannah is generally greater, reaching 26° in some districts.

The mean annual relative humidity lies between 71 and 88 per cent. with a very marked drop to as low as 20 per cent. in the Harmattan season, during December and February.

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An industry in the fruit mentioned is limited at the present time to *Lemons* and *Grape Fruit*, these crops being easily cultivated and handled. The most important factor however is that the fruit would be easily marketable in the United Kingdom as compared to other fruits, which would have to meet severe competition from other countries.

COMMENCING THE INDUSTRY

The industry being a specialised one, where care is required in cultivation, selection of varieties, weeding, mulching, pruning, reaping, handling, grading, packing and shipment, it is obvious it would be useless to attempt the cultivation of either lemons or grape fruit in the same manner as cacao is cultivated by the majority of the farmers at the present time. A number of individually owned plantations with a central packing house, or plantations commenced on a bonus system, as has been done with coffee in this Colony, even with co-operative management, would be doomed to failure from the commencement.

The trees have to be grown on plantation principles and receive care and attention throughout the whole period from seedlings to old age, and the fruit "picked." No fruit of any description is picked in this country and even on Agricultural Stations, unless supervised by a European, the method of collecting is by beating or shaking the branches and allowing the fruit to fall to the ground.

Having regard to the primitive methods of Agriculture in force at present and to the temperament of the African, the industry would have to be commenced and managed by Government, unless a European firm or company with a knowledge of, or interest in, the fruit industry, could be induced to obtain a concession for the purpose.

RAINFALL, SITUATION, SOIL

(a) *Grape Fruit*.—In the United States the trees are grown in many districts on every sandy soil with very low rainfall which requires irrigation. Large and good crops are produced under these conditions but insect pests cause a considerable amount of damage and production costs are relatively high.

* By G. H. Eady, (Gold Coast) in *Bulletin* No. 20 of the Department of Agriculture, Gold Coast.

At Aburi with a rainfall of 48 inches good crops are produced but in general a rainfall of under 50 inches is undesirable. In the West Indies grape fruit cultivation is successful in a high rainfall area of 250 inches per annum. A district with a rainfall of over 50 inches should be chosen and this should be fairly evenly distributed.

A site near a motor road or railway is an obvious advantage, other conditions being suitable, and should be chosen with due regard to the soil and rainfall conditions necessary. Flat land is suitable provided it is well drained but land with a moderate slope is preferable.

The best soils are deep loams, fertile, and well drained. Shallow, heavy, poorly drained soils are unsuitable and clay soil should be avoided. Trees on good fertile soil will produce heavy crops without the use of irrigation or artificial manures and production costs will be at a minimum. Many suitable situations exist in the Gold Coast.

(b) *Lemons*.—At Aburi, elevation 1,500 feet, rainfall 48 inches, the trees grow well and produce fairly good crops on very poor soil. The tree requires practically similar conditions of rainfall situation and soil, as the orange. The tree luxuriates in the tropics, grows well in the sub-tropics and will endure the mild frosts of the South of France. A rainfall above 50 inches is advisable, although in well-watered districts the trees will probably fruit well on less than this. A very humid atmosphere is detrimental to the production of good fruit, whilst a short resting period, such as is encountered during the Harmattan season, would be distinctly beneficial.

Conditions as to suitable situations are the same as required for grape fruit. The higher elevations up to 4,000 feet are preferable but unobtainable in this country. Strong winds are a disadvantage and strong sea breezes definitely harmful.

The type of soil in which lemons luxuriate is of a light rich nature on a marly or limestone formation, but the tree does well on any good rich soil such as may be found in many places in the Western Province of the Colony in well-watered areas.

SUPPLY OF PLANTS AND PLANTING MATERIAL

(a) *Grape Fruit*.—The most desirable characteristics are, thinness of skin, fine texture, yet strong enough to stand up to the handling and travelling necessary, smoothness, good and even colour without roughness or corrugations, and fruit of good shape. A minimum of seeds, pith and rag, is desirable, but sweetness is of little importance, providing the fruit possesses high juice content with a brisk and distinct flavour and is free from bitterness and too much acidity.

Certain trees at Aburi and on other Agricultural Stations possess these characteristics and large numbers of seedlings could be raised by budding on to sour orange stocks. "Marsh's Seedling," "Duncan," "Excelsior," "Hall," "McCarty," and "Triumph," varieties are being imported by the Department and budded plants could be raised from these.

(b) *Lemons*.—The chief characteristics desirable are good colour, smooth, even, thin yet tough skin and a brisk and distinct flavour. Fruit approximating to these desiderata exist at Aburi and on other stations. Large numbers of budded seedlings could be raised on sour orange stocks or from seed if necessary. The Department is importing the following varieties from all of which budwood would be available within a few years: "Eureka," "Lisbon," "Villafranca," "Genoa," "Spanish."

NURSERY AND SEEDLINGS

(a) *Grape Fruit*: (b) *Lemons*.—Numbers of grape fruit and sweet orange trees in this country are destroyed by gummosis of the collar and stem for which reason a resistant stock is essential. The sour or Seville

orange is resistant or nearly so; and possesses certain other desirable characteristics of value. The first, or one of the first, operations after acquiring the land chosen for the plantation would be the selection of a site suitable for nursery. The seedbed need not be raised from the ground unless local conditions require such practice and seed from healthy, vigorous, well-grown trees obtained, preferably from only one tree. When the seedlings are about 8 inches high they should be transplanted into the nursery, 15 inches apart and 3 feet between the rows, taking care to discard all small, weak and diseased plants and those with deformed roots.

Budding may be undertaken whenever the seedlings are large enough and preferably about 10-12 inches from the ground, otherwise the stem may develop gummosis or collar rot. Small and backward seedlings should be destroyed. The usual practice should be followed in this operation which presents no real difficulties in this country. Budwood should only be cut from trees known to produce the right type of fruit in abundance and only from such trees as show the least tendency to single limb mutation.

Budwood may be kept for some time under suitable conditions transported to the nursery by the most direct route, or alternatively, seedling stocks could be raised and budded in the vicinity of the parent trees and the budded plants transported to the plantation.

PLANTING

(a) *Grape Fruit*.—All natural growth should be removed from the selected area and holes dug 25 feet by 25 feet apart each way. When removing plants from the nursery to the plantation all weak trees should be discarded as they are inferior to the well-grown ones and will always remain so. Young plants should each be provided with a stake to which they must be tied to encourage straight stems.

The actual planting operation would naturally follow the standard practice and needs no description here.

(b) *Lemons*.—A planting distance of 20 feet by 20 feet is recommended which gives 109 plants to an acre. A greater or lesser distance may be necessary according to the type of soil otherwise the procedure would be the same as given under grape fruit.

CARE OF THE YOUNG PLANTATION

(a) *Grape Fruit and* (b) *Lemons*.—Until such time as the trees come into good bearing the young trees require continual attention. Vacancies should be filled as soon as they occur in order to obtain trees of uniform growth.

Clean weeding is not recommended except for an area extending for three feet either side of each tree. Weeds and bush may be cutlassed when necessary and the trees mulched with the weeds cut from the centre of the rows. Pruning should be confined to removing branches and suckers that arise from undesirable positions and crossed branches, the object being to produce well-balanced trees with fairly open centres.

Whilst the grape fruit and orange require only a minimum amount of pruning the lemon tree demands almost constant attention. The tree should be regularly pinched back and built up wholly of short stocky branches strong enough to bear a heavy load. The tree should not be allowed to grow more than 8 feet to 10 feet high and all suckers and vigorous shoots removed as occasion demands.

CULTIVATION

With a medium rainfall, clean weeding of young grape fruit or lemon plantation is not recommended since the valuable surface soil would be lost by erosion and humus content quickly destroyed, apart from the damage to the feeding roots which lie close to the surface.

Cover crops should be encouraged whenever possible.

The addition of fertilisers will probably be necessary when the trees commence to bear but, provided good crops are produced, may not be required.

PROBABLE YIELD

(a) *Grape Fruit*.—Trees in full bearing are capable of yielding 500 fruits per tree.

A yield of 20,000 fruits per acre is within the limits of a healthy plantation.

Records of the individual yields of trees both at Tarkwa and Aburi, where the soil is very poor, average 300 fruits per tree over a period of several years. In this country there is a double fruiting season extending from March to June and September to December, the greatest proportion of fruit being produced during the earlier season.

(b) *Lemons*.—The fruiting season is much more irregular than with other citrus fruit, being produced in this country throughout the greater portion of the year. Pruning is an important operation in relation to production but if properly carried out good trees will yield 400-500 fruits per tree or 40,000 per acre per annum.

PICKING

(a) *Grape Fruit*.—This operation is as important as the actual production of the fruit and should receive very great care. Fruit must not be dropped or bruised or suffer mechanical damage whatsoever; otherwise a large percentage will be decayed before reaching distant markets.

Pickers, in addition to being taught that extreme care is necessary in handling the fruit, should wear gloves to avoid finger nail marks. Other points requiring attention are (a) The use of a type of clipper that will not injure the fruit. (b) Containers must be free from roughness, sand splinters, or any material likely to damage the fruit. (c) The stem must be cut flush with the button and no portion allowed to project beyond the fruit otherwise punctures will occur. (d) Fruit must not be piled over 12 inches deep. (e) Fruit must not be picked when wet or during wet weather. (f) Fruit must not suffer from prolonged exposure to the sun. (g) Fruit should be fully mature before being picked and of a degree of ripeness that by the time they reach the consumer they are fully ripe and of a pale lemon yellow colour.

(b) *Lemons*.—The same care in handling, prevention of damage, and mechanical injury is required as with grape fruit but the fruit must be picked in a green or semi-ripe condition and artificially coloured. At Aburi the fruits do not ripen uniformly and attain a good colour if left on the trees and it is safe to assume that they would not do so when grown on a large scale in other parts of the Colony. Artificial ripening also allows fruits to be picked when of uniform size, stored for several months and placed on the market when prices are most favourable.

GRADING AND PACKING

(a) *Grape Fruit*.—Cases recommended are of the same type as those used in South Africa, the inside measurement being, length 23 inches, breadth $11\frac{1}{2}$ inches, depth $11\frac{1}{2}$ inches with a central division across the breadth. These could be manufactured locally providing suitable timber was available or shipped out in shooks made of Swedish white wood. The use of standard cases is essential.

Fruit must be entirely free from surface marking of any description and each fruit must be wrapped in tissue paper. Cases should be packed to counts of 64, 70, 80 and 96 fruits and stencilled accordingly. The fruits should be firmly packed but not so tight as to cause the wood of the case to cut into the fruit.

(b) *Lemons*.—Standard cases should be used, each fruit separately wrapped in tissue paper and packed to a count of 300 per crate, the same general care being required as for grape fruit.

Artificial colouring may be effected by exposing the green fruit to carbon dioxide and carbon monoxide gas in a humid atmosphere of 90°. The process occupies about six days.

The following method in use in New South Wales is taken from a description of the process adopted by the Department of Agriculture in that country.

The actual operation was conducted thus :

The fruit just picked into "lug" boxes was stacked on pieces of wood battens resting on an earth floor. The head of boxes was then covered with a heavy canvas cover, thus enclosing the stack of fruit in practically an airtight condition. An oil engine of 2 P.H. attached to a motor spray machine was used from which the exhaust gases were conducted by a pipe sufficiently long to prevent the temperature of the fruit rising above 75°F. (piping 12 feet long was necessary).

The engine was run intermittently for five days. The actual engine running time was 61 hours, but probably the colouring could be accomplished with less engine running. The cost of oil and benzine for each experiment was 15s. 8d., and up to 97 bushels of fruit were treated at one time. It is believed that the exhaust gases were ample for treating at least three times that quantity of fruit.

In addition to keeping the temperature around 75° it is important to maintain a humidity of not less than 80%. This was accomplished by spraying water on to the ground beneath the boxes when humidity showed a declining tendency.

SHIPMENT

The Gold Coast is in direct shipping communication with England, the voyage taking 13 days.

With careful handling and packing, it is not essential that grape fruit and lemons for the English market should be refrigerated in transit. Messrs. Elder Dempster's steamers have cool room stowage available which it would be necessary to use if other stowage was not available. With a progressive firm like Messrs. Elder Dempster & Co., however, it is fairly safe to assume that shipping difficulties, should they arise, would be solved even to the extent of running special steamers if and when the industry should warrant such provision.

MARKETING

The geographical position of the Gold Coast is such as to make it compare favourably with other Colonies interested in citrus culture, since its only competitor of any importance at present would be South Africa, whose fruits take practically a week longer to reach the market than would fruit from the Gold Coast. It must, however, be remembered, that Sierra Leone are very seriously considering the citrus fruit market and in the case of this trade developing they will be able to get their fruit over in three or four days' less time

Detailed arrangements as to marketing the fruit would have to be made beforehand with wholesale fruit salesmen such as Messrs. Broome and Green, Messrs. J. and H. Godwin & Co., or other prominent firms. It would be advisable to mark on each crate, before shipment the nature of the contents and number of fruit per case.

COSTS

(a) *From Seedling to Bearing Trees.*—Assuming 20 acres of land is planted to commence with, the cost of bringing the plantation into bearing would approximate to the following:

			£	s.	d.
Cost of trees	...	...	35	0	0
Clearing	...	...	150	0	0
Planting	...	...	3	0	0
Pruning, etc.	5	0	0
Treating diseases	5	0	0
Cutlassing, weeding	250	0	0
Mulching, etc.	50	0	0
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			£498	0	0

The cost of bringing an acre of grape fruit to the bearing stage should not cost more than £25 per acre in this country. In the case of lemons this cost would be slightly greater on account of the extra number of trees required and a greater expenditure on pruning. This should not, however, exceed £30 per acre.

(b) *Maintenance Costs after Maturity per acre per Annum:*

	Grape Fruit			Lemons			
	£	s.	d.	£	s.	d.	
Pruning	...	1	0	0	2	0	0
Cultivation	...	3	0	0	3	0	0
Treating, diseases, etc.	...	1	10	0	1	10	0
Fertilisers	...	6	0	0	6	0	0
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Per acre per annum	£11	10	0	£12	10	0	

(c) *Estimated Cost of Landing Fruit in England per Case:*

	Grape Fruit (per box of 60)			Lemons (per box of 300)			
	£	s.	d.	£	s.	d.	
Cost of Production	...	0	0	6	0	0	9
Picking	...	0	0	2	0	1	0
Packing and material	...	0	0	3	0	0	5
Cases	...	0	0	6	0	0	6
Transport	...	0	0	6	0	0	6
Freight to England	...	0	3	0	0	3	0
Commission, United Kingdom charges, etc.	...	0	2	0	0	2	0
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	£0	6	11	£0	8	2	

A yield of 363 boxes of grape fruit, containing an average of 77 fruits should be obtained per acre and 133 boxes containing 300 fruits in the case of lemons.

WHOLESALE PRICES IN THE UNITED KINGDOM

(a) *Grape Fruit.*—An examination of the wholesale prices of grape fruit in the United Kingdom reveals very considerable fluctuations not only from one part of the year to the other, but even in any one month. There are naturally also the ordinary variations in prices on any one date due to differences in quality and picking.

As an illustration, Jamaican grape fruit may be taken. At Liverpool during the past 12 months, according to the market report of a well-known firm of fruit merchants, the price of this fruit has fluctuated between 10s. 9d. and 17s. in November, and 31s. 6d. and 46s. in September.

Another striking case is that of Florida grape fruit where quotations have varied between 12s. to 19s. 3d. and 26s. to 40s. which was obtained in May.

The highest prices were, however, obtained by Porto Rican grape fruit, the best qualities of which reached 47s. to 48s. and 44s. to 49s. in September.

South African grape fruit were available in July and August, but did not attain very high prices, ranging between 9s. 6d. and 18s. 9d. with one solitary quotation—the last of the season—of 25s.

Similar fluctuations were noted in the wholesale prices of grape fruit in London as given by a large firm of wholesale fruit merchants.

Isle of Pine grape fruit varied in price between 17s. to 25s. Florida between 19s. to 30s. 6d. and Jamaican between 12s. and 23s.

(b) *Lemons*.—No wholesale prices are available but as the retail price for good fruit is never less than 2d. and frequently much more this may be taken as varying between 20s. and 30s. per box.

ESTIMATED NETT REVENUE PER ACRE

(a) *Grape Fruit*.—With a wholesale price as low as 10s. per case, a nett profit per acre of £55 would be obtained. Even assuming the yield was only 200 fruits per tree and the wholesale price 10s. per case, a nett profit of £27 would be received. The greatest possible nett profit from an acre of cacao could not exceed £10 per acre, so it is evident grape fruit culture in this country would be a highly remunerative undertaking.

(b) *Lemons*.—The nett profit per acre from lemon trees grown on good soil and in full bearing exceed the figures quoted above and even with a yield less than half that estimated, and double the production costs, a very handsome profit would be available.

INCREASED DEMANDS IN GREAT BRITAIN FOR GRAPE FRUIT

The steady increase in the demand for grape fruit has provided the trade with one of its most interesting features of recent years, and there is every indication that the time is not far distant when grape fruit will rank with apple, orange, banana and grape as being among the most popular fruits handled by our industry. This consistent and increasing demand will undoubtedly be helped by the fact that the grape fruit furnishes yet another instance of a fruit that is available to the trade from one year's end to another, since no sooner is the crop at one source of supply exhausted than the sequence of supply is taken up by some other grape fruit producing area. American grape fruit provides the British market with the bulk of its requirements at present, and it is interesting to note that imports of American grape fruit into the United Kingdom during 1926 amounted to the record figure of 25,939 cases.

The other principal sources of supply are South Africa and British West Indies, and in each of these cases the trade has grown rapidly in the past six years, but the increase in the proportion supplied by the United States has been by far the greatest. Statistics indicate that three-fourths of the grape fruit imports now are supplied by the United States. Some of these imports, however, consist of fruits from the Isle of Pines shipped *via* New

York. Grape fruit has first appeared as a separate item in the United Kingdom Trade Statistics in 1920, when 21,974 boxes of 70 pounds each were imported. The United States that year supplied 58·3% of the total. British imports in 1927, the last year for which detailed statistics are available, amounted to 606,468 boxes, of which 74·6% was accredited to the United States.

While the bulk of the American exports is shipped during the six months February to July, exports are maintained on a substantial level throughout the year. South African and West Indian supplies in the British Market are, in a sense, complementary to each other. Thus South African grape fruit is available principally from June to September and West Indian supplies largely from December to April.

Although the consumption of grape fruit in Great Britain has grown very rapidly in recent years, the quantities consumed per head of the population are still very small, as indicated by the fact that during the past five years the *per capita* consumption of grape fruit has been only ·2 of a pound.

Imports of Grape Fruit into the United Kingdom

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

FACTORS AFFECTING GRAPE FRUIT INDUSTRY

During the past eight years the world's production of grape fruit has increased rapidly and a further large increase may be expected. Taking the import figures into consideration it appears to be inadvisable to carry out further expansion. The production and delivered costs must, however, be taken into consideration. The West Indies cannot land and sell grape fruit in the United Kingdom at less than 30s. 6d. per box, California and Texas 18s. per box, Florida, the Isle of Pines and Porto Rico 16s. per box. Landed costs of Gold Coast fruits should be considerably below any of these figures which places the Gold Coast produce in a distinctly advantageous position. Should the supply at any time exceed the demand the country which can produce good quality fruit at a lower price than any of its competitors is justified in continuing its existing industry or commencing one.

The factor of lower production and landing costs loses its importance unless fruit of good quality and uniformity can be produced since the public will always pay more for a high grade product irrespective of its origin.

There appears to be no reason why the Gold Coast cannot produce fruit equal to that of anywhere in the world. If it can do so, and at the same time keep production and landing costs below that of other countries, it is in a distinctly advantageous position.