THE CITRUS INDUSTRY OF THE STANN CREEK VALLEY, BRITISH HONDURAS

Thesis for the Degree of M. A.
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MICHAEL G. WHITE
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ABSTRACT

THE CITRUS INDUSTRY OF THE
STANN CREEK VALLEY,
BRITISH HONDURAS

by Michael G. White

This thesis constitutes a survey and analysis of the citrus industry of the Stann Creek Valley, British Honduras. The Stann Creek Valley has been the center of British Honduras citrus production since 1913 and will probably retain this position in future years. Now responsible for 90 per cent of the citrus production, and for the entire export of processed citrus products, this valley has become the second most important agricultural region of British Honduras. Its production therefore affects both the local and colony-wide economy. Since the total budget of British Honduras is approximately BH $20 million, and revenue from the export of citrus products averages $4 million, the citrus industry is a significant element in the government's attempt to balance trade and the economy.

Citrus producers in the valley total 125 and can be classified into two types: "commercial" (large-scale) and "subsistence" (small-scale). Seventy acres of citrus is currently the minimum requirement for profitable citrus

production. Therefore, only five of the growers can be considered "commercial" producers, in that citrus is produced at a profit. The remaining 120 growers are "subsistence" producers, since they normally produce citrus at little or no profit, and this as a secondary occupation. While the growers are aware of modern agricultural methods, usually these techniques are not utilized because they are considered too costly to permit a profit from citrus cultivation.

Two foreign-owned enterprises, with different end products, have been established in the valley to process the citrus fruit. In addition, both companies possess large amounts of citrus acreage of their own. The British Honduras Fruit Company is a subsidiary of Salada Foods, Inc., of Toronto, Ontario, and the Citrus Company of British Honduras is owned by the Sharp interests of Jamaica. Utilizing the most advanced processing technology, the plant of the British Honduras Fruit Company, constructed and placed in operation in the 1962-63 agricultural season, produces solely frozen orange concentrate. The Citrus Company was established at its present location in 1948 and employs the technology of twenty years ago in its production of canned grapefruit segments, citrus juices, and concentrates.

The two processing companies serve different markets but face similar marketing problems. The British Honduras

Fruit Company ships to North American consumers, whereas the United Kingdom is the principal destination for Citrus Company products. Because the Stann Creek Valley is a high-cost producer, both companies have difficulty in selling their products in foreign markets that are open to competition from other citrus producing countries. The lack of regular shipping schedules forces the construction and maintenance of storage facilities by the companies. Lacking a deep-water port and adequate loading facilities, the trans-Atlantic ships of the Citrus Company must anchor nearly one mile offshore and load by a lightering system, using costly hand labor. The British Honduras Fruit Company, which uses shallow-draft, refrigerated ships that can dock at the Commerce Bight pier, is saved this added cost. The citrus industry of Stann Creek would benefit greatly from a deep-water port facility and guaranteed foreign markets.

Although numerous physical, social, and economic problems exist in the citrus industry, the development potential of the Stann Creek Valley is significant. A major conclusion of this thesis is that acreage in citrus orchards within the valley could approximately double, but economic problems, especially the high cost of pest and disease control and low citrus prices, discourage the adoption of scientific horticultural techniques and large-scale foreign investment. In other words, the future for the

citrus industry in the valley does not appear promising, despite an apparent potential, and the industry is now in an almost static condition. The utilization of modern techniques, the assurance of higher citrus prices, the control of pests and diseases, the initiation of adequate government aid programs, and the establishment of some form of economic tie with other countries are prerequisites for the further expansion of the citrus industry in the Stann Creek Valley.

THE CITRUS INDUSTRY OF THE STANN CREEK VALLEY, BRITISH HONDURAS

By

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1968

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PREFACE

This study is an evaluation of the status and potential of the citrus industry of the Stann Creek Valley of British Honduras. It is a result of the author's interest in Latin America and concern for this last vestige of British colonialism on the mainland of the Americas. Since the official governmental emphasis in British Honduras is upon agricultural development, the study should be useful as an appraisal of one of the colony's principal crops and its potential for future development.

Data for the study has been derived from personal interviews, observation, and library research. The maps are based in part upon those produced by the British Honduras Land Use Survey Team, in 1959, and topographic-cadastral maps of the Stann Creek Valley, published in 1966. Field research was conducted during the period from December, 1967, to February, 1968.

Appreciation is hereby expressed to the many persons who rendered assistance and cooperation during the gathering of materials for this study. I am particularly indebted to the following persons, agencies, and libraries: the staff of the Reference Division of the Michigan State

University Library; the staff of the Library of British Honduras; Mr. Eric W. King, Chief Agricultural Officer of British Honduras; Mr. Albert Grant, Chief Draftsman of the Land Survey Department of British Honduras; Mr. Eustace Bradley, Chief Forestry Officer of Stann Creek District; Mr. Richard N. Wedderburn, Agronomist, Caribbean Citrus Research Unit, British Honduras; and the staff of the District Agricultural Station in Stann Creek. Mr. Eugene Ysaquiree, of Belize City, deserves special mention for his aid to the author in the field research.

Throughout the preparation of this thesis, several professors and graduate students in the Geography Department of Michigan State University gave both aid and encouragement. I am especially grateful to my thesis advisor, Dr. Clarence W. Minkel, and to Dr. Paul C. Morrison, second reader, for their constructive criticisms and suggestions.

Finally, I am deeply grateful to my wife, Marilyn, whose devotion and assistance made possible the field research and preparation of this thesis, and to my parents, whose personal sacrifices and assistance made possible a college education.

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INTRODUCTION

Forestry has traditionally dominated the economy of British Honduras. It formed the basis of the colony's development from the first settlement in the seventeenth century until 1959, during which time logwood and other forest products accounted for approximately 80 per cent of the total domestic revenue. Forest exploitation formed the raison d'etre of British Honduras, and it provided sufficient exports to make practical the importation of essentially all necessities.[1]

Since 1955, the value of forest products has decreased rapidly. This is evidenced by a reduction of their share of the total exports, from 76 per cent in 1955 to less than 50 per cent in 1959. The decline of the forest industry has been due largely to uncontrolled cutting, which drastically reduced the number of trees suitable for exploitation, and the lack of reforestation programs or long-term efforts in forest management. Hurricane Hattie,

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[1]D. A. G. Waddell, British Honduras, A Historical and Contemporary Survey (London: Oxford University Press, 1961), p. 102.

in 1961, with its destruction of the few large remaining forests in accessible areas, emphasized the fact that British Honduras must now search for other economic resources.

With independence anticipated, the primary problem for British Honduras is the development of a viable economy. To reduce imports and increase exports, to promote tourism, and to significantly enlarge the industrial sector of the economy are goals the government of British Honduras hopes to attain. In other words, to minimize economic dependence upon Great Britain or the United States, British Honduras must produce Belizean[2] products to be marketed both at home and abroad.

An expansion of agriculture is seen as the primary answer to a decreased importance of the forest industry. The agricultural potential of British Honduras has long been recognized as substantial, and farm production has now supplanted forestry as the largest single contributor to the colony's economy. British Honduras ". . . may be able to increase agricultural exports and at the same time supply more of its own food needs if current agricultural development plans materialize."[3] Presently, agriculture supplies

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[2]British Honduras and Belize are used interchangeably. Belize will be the official name of the country after independence.

[3]U. S., Department of Agriculture, The Agriculture and Trade of British Honduras, ERS-Foreign 209, prepared by Mary S. Coyner (Washington, D. C., January, 1968), p. iii.

an estimated 28 per cent of the gross domestic product, 60 to 80 per cent of total exports, and employment for about one-third of the labor force.

A statement from Latin American Report epitomizes the general belief in the agricultural future of British Honduras:

> During the last 10 years, great strides in increased land use have been scored. Yet for all of this, less than 10% of the land is being actively utilized. Some idea of the tremendous potential can be gathered from a United Nations Survey which stated that the country has some 2.2 million acres of land well suited for agricultural use, and that soil and climatic conditions are suitable for a wide range of agricultural enterprises.[4]

Export crops form the primary basis of the agricultural economy. Second in importance to sugar among exports, citrus products account for approximately 15 per cent of the gross domestic product of British Honduras. Citrus exports were valued at BH $345,000 in 1946, but by 1960 the figure had risen to BH $3,133,000.[5] Exports are directed primarily to the United Kingdom, Canada, France, and the Fiji Islands. The main center of citrus production in British Honduras is the fertile Stann Creek Valley.

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[4]"A New Look at Belize," Latin American Report, VI, No. 8 (September-October, 1967), p. 26.

[5]BH $1.00 is equal to US $.70.

The Problem

The purpose of this study is to analyze the citrus industry of the Stann Creek Valley of British Honduras and its prospects for future expansion. More specifically, answers have been sought to the following questions:

1. What physical properties of the valley favored the initiation of citrus production at this location?
2. To what extent has the historical development of the citrus industry influenced present production techniques?
3. How does government legislation affect citrus production and processing in the valley?
4. What are the current trends in planting, cultivation, maintenance, harvesting, and processing of the citrus crop?
5. What are the effects of marketing procedures and transportation methods on production?
6. What are the physical problems of citrus production within the valley?
7. What is the status of citrus research and agricultural extension programs?
8. What social problems exist in the Stann Creek Valley which might inhibit expansion of citrus production?
9. What economic problems may be decisive in relation to further development of citrus acreage?

10. What are the overall future prospects for citrus production in the Stann Creek Valley?

Procedure

Most of British Honduras has experienced important agricultural development only since 1961, while the Stann Creek Valley has had citrus production as its economic basis for more than thirty years. Citrus of the Stann Creek Valley currently comprises about 90 per cent of the British Honduras crop, and the entire citrus processing industry is located within the valley. The valley was selected for this study since it represents a conspicuous departure from the traditional agricultural activities in British Honduras, namely commercial sugar cane cultivation and primitive subsistence agriculture.

Published data for this study were obtained from the Michigan State University Library in East Lansing, Michigan, the Library of British Honduras in Belize City, and various government agencies in British Honduras. Direct data were obtained by means of approximately thirty interviews with knowledgeable persons in Belize City, Central Farm, Stann Creek Town, and the Stann Creek Valley. The field work in British Honduras was accomplished during the period from December, 1967, to February, 1968.

The Study Area

British Honduras is located in the southeastern part of the Yucatan Peninsula of Central America, roughly between 16° and 18° North Latitude, as shown in Map 1. It is bounded by the Mexican territory of Quintana Roo on the north, Guatemala on the south and west, and the Caribbean Sea to the east. It extends 174 miles from north to south and sixty-eight miles from east to west. Slightly larger than Massachusetts, the total area including the cays is 8,867 square miles.

The specific study area, the Stann Creek Valley, occupies about 125 square miles in the east-central portion of this British Crown Colony (Map 2). The valley extends twenty-five miles from west to east, but is only eight miles wide at the widest point. Ten miles from the Caribbean Sea, it narrows to only four miles in width as formations of the Maya Mountains fade beneath alluvial material, which extends eastward to the Caribbean coast and Stann Creek Town.

The Stann Creek Valley is described in the Chronicle of the West Indies Committee as the "valley of the orange blossom promise."[6] It is located thirty-five miles by sea and 105 miles by road south of Belize City, the capital,

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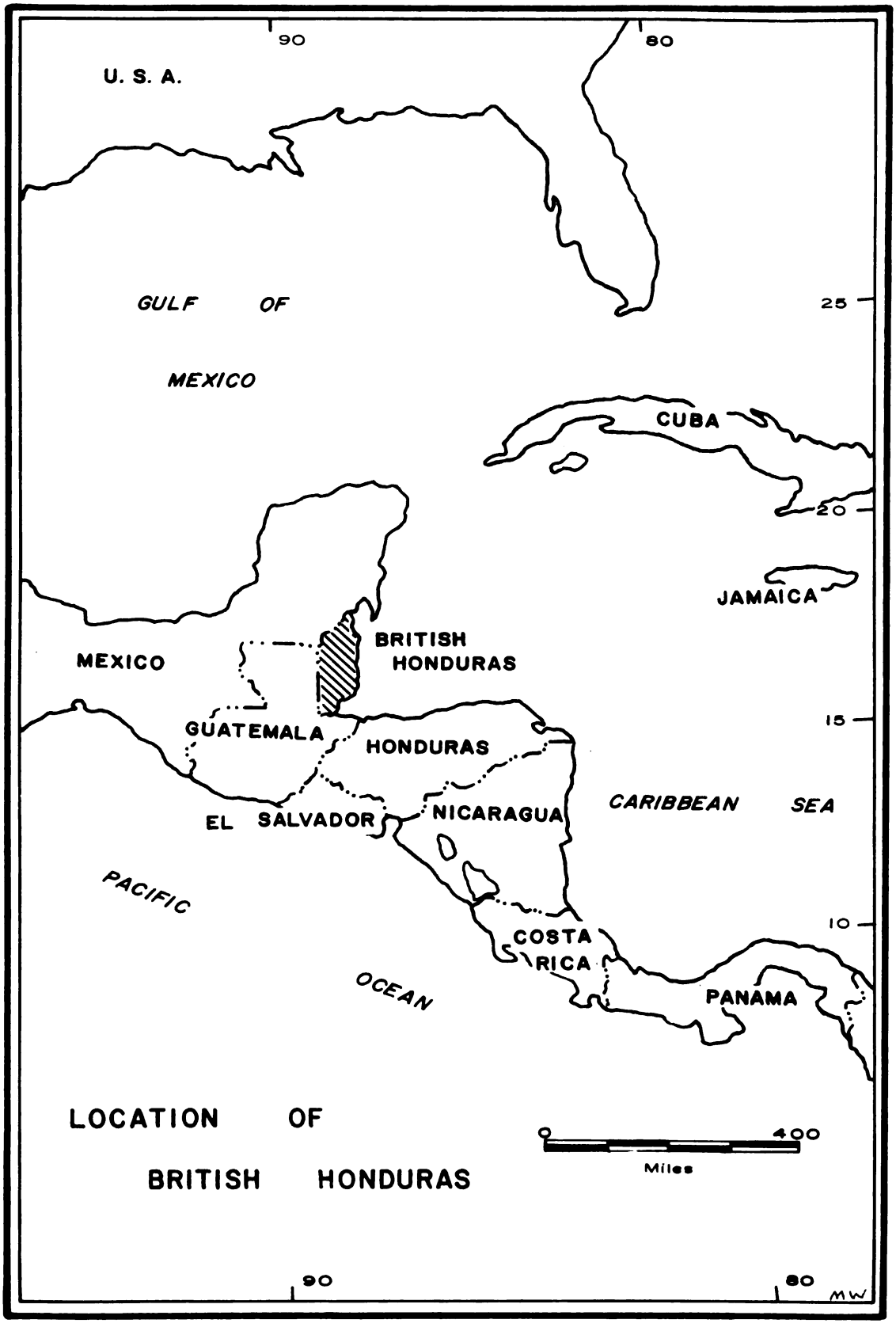
[6]U. S., Department of Agriculture, The Agriculture and Trade of British Honduras, p. 4.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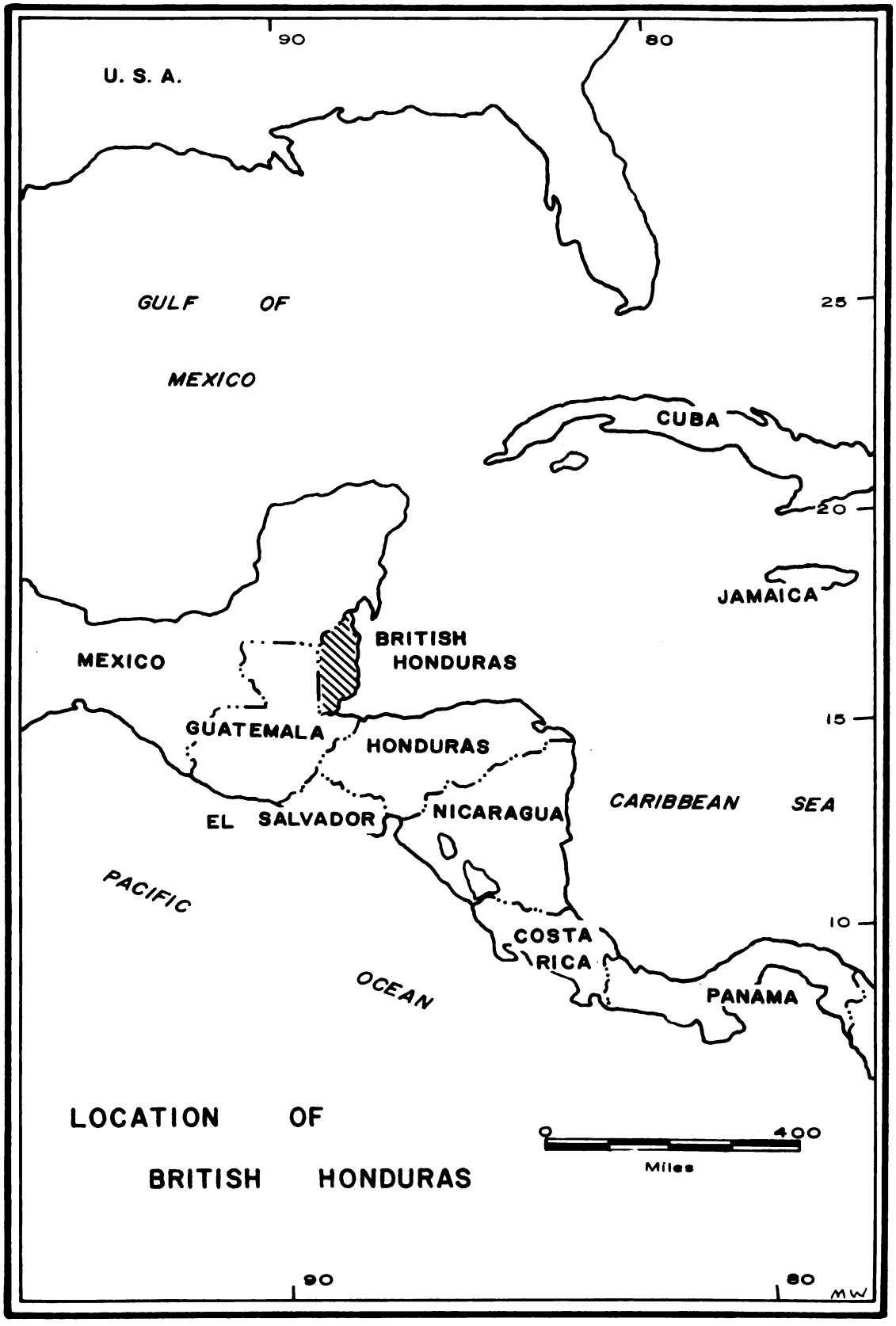
Map 1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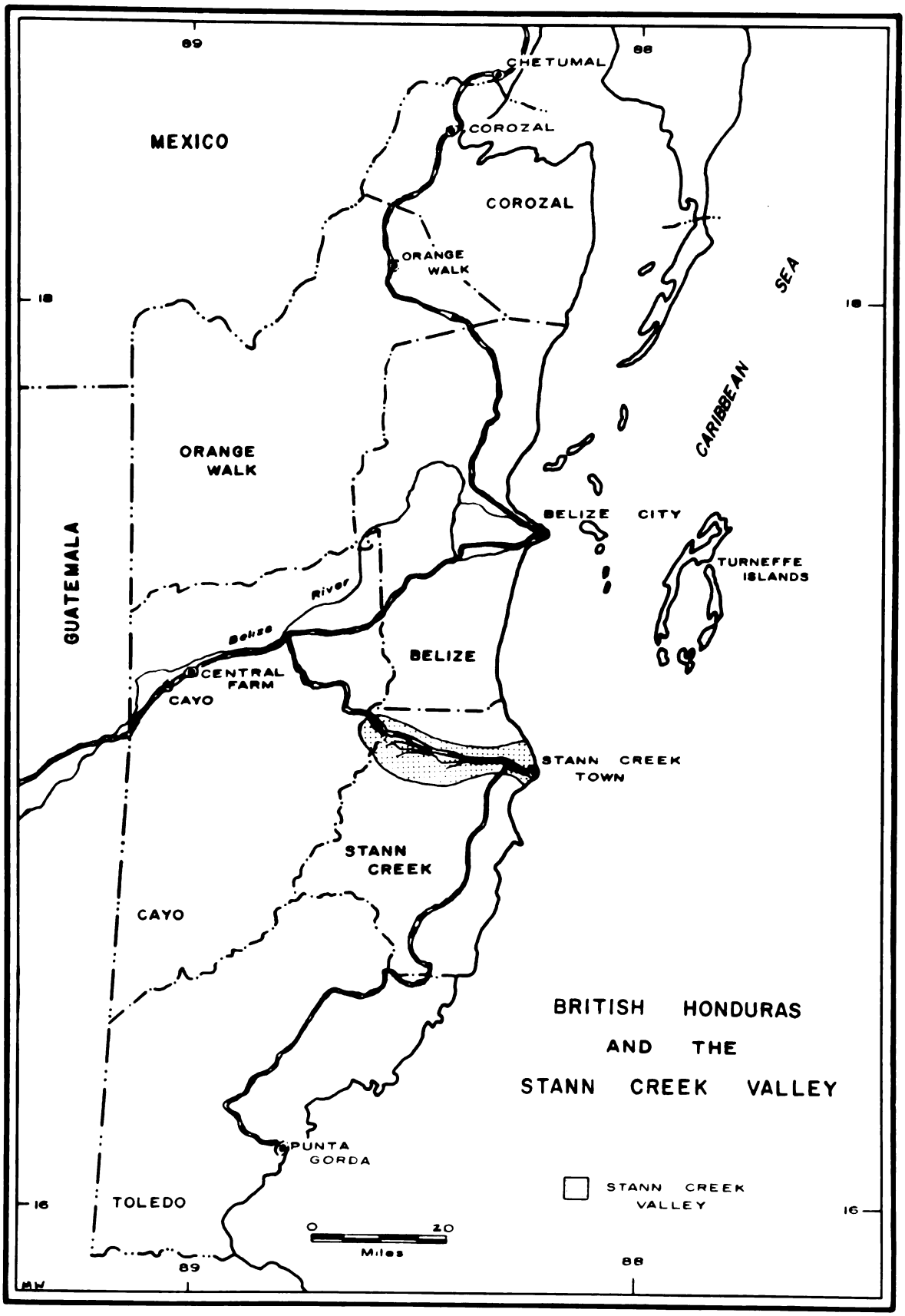
Map 1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BELIZE
RIVER
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CENTRAL FARM
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STANN CREEK TOWN
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Map 2

and possesses certain physical characteristics ideal for the cultivation of citrus: (1) a fairly free-draining soil, (2) a frost-free climate, and (3) at least sixty inches of rainfall annually.

Soils in the middle and upper parts of the valley are excellent for citrus.[7] All soils are formed on, or derived from, potash-bearing rocks. Those of the western valley are shallow skeletal soils derived from the Maya Mountains, which consist of shales, fine sandstones, and quartzite.[8] The eastern terraces are comprised of a wide range of soil types. However, they are predominantly sandy alluvium and, thus, are fairly free-draining.

The Stann Creek Valley has a tropical, rainy climate (Köppen Af). The average maximum temperature is 85°F., the average minimum is 71°F., and the average annual humidity 85 per cent. Rainfall varies in amount from year to year (90 - 120 inches) and areally within the valley, increasing westward toward the mountains. Precipitation is concentrated in the months from May to December and tends to occur in tropical thundershowers, which account for large amounts of rain within relatively short periods

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[7] A. C. S. Wright, Land in British Honduras; Report of the British Honduras Land Use Survey Team (London: Her Majesty's Stationery Office, 1959), p. 165.

[8] Ibid., p. 164.

of time. However, the valley is also subject to day-long drizzles. The number of rainy days ranges from 150 to 200 per year.

Cold air masses and hurricanes form distinct elements in the climate of the valley. The cold air masses, or "northers," from the North American interior push southward across the Gulf of Mexico during the winter season and result in temperatures from fifteen to thirty degrees below normal. Hurricanes, with their high winds and heavy rainfall, not only threaten human life but also cause heavy fruit drop and bud damage to citrus trees. Unfortunately, these natural disasters occur from August to October, when the buds are forming and the fruit is beginning to ripen. Severe hurricanes pass directly through the Stann Creek Valley approximately once every thirty years, but since the hurricane track has been moving slightly southward during the present century the valley may receive more frequent visits from such devastating storms in the future.

Citrus requires at least sixty inches of rainfall per annum for ideal production without irrigation. Receiving a total of from ninety to 120 inches of rainfall, distributed throughout the year, the Stann Creek Valley possesses a moisture excess which must be drained away and the citrus groves properly ventilated to prevent tree and fruit diseases.

The natural vegetation of the valley is a broadleaf forest, with few lime-loving species. Negrito, banak, and cohune palm trees are abundant. Hurricane Hattie of 1961 destroyed the tallest tree canopy, and now the uncleared areas, which comprise over one-half of the valley area, consist largely of jungle growth. Cleared areas used for citrus are covered with grasses which do not seriously inhibit soil aeration and which protect the soil against erosion.

Inhabitants of Stann Creek Town and the valley number roughly 5,000. They include Creoles, who reside in town; Caribs, who inhabit the town, but are attracted to the valley by seasonal work in the orchards and factories; Jamaicans, who are primarily residents of the valley and are remnants of a 1932 settlement scheme; and Mayan Amerindians, who are seasonal workers and milpa agriculturalists and are considered to be the best field workers of the valley. Arabs and Asiatics, a very minor population element in terms of numbers, form a significant part of the merchant class.

Summary of Findings

Since the first planting of citrus in 1913, orchards in the Stann Creek Valley have expanded to include 8,000 acres and more than 560,000 trees. Production totals

nearly 900,000 contract boxes of fruit per year.[9] The number of growers has risen steadily to more than 120 in 1967. Two processing companies have also initiated fruit production in the valley: the Citrus Company of British Honduras, owned by the Sharp interests of Jamaica, and the British Honduras Fruit Company, operated by Salada Foods of Canada. Thus, citrus forms the predominant economic activity of the Stann Creek Valley and is second in importance only to sugar as an export product of the colony.

Production levels of citrus in British Honduras are, however, subject to wide fluctuations due to physical and economic problems. Hurricanes and heavy rainfall can cause widespread bud damage and fruit drop, resulting in a partial loss of the annual crop. Low prices on the world market may result in low production, since the growers will neither fertilize nor use preventive sprays if prices fall below a certain level. Crop losses due to pests and diseases may then range from 10 to 20 per cent. A lack of orchard maintenance also results from low prices, causing yields to be significantly reduced by weeds and grasses that utilize many of the soil nutrients required by the trees. In addition, shortages of labor for harvesting operations can reduce production, since the fruit will drop and spoil rapidly unless picked soon after ripening.

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[9]Contract boxes contain 80 pounds of grapefruit or 90 pounds of oranges.

The marketing of citrus products also presents difficulties. Stann Creek Valley citrus depends upon world price situations and market potentials. If world citrus production is greater than usual, increased competition from foreign sources in such markets as Canada and the United Kingdom drives prices downward and injures the economy of British Honduras and the Stann Creek Valley.

Further orchard expansion and investment will depend upon economic and agricultural developments not only in British Honduras but also in the rest of the world. Citrus research can lead to less expensive production, for example, through the development of disease-resistant species of citrus. Due to the superior quality of fruit, perhaps the Stann Creek Valley should be increasingly devoted to the production and marketing of fresh fruit rather than processed products. The general outlook for the valley at present is not bright, but future events could rapidly alter the picture to resemble the "boom period" of the 1930's and 1940's.

CHAPTER II

HISTORICAL DEVELOPMENT

Since its inception, citrus cultivation in the Stann Creek Valley has been primarily dependent upon world markets and prices. Therefore, historical events, both domestic and foreign, have alternately stimulated and hindered citrus production and have significantly affected agricultural traditions and techniques. An analysis of historical background helps to explain the present landscape of the valley, in addition to the "citrus mentality" of the producers.

The history of citrus production and processing in the valley can be divided conveniently into two periods. Grapefruit production dominated the first interval, from 1913 to 1948. After 1948, an emphasis upon orange production became paramount, and its importance continues to the present. Since April, 1967, government control and regulation of both citrus production and processing has presented a new aspect of the industry deserving separate consideration and analysis.

Early Period, 1913-1948

Although various historical records mention citrus being grown in British Honduras since 1859, the citrus industry of the Stann Creek Valley is of more recent origin.[10] In 1913, the first grafted citrus trees were imported from Florida and planted by Dr. S. O. Browne, who had the original idea; Mr. A. E. Vine, Manager of the British Honduras Syndicate, Ltd.; and Mr. W. A. J. Bowman. Each of the three growers imported 300 grapefruit trees, sufficient for a total of fifteen acres of land at 60 trees per acre. Primary advantages for the initiation of citrus production in the Stann Creek Valley included: (1) a tropical climate with more than the minimum rainfall required by citrus, (2) proximity to a port facility, and (3) large tracts of suitable land available at low cost.

After operating at a loss for the first twelve years, during which time the primary difficulties were pests and low yields, two of the three citrus pioneers decided to sell their holdings.[11] In 1924, Browne retired to Jamaica, selling his property to Bowman, who promptly

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[10] British Honduras, Agriculture Department, British Honduras Citrus Production (Belize City: Government Printing Office, 1955), p. 3.

[11] W. A. J. Bowman, "Citrus Culture in British Honduras, The Development of the Citrus Industry in the Stann Creek Valley, British Honduras" (unpublished manuscript, 1955), Library of British Honduras, p. 2.

introduced new varieties from Florida and California. Vine, who returned to England to retire, sold his land to the government of British Honduras for the establishment of the Boys' Industrial School at Pomona.

Also in 1924, a government policy to increase the acreage of citrus was formulated and a nursery was established for the sale of budded trees to prospective producers. This action led to expansion of the industry. The first shipment of citrus, 3,756 cases of fresh grapefruit, was made to Canada in 1925. Shipments to England followed, with sales being handled by the British Honduras Government Agricultural Cooperative Society.

An emphasis upon high fruit quality and appearance accompanied the increase in plantings. Colonel A. P. Bellhouse, H. T. A. Bowman, and other developers joined the ranks of growers as budded trees became available from the Government Agricultural Station at Stann Creek. Grapefruit exhibits were sent to the Imperial Fruit Show in Great Britain, where the Boys' Industrial School won the gold and silver medals at the Fruit Show, Manchester, England, in 1928. The superior quality and appearance of the fruit was further attested by W. A. J. Bowman's winning of the gold medals at the Fruit Show, Birmingham, England, in 1929, and Leicester, England, in 1930.

By 1931, grapefruit cultivation had expanded to 450 acres. During that year Mr. G. G. R. Sharp, of the Sharp interests of Jamaica, purchased Middlesex, a forest reserve at the western end of the valley, from the British government and immediately began planting grapefruit. He was thus directly responsible for the expansion of its cultivation in the valley to 800 acres by 1937.

Private enterprise, meanwhile, had taken over the marketing of citrus fruit from the British Honduras Government Agricultural Cooperative Society. A packing plant for fresh fruit was first erected in Stann Creek in 1933, being transferred to Pomona at the end of 1942. Its daily capacity was 100 boxes per hour during the months from September to April. W. A. J. Bowman was the chairman of the company, known as the British Honduras Citrus Association, until it was dissolved in 1948.

Fresh fruit became the principal export from Commerce Bight, the port facility two miles south of Stann Creek Town, but development of canned citrus products followed the discovery that nearly 40 per cent of the fruit grown were too large to be acceptable for the export market.[12] Canning of grapefruit segments and juice began at the Citrus Association plant in 1935. The plant capacity was five cases per day, each case containing twenty-four

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[12]Wright, op. cit., p. 119.

nineteen-ounce cans. The average annual export of fresh fruit during the period 1934-1940 was 50,000 boxes, from a total production of 60,000. Canning of segments and juice utilized most of the remaining 10,000 boxes, since domestic consumption totaled only about 1 per cent of the annual harvest. Table 1 illustrates the volume of citrus exports, 1937-1948, and reflects the decline during World War II. Table 2 shows the dislocation of the fresh grapefruit market caused by the war.[13]

Grapefruit orchards in the valley, which currently approximate 900 acres, have not undergone significant expansion since 1942. This is due to the lack of shipping facilities during the war and because of the subsequent limited market at home and abroad for fresh grapefruit and processed products. Grapefruit production has therefore declined in relative importance, and the orchards are suffering plant losses through age and disease at the rate of 1 to 3 per cent annually. Neither replacement nor new plantings of grapefruit trees are presently being undertaken.

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[13]Throughout this study all export figures for citrus pertain to the Stann Creek Valley, since this area provides the entire export crop of British Honduras.

TABLE 1

EXPORT OF FRESH ORANGES AND GRAPEFRUIT FROM BRITISH HONDURAS, 1937-1948

(Boxes, 80 pounds net)

Year	Oranges	Grapefruit	Total
1937	3,429	20,793	24,222
1938	422	50,858	51,280
1939	838	61,804	62,642
1940	2,226	55,848	58,074
1941	1,746	5,809	7,555
1942	734	263	997
1943	2,965	6,443	9,408
1944	3,336	2,545	5,881
1945	3,592	2,260	5,852
1946	6,117	1,071	7,188
1947	2,688	874	3,562
1948	2,214	1,380	3,594

Source: Citrus Industry of British Honduras, Jamaica, Trinidad, J. Henry Burke.

Modern Period, 1948-1968

Although grapefruit production in the valley exceeded that of oranges until 1957, emphasis after 1948 was placed upon increasing the acreage in orange groves. Probably the decline of grapefruit to a secondary position had

its beginning in the 1941-1942 agricultural season, when the British Ministry of Food contracted the Stann Creek citrus factory to provide single-strength orange juice to the United Kingdom.[14] Due to a lack of shipping facilities, however, the factory was forced to close in 1943 and did not reopen until 1948. Yet, the impetus for orange production had been established, and when the Ministry of Food contract for single-strength and concentrated orange juice was renegotiated in 1948, the acreage in oranges began a rapid expansion that has only recently tapered off. Another factor in this growth was the general desire of British Caribbean territories to develop new crops to diversify their agricultural economies.[15]

After the British Honduras Citrus Association was dissolved in 1948, its processing plant was purchased by the new Citrus Company of British Honduras. The present canning section of the factory at Pomona was constructed at the same time, and new machinery was imported from Britain. Although citurs plantings in the valley increased from less than 1,200 acres in 1935 to more than 6,000 by 1957, the Citrus Company was able to process the greater production

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[14]Interview with Eric W. King, Chief Agricultural Officer of British Honduras, January 2, 1968.

[15]Great Britain, Caribbean Commission, Central Secretariat, Caribbean Market Survey: Citrus (Port-of-Spain, Trinidad: Kent House, 1956), p. 1.

by means of longer operating hours and modern facilities. Not only did the factory introduce up-to-date industrial methods but it also caused an awakening of the resident population to the monetary value of man's labor and the bargaining power of a labor force.[16]

TABLE 2

EXPORTS OF FRESH GRAPEFRUIT FROM BRITISH HONDURAS, BY COUNTRY OF DESTINATION, 1939-1944

(Boxes, 80 pounds net)

Year	UK	Canada	Bermuda	Mexico	Cayman Islands	Panama	Total
1939	50,919	10,368	305	160	52	--	61,804
1940	37,991	16,061	1,226	570	--	--	55,848
1941	--	5,300	302	207	--	--	5,809
1942	--	--	--	165	--	--	165
1943	--	--	--	2,481	--	3,962	6,443
1944	--	--	--	2,233	--	312	2,545

Source: Agriculture of British Honduras, Constance H. Farnworth.

[16]Interviews with Frank Sharp, owner of the Citrus Company of British Honduras, January 11, 1968, and R. Castillo, President, Southern Christian Workers Union, Stann Creek Town, British Honduras, January 29, 1968.

As citrus production expanded (Table 3), the Citrus Growers Association of British Honduras became more prominent. Formed in 1951 by Henry Bowman, the Association's major objectives were: (1) to promote, foster, and encourage the growing of citrus, (2) to promote the orderly and proper delivery of citrus, (3) to promote the extension and welfare of citrus farming as an industry, (4) to aid in settling disputes which might arise between members of the Association and the citrus packers and processors, and (5) to act as agents for all members of the Association.[17]

Citrus yields attained record levels in the 1960-1961 agricultural season. The Citrus Company of British Honduras was not able to process the entire production, and the surplus of fruit totaled 60,000 boxes. Anticipating a continuation of this condition, the government of British Honduras made known the need for a second processing factory.

In late 1962, Salada Foods, Inc., of Toronto, Ontario, owner of the present British Honduras Fruit Company, investigated the possibilities of growing and processing citrus in British Honduras. A decision was made to purchase 1,000 acres of uncleared land and 545 acres previously developed by the Colonial Development Corporation in the Stann Creek Valley, with the intention of utilizing the entire holdings for orange orchards. A modern factory

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[17]Bowman, op. cit., p. 25.

with refrigeration units for frozen citrus concentrate was erected within a period of three months on the property, 14.5 miles west of Stann Creek Town. The fully automated processing section of the factory produced both grapefruit and orange concentrate until 1967, when a decision was made to process oranges only.

TABLE 3

CITRUS PRODUCTION IN BRITISH HONDURAS, 1954-1967

(boxes)*

Year	Oranges	Grapefruit	Total
1954-55	80,000	215,000	295,000
1957-58	195,000	188,000	383,000
1958-59	281,000	220,000	501,000
1959-60	450,000	250,000	700,000
1960-61	718,000	261,000	979,000
1961-62**	190,000	101,000	291,000
1962-63	940,000	231,000	1,171,000
1963-64	859,000	268,000	1,127,000
1964-65	856,000	243,000	1,099,000
1965-66	952,000	248,000	1,200,000
1966-67	700,000	236,000	936,000

*Oranges: 70-pound boxes, 1954-1965; 90-pound boxes, 1966-67. Grapefruit: 80-pound boxes.

**Production reflects damage by Hurricane Hattie, September, 1961.

Source: Annual Agricultural Reports, Stann Creek District Agricultural Station.

Price competition between the Citrus Company of British Honduras and the British Honduras Fruit Company in the purchase of fruit naturally resulted from establishment of the new factory. In April, 1963, Salada initiated operations and offered growers BH $2.80 per box of oranges. The Citrus Company of British Honduras, which had been paying BH $.90 per box, was forced to raise its price to BH $2.00. Thus, Salada (British Honduras Fruit Company) represented a formidable challenge to the Sharp interests, which had enjoyed a monopoly in citrus processing during the previous fifteen years.

Although the competition remained intense, prices offered gradually declined. During the years 1964-1966, the price paid by Salada per box of oranges fell from BH $2.25, to $1.57, to $1.25, while the Citrus Company was offering BH $2.00, $1.15, and $1.00. During the 1966-67 agricultural year, Salada suffered an economic collapse, because of a great increase of citrus production in the United States, and could give only BH $.50 per box for oranges, which was $.30 below growing costs. Sharp was also forced to lower prices, to BH $.80 per box, but was able to secure most of the valley's citrus. Though Salada was again able to pay BH $1.25 per box of fruit during the 1967-68 season, compared with Sharp's $.90 per box, it was unable to secure more than the minimum number required to maintain operations. The growers now fear that prices

might again fall and that they will be subject to adverse economic tactics by the processing interests.

The government of British Honduras, concerned with the intense competition, declining prices, and the relationships between growers and processors, initiated legislation to regulate the industry. Consequently, on April 1, 1967, the Citrus Ordinance was signed into law by the colonial governor, thus ushering in a legal factor in the historical development of citrus in the Stann Creek Valley.

Citrus Legislation

The Citrus (Processing and Production) Ordinance, 1967, "provided for the control and regulation of the citrus industry and the production of citrus fruit."[18] The Ordinance states that "no person shall import into or export from this country any citrus, whether fresh or processed fruit, except in accordance with the terms and conditions of a valid license issued to them by the Minister of Natural Resources after consultation with the Citrus Control Board."[19] Licensing conditions also apply to any citrus processor.

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[18]British Honduras, Citrus (Processing and Production) Ordinance, 1967 (Belize City: Government Printing Office, 1967), p. 1.

[19]Ibid., Section 3, p. 5.

The legislation gives the Minister of Natural Resources power to require any producer or processor to reserve for domestic sale and consumption any portion of the citrus produced or processed in British Honduras.[20] It also reserves the right of the Minister to fix the price, with due regard to the world price situation, of fresh and processed citrus fruit sold within the country.

Regulations on purchases by processors are elaborated in Section 7, Clause 3:

> Every processor shall during every year of operation accept and pay for in accordance with the provisions of this Ordinance, including any contract made hereunder, all mature and merchantable citrus delivered to him by producers holding valid licenses to deliver citrus to him provided that a processor may be exempted from the provisions of this subsection if owing to any disaster of nature, major breakdown of equipment, unfavorable market trend, circumstances caused by crop failure or shortage, inability to procure packing and/or shipping or supplies, act of God, war or war conditions, embargo, fire, flood, accident, strike, riot, transportation difficulties, or any other cause or considerations beyond the control of the processor, the Board after consultation with the Association (of growers) permits him to declare a temporary shutdown or that his year of operation has come to an end.[21]

Government regulation of the citrus industry was implemented through the formation of a Citrus Control Board. Membership of this Board is composed of the Permanent Secretary of the Ministry of Natural Resources and Trade, the Chief Agricultural Officer, one representative

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[20] Ibid., Section 5, p. 6.

[21] Ibid., p. 6.

of each processor, a number of representatives from the growers' association (one of whom must be the Chairman) equal to the number of representatives from the processors, and three persons appointed by the Minister of Natural Resources who have no connection with the citrus industry. Financial support of the Board is provided equally by the processors and the Citrus Growers' Association, of which each grower is a compulsory member at a cost of BH $.02 per box of fruit marketed.[22] The Board has the power and duty: (1) to employ such officers and servants upon such terms and conditions as it may deem fit; (2) to request, receive, and deal with returns from processors and from the Association; (3) to authorize the Citrus Growers' Association to issue licenses to producers for the purpose of delivering citrus to processors; (4) to be the final arbitrator in disputes between any processor and the Association; (5) to advise processors and the Association on any matter in connection with this ordinance; (6) to advise the Minister of Natural Resources on the granting of licenses to exporters and importers of citrus and on the control of sales of fresh or processed citrus for domestic consumption, including fixing of prices; and, (7) to hear and determine appeals by any person aggrieved at the refusal by the

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[22]Interview with Karl Gabrouel, a citrus producer in the Stann Creek Valley, January 11, 1968.

Association to issue a license to him or at the terms and conditions of his license.[23] Finally, the Citrus Control Board may make regulations for the control of the citrus industry: (1) concerning the form of licenses, application for licenses, reports, returns, and other documents; (2) prescribing the records to be kept and the returns to be made by all licensed persons; and, (3) requiring every producer to show his license to deliver citrus to the processor at the time of the first delivery.[24]

The British Honduras Citrus Growers' Association, formed in 1951, was dissolved by the Citrus Ordinance and was replaced by the Citrus Growers' Association. The primary objectives of the new Association, as outlined by the Ordinance, are:

> 1. To promote, foster, and encourage the growing of citrus . . . and the extension and welfare of the citrus industry.
>
> 2. To assist in the preparation of, or the settling of, terms for contracts between producers and processors, and with labor.
>
> 3. To assist in settling disputes which may arise between producers and processors, producers and laborers, and producers.
>
> 4. To act as agents for the individual producers or any group of them.

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[23] Citrus Ordinance, Section 16, pp. 9-10.

[24] Ibid., Section 17, p. 10.

5. To make suggestions to the Minister of Natural Resources on any matter affecting the interests of the producers.

6. To buy, sell, and deal in fertilizers, agricultural implements, and supplies for the benefit of producers.

7. To endeavor to obtain for, and to extend financial aid to, any Association member who requires such aid in continuing cultivation.[25]

To become a member of the Citrus Growers' Association, a grower must own one acre or more of fruit-bearing trees and have delivered to a processor within the last twelve months at least twenty boxes of citrus. A provisional membership status is possible for those producers who have one or more acres of non-bearing citrus trees. However, provisional members cannot vote or hold office in the Association.

Operations of the Association are directed by a Committee of Management. Consisting of nine persons, the Committee must be composed of full members of the Association elected by their peers.[26] This committee has complete control over the income, capital, and property of the Association. It may authorize any person to enter and inspect the citrus orchards of any member of the Association. The Committee must submit an annual return to the Citrus Control Board so that the Board can determine the acreage, location,

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[25] Ibid., Section 22, pp. 12-13.

[26] Ibid., Section 37, p. 18.

and age of the citrus orchards of each Association member and the deliveries of citrus made by him to the processors.[27] Finally, the issuance of producer licenses to members of the Association desiring to deliver citrus to the processors is a function of the Committee of Management.

To meet yearly expenses and provide citrus research facilities, the Association may levy and collect a fee upon all citrus delivered to processors. The fee for research purposes is BH $.033 per box, while that for Association expenses is BH $.02 per box. The Ordinance stipulates that total fees shall not exceed BH $.0533 per box, except with approval by the Minister of Natural Resources. At present, the maximum fee is collected.

The Citrus Industry, 1968

Citrus production has become of major significance in the economy of British Honduras since the decline of the forest industry. Citrus is now second only to sugar in value of exports and is equally important to the colony's economy.[28] The Stann Creek Valley accounts for 90 per cent of the citrus production, and all of its export.

While the export value of citrus has increased through time, it fluctuates widely with variations in

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[27] Ibid.

[28] Waddell, p. 91.

annual yields. As long as output reaches 1,000,000 boxes per year, the export value approximates BH $4,000,000. This value represented 44 per cent that of agricultural exports and 25 per cent that of total exports in 1964.[29]

Table 4 illustrates the export earnings from citrus from 1945 to 1965. The fluctuations in yields and prices, resulting in "boom" and "gloom" periods in the Stann Creek Valley, can affect adversely both the Belizean and valley economies. Therefore, citrus tends not to be a stable commodity upon which British Honduras should base a large segment of its total economy.

Although there are formidable problems to be resolved, citrus production continues to be the dominant motivating force in the valley. Extensive areas cleared of forest growth are now utilized for citrus cultivation. Yet, development has slowed considerably since 1965, and only a substantial rise in world prices can revive large-scale expansion similar to that of the 1950's.

The Citrus Company of British Honduras has particularly influenced the "citrus mentality" of the valley producers. Due to its economic importance in the valley during the past twenty years, growers tend to apply those agricultural techniques employed by the Citrus Company.

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[29]G. Clayton et al., Report of the Tripartite Economy Survey of British Honduras (Washington, D. C.: Government Printing Office, May, 1966), p. 18.

TABLE 4

DOLLAR VALUE OF CITRUS EXPORTS, 1945-1965

Year	Fresh	Juice	Segments	Concentrate	Total
1945	5,270	--	--	--	5,270
1946	4,700	--	339,300	--	344,000
1947	3,900	--	416,900	--	420,800
1948	3,200	--	429,500	--	432,670
1949	235,000	--	293,300	--	528,310
1950	298,000	--	245,100	--	543,100
1951	105,000	--	626,600	--	731,620
1952	154,000	--	657,500	--	811,500
1953	122,000	--	726,700	--	848,730
1954	110,000	--	988,400	--	1,098,350
1955	117,000	--	817,500	--	934,530
1956	71,000	899,000	1,009,000	374,000	2,353,000
1957	7,000	240,000	773,000	325,000	1,345,000
1958	4,000	720,000	677,000	411,000	1,812,000
1959	106,000	705,000	502,000	586,000	1,899,000
1960	192,000	1,604,000	722,000	569,000	3,087,000
1961	125,000	1,369,000	248,000	1,737,000	3,479,000
1962	5,000	785,000	570,000	49,000	1,409,000
1963	365,000	1,447,000	1,080,000	1,909,000	4,801,000
1964	259,000	1,533,000	229,000	2,679,000	4,700,000
1965	11,000	1,067,000	998,000	1,747,000	3,823,000

Source: British Honduras, A Historical and Contemporary Survey, D. A. G. Waddell (1945-1955) and Annual Abstract of Statistics, British Honduras (1956-1965).

Unfortunately, not all of these practices are beneficial to growing citrus under tropical conditions. For example, close spacing of trees to receive higher yields per acre has resulted in an increase of gummosis, a disease which leads to the demise of trees, since excess moisture in the orchards is retained under conditions of poor ventilation. At present, few producers employ the scientific methods advocated by horticultural specialists, and the current production level of citrus reflects this fact.

CHAPTER III

CITRUS PRODUCTION AND PROCESSING

The Stann Creek Valley has become the second most important agricultural area of British Honduras, producing approximately 700,000 boxes of oranges and 230,000 boxes of grapefruit annually. Although the industry is physically concentrated within the valley, other areas are affected financially by citrus production. This is particularly true of those that supply much of the labor force employed in the orchards. Fluctuations in production therefore affect not only the prosperity of the Stann Creek Valley, but also that of the district and the entire colony.

Citrus is grown in the valley under varying degrees of technology. Some commercial as well as most "subsistence" producers use horticultural techniques not recommended by research personnel. But the British Honduras Fruit Company (Salada) and approximately twenty other growers practice scientific techniques considered ideal for tropical citrus production. Thus, while the great majority of producers attempt to obtain yields with the least amount of agricultural input, and with unscientific planting and spacing, a small number are determined to achieve higher yields through use of improved methods.

Since the predominant agricultural tradition is that of the milpa farmer, innovative techniques and horticultural research have tended to be ignored (Fig. 1). However, faced with introduction of more advanced technology by Salada, increased government emphasis upon scientific methods, and empirical evidence of inferior results from poor agricultural practices, the citrus producers have become more aware of improved orchard procedures. Through the ensuing years, the producers should overcome their "milpa" outlook toward agriculture and adapt increasingly to new ideas that can aid citrus production. With widespread adoption of modern techniques, including disease and pest control measures, the Stann Creek Valley will be able to produce substantially greater citrus yields.

Producers and Processors

Two classes of producers reside in the valley, the more affluent and influential being those owning more than seventy acres of citrus (Figs. 3 and 4). These growers operate at a profit and can therefore be considered commercial producers. At present only five growers, among more than 120 in the Stann Creek Valley, own sufficient acreage to be considered in this category. Two additional growers own more than seventy acres of potentially productive land, but have not as yet developed it. Table 5 lists the commercial citrus producers and their respective acreages in

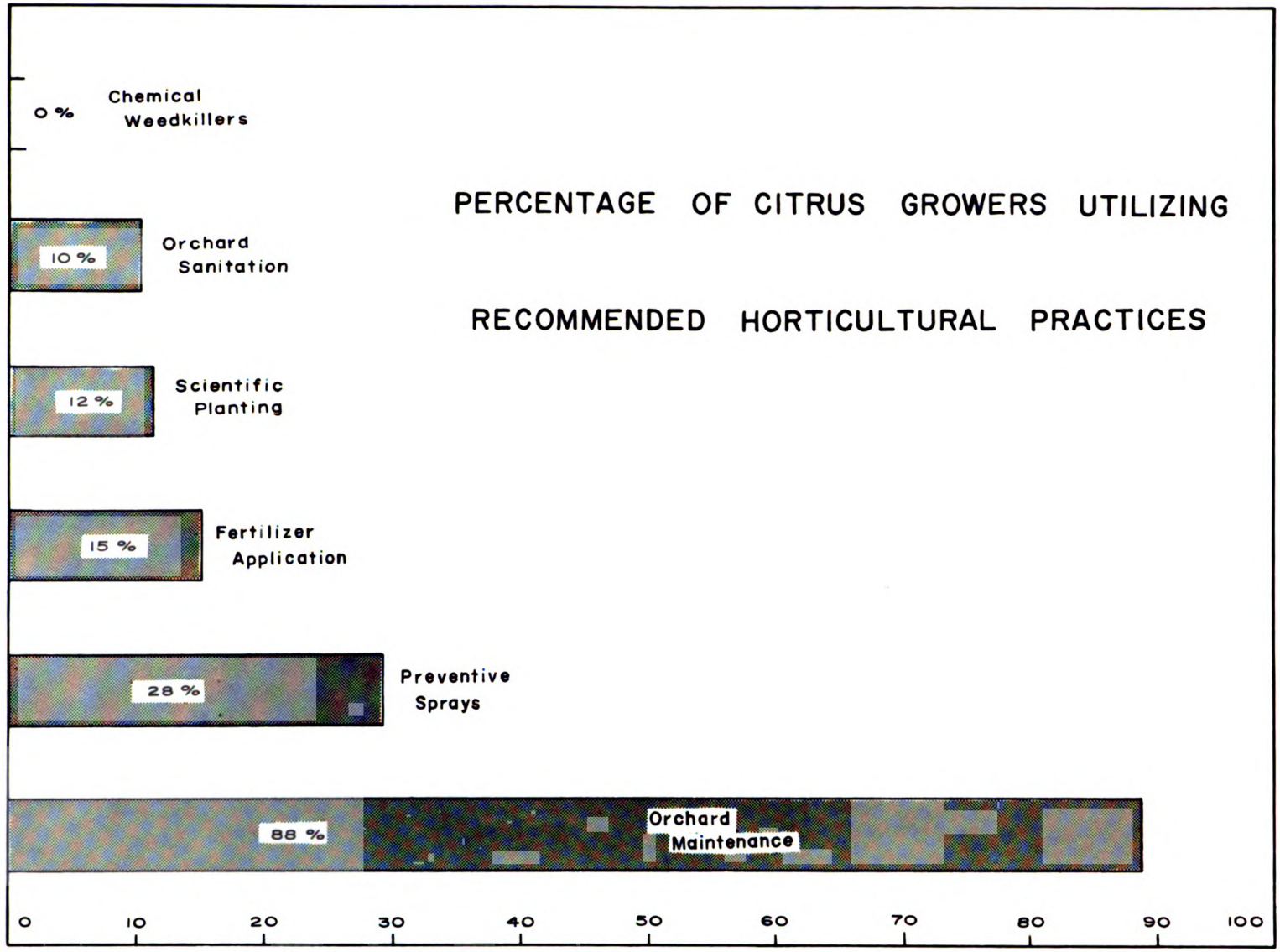

PERCENTAGE OF CITRUS GROWERS UTILIZING
RECOMMENDED HORTICULTURAL PRACTICES
0 %
Chemical Weedkillers
10 %
Orchard Sanitation
12 %
Scientific Planting
15 %
Fertilizer Application
28 %
Preventive Sprays
88 %
Orchard Maintenance
0
10
20
30
40
50
60
70
80
90
100

Figure 1

Figure 2. Citrus production on mountain slopes in the Stann Creek Valley. The arrow points to the natural division between the jungle vegetation on the mountain and the citrus orchards below.

Figure 3 (L). Subsistence production of oranges in the Stann Creek Valley. Young trees up to five years of age are interplanted with bananas to realize immediate profits from the land.

Figure 4 (R). Commercial orchards of the Citrus Company of British Honduras near Middlesex.

grapefruit and oranges. It illustrates the predominance of orange production and the fact that the two citrus processing companies own the greatest acreage. Map 3 shows the location of each commercial grower.

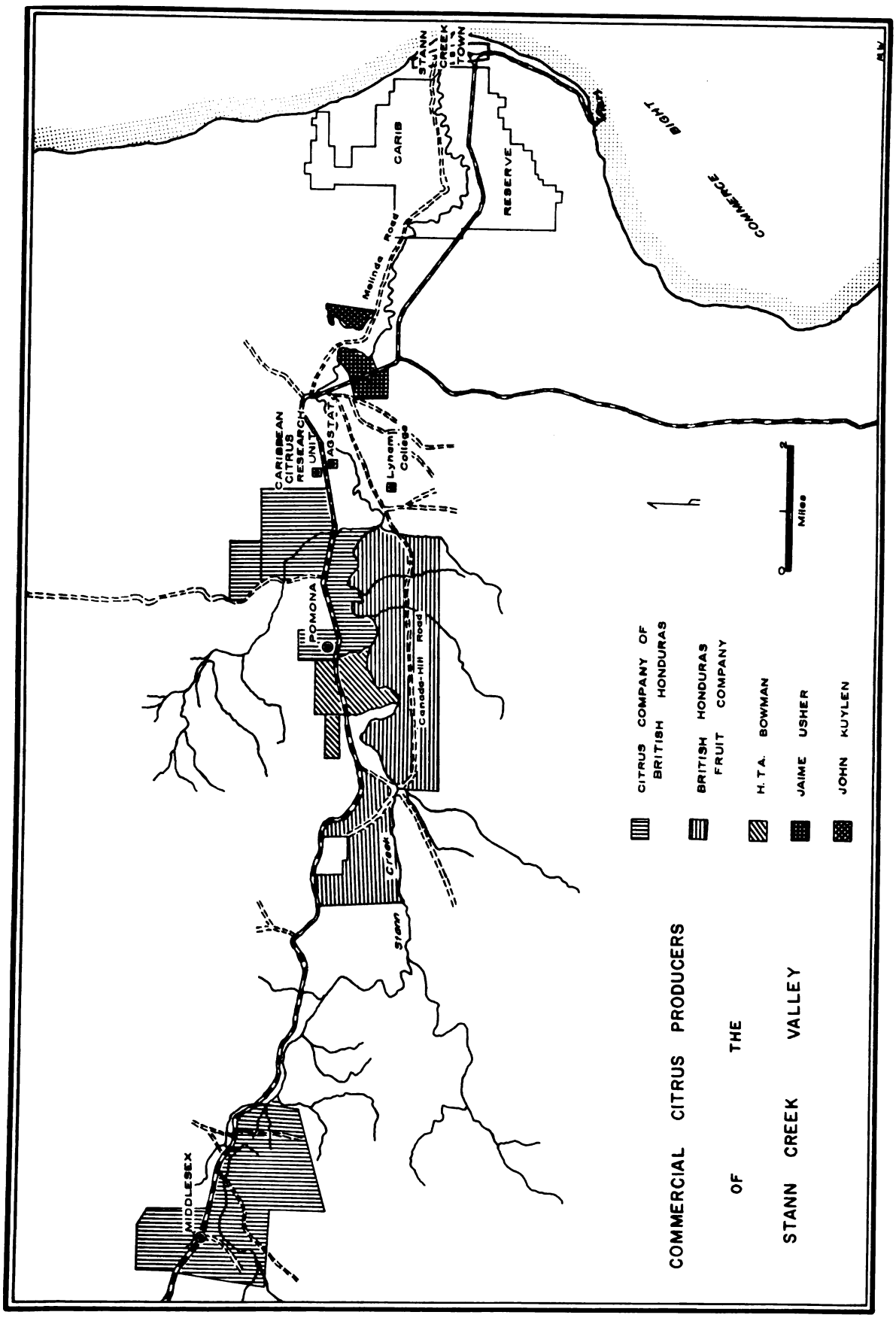
TABLE 5

COMMERCIAL CITRUS PRODUCERS IN THE STANN CREEK VALLEY

Producer	Location	Total Acreage	Acreage in Grapefruit	Acreage in Oranges
Citrus Company of British Honduras	Stann Creek Road	2,000	400	1,600
British Honduras Fruit Company	Stann Creek Road	1,545	--	1,200
H. T. A. Bowman	Stann Creek Road	700	200	400
J. Usher	Canada Hill Road	362	15	76
J. Kuylen	Melinda Road	129	30	60

Source: Citrus Census for 1967, Citrus Growers' Association

Since seventy acres of citrus are required for commercial production, any grower owning less than this amount can be considered a "subsistence" producer. In other words, due to the high cost of production, the individual produces citrus with little or no profit. Citrus production for the "subsistence" grower is therefore a


COMMERCIAL CITRUS PRODUCERS
OF THE
STANN CREEK VALLEY
CITRUS COMPANY OF BRITISH HONDURAS
BRITISH HONDURAS FRUIT COMPANY
H. T. A. BOWMAN
JAIME USHER
JOHN KUYLEN
Miles
CARIB RESERVE
COMMERCE BIGHT
STANN CREEK TOWN
Melinda Road
CARIBBEAN CITRUS RESEARCH UNIT
MOSTA
Lynam College
POMONA
Canada-Hill Road
MIDDLESEX
Stann Creek

Map 3

secondary occupation, and no intensive cultivation is employed. Approximately 120 growers, with 4,000 acres of citrus, can be classified as subsistence producers (Map 4).[30]

Land ownership in the Stann Creek Valley consists of two general types. A freeholding status is the dominant one. This includes primarily the larger and earlier established growers, who own title to the land. Approximately 90% of all growers in the valley are freeholders. Beginning in 1915, location tickets, or the "pay as you grow systems," became the landowning status of a number of the small and/or more recent citrus producers.[31] According to A. C. S. Wright:

> . . . the location ticket gives no right to land beyond that of a mere tenant at will. The applicant is expected to develop at least one-half of the total area with permanent crops and to pay the purchase money for the land by ten semi-annual installments. . . . The price is established according to the quality and accessibility of the land. Advantages consist of: (1) a set period (five years) in which eventual transfer to freehold status is made after minimal conditions are met, (2) regulation of the distribution of Crown lands, (3) assurance of good land utilization, and (4) encouragement of distribution of small land parcels. The chief disadvantage is that no permanent survey is completed until the Crown grant of freehold status five years later.[32]

The two foreign-owned citrus processing companies were attracted to British Honduras and the Stann Creek

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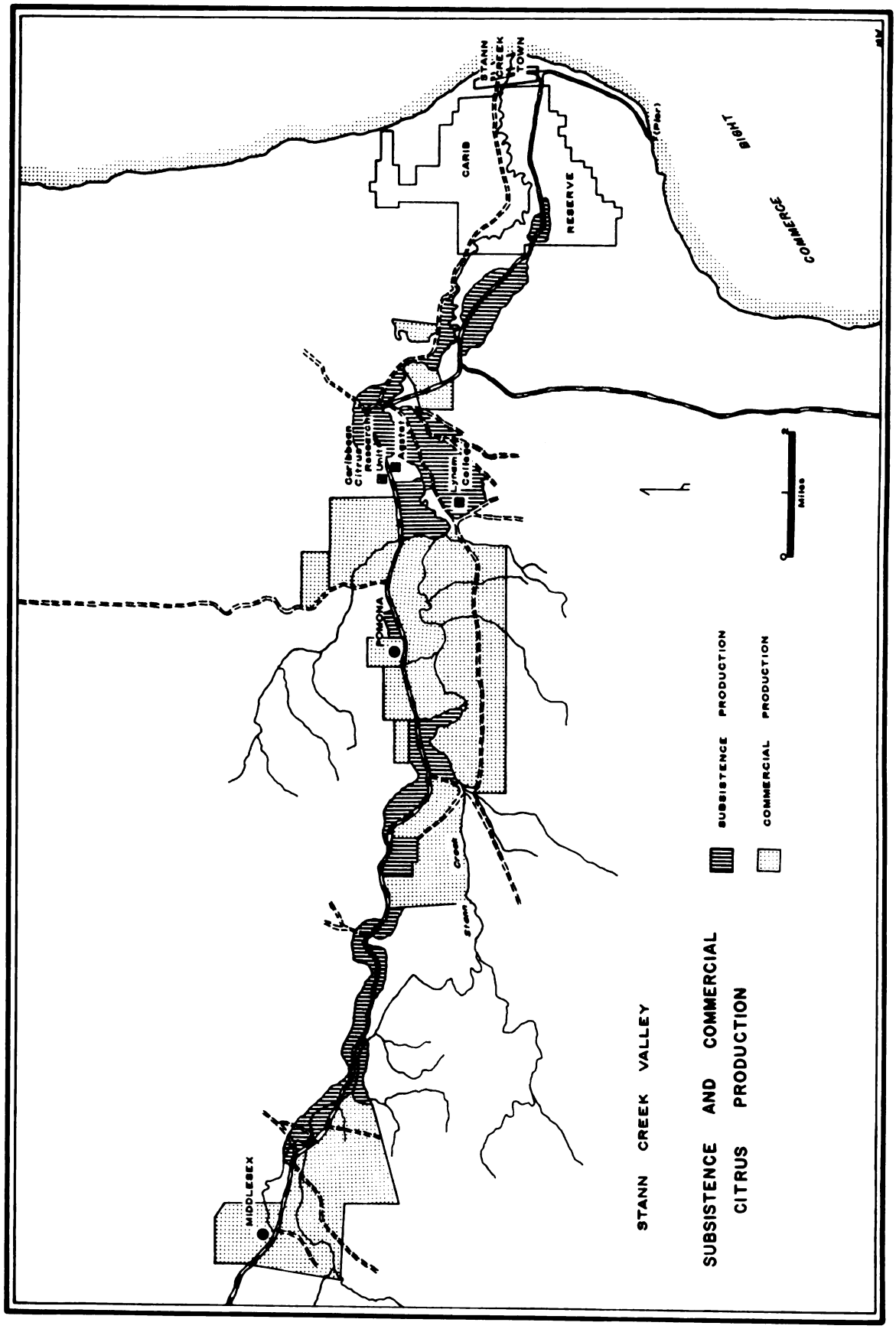
[30] See Appendix A.

[31] A. C. S. Wright, op. cit., p. 266.

[32] Ibid.


STANN CREEK VALLEY
SUBSISTENCE AND COMMERCIAL CITRUS PRODUCTION
SUBSISTENCE PRODUCTION
COMMERCIAL PRODUCTION
Miles
MIDDLESEX
DANGRIGA
STANN CREEK TOWN
CARIB RESERVE
COMMERCE BIGHT

Map 4

Valley by a number of factors. These included: (1) a frost-free climate with more than adequate rainfall for citrus production; (2) large tracts of fertile land available at low costs; (3) a stable government and monetary situation; (4) a British colony which adheres to Western ideology; (5) proximity to a port facility; (6) previous establishment of citrus; and (7) easily accessible water supplies. In addition, the Sharp interests established the processing factory for their Citrus Company of British Honduras at Pomona because this location, twelve miles from the coast, was at the center of the valley.

The two companies produce different end products, but both need assured fruit supplies to function at a profitable level of operation.[33] The Citrus Company of British Honduras processes fresh grapefruit for export in the form of canned sections and single-strength juice, and oranges as single-strength juice, sweetened orange oil, 60° brix concentrate,[34] and essential oils. The British Honduras Fruit Company, of Salada Foods, Inc., produces frozen orange concentrate for export in 65° brix. Both processing companies previously produced grapefruit concentrate for export in 58° brix, but this was terminated

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[33]Interview with Eric King, January 2, 1968.

[34]The degree of "brix" refers to the amount of fruit solids present in the processed concentrate, rather than the temperature of the concentrate.

by Salada in 1966 and by the Citrus Company in the 1967-68 agricultural season because of the decrease in market demand.

With both companies processing oranges, the demand for fruit is much greater than the supply. The older, more established Citrus Company receives a greater share of the annual orange production, although it usually offers at least BH $.30 per box less than Salada. This fact demonstrates the tie between the valley residents and the Citrus Company, which has become virtually a socio-economic institution.

If further expansion of citrus acreage takes place, or if present yields per acre increase, Salada will be able to operate at increased efficiency and profit. While the Citrus Company processes at full capacity, Salada operates at only 35 to 45 per cent of this figure. Since Salada is a fully automated unit, operation at less than 55 per cent of capacity means operating at a loss.[35] Approximately 400,000 boxes of oranges are necessary per season for economic production, but growers were expected to provide only 150,000 during the 1967-68 harvest. Instead of producing over 950 pails of frozen orange concentrate per twenty-four

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[35]Interview with S. A. Spross, Manager of the British Honduras Fruit Company, January 22, 1968.

hour, three-shift day, Salada was able to average only 400 pails in a twelve-hour, two-shift day.[36]

Citrus Cultivation

To supply the two processors with adequate quantities of fruit, further expansion of orchards or higher yields per acre are necessary. Each of these solutions, however, presents numerous problems. Both involve primarily financial considerations. Higher yields per acre are difficult to attain, due to poor agricultural practices by the great majority of producers. High yields, potentially greater than those obtained in Florida and California, cannot be achieved in the Stann Creek Valley until more scientific techniques, including disease and pest control, are practiced by the growers.

Planting Practices

In planting citrus, growers must take into consideration the various soil types and conditions. Deep, sandy soils are preferable, so that air can readily reach the tree roots and thus prevent gummosis and other fungus diseases. The Stann Creek Valley soils are generally sandy alluvium and therefore more porous than the heavier clay soils found elsewhere. The principal soils of the valley are shown in Map 5.

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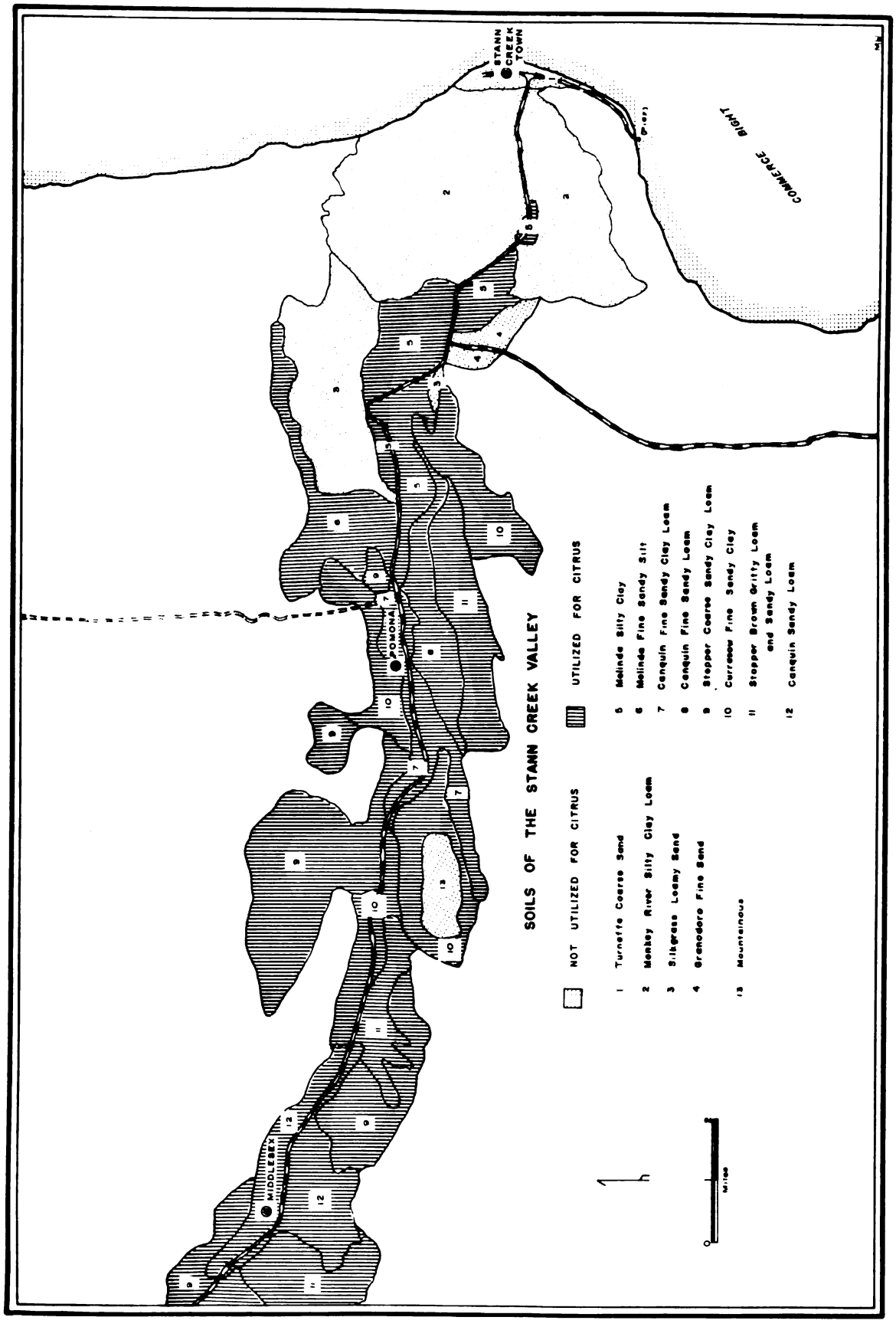
[36]One pail contains five gallons of frozen orange concentrate and weighs approximately fifty-one pounds.


SOILS OF THE STANN CREEK VALLEY
NOT UTILIZED FOR CITRUS
UTILIZED FOR CITRUS
1 Turnefte Coarse Sand
2 Monkey River Silty Clay Loam
3 Silkgrass Loamy Sand
4 Grandedre Fine Sand
5 Melinda Silty Clay
6 Melinda Fine Sandy Silt
7 Canquin Fine Sandy Clay Loam
8 Canquin Fine Sandy Loam
9 Stepper Coarse Sandy Clay Loam
10 Curreeow Fine Sandy Clay
11 Stepper Brown Gritty Loam and Sandy Loam
12 Canquin Sandy Loam
13 Mountainous
STANN CREEK TOWN
COMMERCE BIGHT
MIDDLESEX
DUMONAL
Miles

Map 5

Consideration must also be given to drainage. This is necessary so that excess water will be removed before it can cause damage to the trees. Tropical rainstorms are usually intense, and drains must therefore be constructed to handle large quantities of water. To insure good drainage, citrus rows should be cambered. The purpose of the mounds is twofold: (1) to make sure seedlings are above water, so as to prevent gummosis, and (2) to insure against attack by the Citrus Root Weevil (Pachnaeus litus), which rings the collar of young trees just below the ground surface.[37] Since drainage is also aided by sloping topography, many orchards have been planted on slopes ranging from 15° to 45°. Erosion is slight, due to the rapid growth of grasses among the trees.

Before citrus is planted, the natural vegetation must be cleared. Almost all growers clear their land by machinery especially adapted to this type of work. After the vegetation is cleared and burned, the ground is cambered in preparation for citrus. Due to the high annual rainfall, no supplemental irrigation facilities are required.

The actual planting of trees is conducted in four operations. First, seeds are planted in seedbeds. Then, when the plants are approximately three months old and at

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[37]M. K. Chopin, "Planting Your Citrus Groves," Radio talk by the Principal Agricultural Officer, December 2, 1964.

least four inches tall, they are transplanted to nursery beds. Three months later, when the plants are twelve inches tall, they are again transplanted to nursery rows. Finally, an additional six months later, the plants are budded and removed to orchard rows. During each of these steps, the weaker plants are discarded, with the result that only 40 per cent of the original number survive to the final stage.[38]

The following guidelines have been formulated by the Agriculture Office to aid growers in the care of new plantings:

1. Keep nurseries fertilized and free of weeds.
2. Select budwood from bearing trees which have yielded well for at least two years.
3. Do not use overgrown or discarded plants.
4. Stake plants after budding to insure straight growth.
5. Use only virus-free budwood.
6. Plant the citrus tree with the bud union eighteen inches above the ground so that any disease present in the soil cannot reach it.[39]

New citrus groves should be planted in cambered rows twenty-five to thirty feet apart, so as to allow plenty of space for root growth. Two months are required

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[38]Interview with Jaime Usher, a citrus producer in the Stann Creek Valley, January 10, 1968.

[39]Agricultural Service, Planting Citrus (Belize City: Government Printing Office, 1964), pp. 7-8.

for the plant to establish itself adequately. The best time for planting is in November, when the rainfall and soil moisture decrease and when there is little danger of hurricane damage. All planting must be done by hand.

Most citrus growers in the valley use scientific growing and budding techniques, except for the spacing of trees. Whereas horticultural research indicates the ideal spacing for grapefruit to be 30 by 30 feet, and for oranges either 30 by 15 feet or 24 by 24 feet, growers have used such measurements as 20 by 20, 18 by 18, 15 by 15, and even 12 by 12.[40] The purpose of closer spacing is to increase yields per acre. Severe problems of ventilation arise, however, when the trees reach maturity and the branches intertwine. Without adequate ventilation, the moisture in the orchard increases and gummosis becomes prevalent. The growers must usually then clear alternate rows of trees to reduce tree damage and loss. Thus, the profit gained through temporarily increased yield is eventually offset by diseases and tree removal. Only through empirical evidence of widespread diseases and rising maintenance costs in the closely spaced orchards have proper spacings been adopted, and that by only a small percentage of the growers.[41]

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[40] Ibid., p. 8.

[41] Interview with Alberto Navarette, District Agricultural Officer, Stann Creek, January 5, 1968.

Fertilization

A fertilizer program requires variation only for exceptional soil groups in the Stann Creek Valley, since climatic conditions in the valley are relatively homogeneous. The amount and quality of the citrus crop are not determined solely by the ratio and rates of nutrients used, however, but are also influenced by cultural practices and the environmental conditions of previous years.

Deficiencies in citrus nutrients, which include nitrogen, phosphorous, magnesium, potassium, plus minor traces of boron, zinc, iron, copper, manganese, molybdenum, calcium, and sulfur, are readily recognized through leaf and soil analyses. Leaf analysis indicates the ability of a plant to obtain nutrients from the soil, whereas a soil analysis indicates the reserve of plant nutrients available.[42] Together, these analyses reveal the amounts of nitrogen in the soil, whether or not the producer is applying the correct nutrients, and whether or not the grower should use acidic or alkaline nitrogenous fertilizers. Analyses are necessary to keep the orchards productive, to anticipate nutritional problems before they occur, and even to reduce fertilizer costs.[43]

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[42]C. C. Weir, A General Citrus Fertilizer Program, Citrus Research Bulletin No. 8 (St. Augustine, Trinidad: University of the West Indies, October, 1967), p. 1.

[43]C. C. Weir, Leaf and Soil Analyses as Guides for Citrus Fertilizer Practices in the West Indies, Citrus Research Bulletin No. 1 (St. Augustine: University of the West Indies, 1966), p. 1.

The Agricultural Service lists the following soil nutrients and their deficiency effects:

1. Nitrogen: uniform loss of chlorophyll (chlorosis) occurs.
2. Phosphorous: smaller trees and leaves than normal, and the fruit is rough and coarse with a thick rind.
3. Potassium: no affect on yield, but acids and juices are reduced, and oranges have smaller and thicker rinds.
4. Magnesium: affects yields only when extremely deficient, but leaves become yellow.
5. Boron: brown colors in the rag and rind of the fruit, and the rind becomes thick. Fruit drop also occurs.
6. Zinc: leaves become smaller, and white patches appear between veins of the leaves. Yields are reduced.
7. Lime: "lock-up" of nutrients by acidic soil, so they are not available to plants.
8. Copper: rust spots appear on the branches and fruit.
9. Iron: yellow-brown colored leaves and pronounced leaf veins develop.
10. Manganese: yellowish colored leaves predominate.[44]

Concerning citrus nutrients, the University of the West Indies Citrus Research Unit reports that:

> The content of trace elements is rather low in most citrus producing areas in the West Indies and British Honduras. The conventional method of estimating the nutrient status of citrus trees is by determining their total content in appropriate leaf samples. . . . There exists, however, a "symptomless deficiency zone" where

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[44]Agricultural Service, Citrus Fertilizer (Belize City: Government Printing Office, 1964), pp. 2-11.

> trace element content is low, but there is no corresponding deficiency symptom appearing. Another limitation to visual diagnosis is the danger that the effects of diseases, insects, water shortage, waterlogging, or even sun scorch may be confused with nutrient deficiency symptoms.[45]

Application of fertilizers should follow certain basic principles. With younger trees, fertilizers should be applied along the tree drip circle (the extent of the branches) or just outside of it. Fertilizer, when used for older trees, is spread over the entire ground surface because of the wider root systems. Fertilizers are applied twice each year, six weeks before the first blossom and six weeks after the second blossom.[46] The correct mixture for trees ten or more years old is approximately 700 pounds of calcium nitrate per acre per year, or 500 pounds of 21 per cent nitrogenous fertilizer, 200 pounds Triple Super Phosphate, and 100 pounds Muriate of Potash.[47] Fertilizer application for bearing trees also depends upon the average number of boxes of fruit obtained per tree. Non-bearing or very young trees require variable applications, according to age (Table 6).

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[45]Citrus Research Unit, University of the West Indies, Citrus Research, 1966 (St. Augustine, Trinidad: University of the West Indies, 1966), p. 39.

[46]Oranges bloom December-January and April-May, while grapefruit bloom February-March and May-July.

[47]Agricultural Service, Citrus Fertilizer, p. 7.

TABLE 6

ANNUAL FERTILIZER APPLICATIONS
FOR YOUNG CITRUS TREES

Tree Age	Number of Applications	Quantity per Tree per Application (pounds)	Total per Tree (pounds)	Quantity per Acre (pounds)
1	4	.25	1	100
2	4	.50	2	200
3	3	1.00	3	300
4	2	2.00	4	400
5	2	2.50	5	500
6	2	3.00	6	600

Source: Planting Citrus, British Honduras Agricultural Service.

Soil and leaf analyses are not readily available to citrus growers in the valley, due to the large capital outlay and trained personnel requirements. Also, many growers simply do not follow recommended practices. Only the larger producers fertilize their orchards, and then only at irregular intervals. Most of the smaller ones cannot afford the cost of fertilizers, which have to be imported, and they, therefore, do not realize the benefits to be gained. Without fertilizer, citrus yields in the valley are only about one-half of what might otherwise be expected.

An interesting technique is employed by the Citrus Company of British Honduras, in which mashed orange rind is applied to add nutrients to the soil. Unfortunately, this also results in an increase of the Mexican Fruit Fly (Anastrepha ludens). This fly attacks not only the fruit of the CCBH, but also that in neighboring orchards, thus decreasing production throughout the valley. The disposal of citrus waste should probably be accomplished by some other method, such as in compost piles or in feed for cattle.

Maintenance and Sanitation

High temperatures, rainfall, and humidity make the control of grasses and weeds a more serious and continuing problem in the tropical Stann Creek Valley than in subtropical citrus growing areas.[48] To insure at least minimum acceptable yields, orchard maintenance and sanitation are prerequisites. Otherwise, grasses and weeds rob the citrus trees of the soil nutrients that are necessary for adequate growth and fruit production.

Since grasses and weeds in the citrus orchards grow approximately eighteen inches every six weeks, various control devices are necessary. The common method, used by

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[48] I. Kasasian, Weed and Grass Control in Citrus Groves, Citrus Research Bulletin No. 3 (St. Augustine, Trinidad: University of the West Indies, 1966), p. 1.

almost all growers, is bush-hogging and cutlassing. Pulled by a tractor, several mowers cut the grass at approximately one acre every fifteen minutes. Cutlassing involves the use of a machete to cut the remaining vegetation surrounding the trunks of the citrus trees. The cost of this operation, employed every six to seven weeks, is relatively inexpensive: BH $3.25 per hour without cutlassing and BH $6.00 with the added labor. This explains its widespread use.

Chemical weedkillers, recommended by the Caribbean Citrus Research Unit in the Stann Creek Valley, should probably be used for orchard maintenance, although there is a lack of agreement on this point on the part of personnel of the Agricultural Station. If these chemicals were employed, the principal advantages would include the following: (1) tree stems are not damaged (making entry points for pests and diseases) as in cutlassing; (2) weedkillers can be useful on land too stony, too rough, or too steep for machines; (3) weedkillers can be combined with insecticidal or fungicidal ground sprays; and (4) long-range costs of weedkillers is less than that of bush-hog operations.[49]

There are three types of weedkillers available to valley citrus producers:

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[49] I. Kasasian, op. cit., pp. 1-2.

1. Contact foliage treatments (chemical cutlasses): kill only those parts of a plant with which they come into direct contact and are most effective on young weeds and softer growth in shade. Effective control is from one to two months, but spray drift must be avoided by the operator when spraying is being done.

2. Systemic foliage treatments: chemicals absorbed and travel throughout the plants, killing shoots and roots of susceptible plants. Therefore, the plants do not send out fresh growth. Best results are obtained in shade, the effects lasting two to four months. These sprays are slow-acting, and rain decreases their effectiveness.

3. Soil-acting (residual) treatments: act through soil where residues prevent growth. Best results are obtained if the spray is mixed with either of the above. These treatments are most active on young annuals, being very effective in preventing germination of weed seeds, and have telling results for three to six months.[50]

Weed control is one of the growers' biggest items of expenditure, and though weeds aid in preventing erosion, they also compete with the citrus trees for soil nutrients, sunlight, and water.[51] For a single application, weed-killers are likely to cost about the same as bush-hogging and cutlassing. Once started, however, costs of the former operation fall progressively, whereas those of the latter remain constant. The more effective weed control by chemicals can result in substantial increases in citrus yield.

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[50] Ibid., pp. 2-3.

[51] Interview with R. N. Wedderburn, Agronomist, Caribbean Citrus Research Unit, Stann Creek, January 6, 1968.

Chemical weedkillers have not been adopted by valley producers, due to the fact that no precedent has yet been established. The inertia of the smaller producers will not be broken until the large growers utilize this technique.[52] The passiveness results not only from the success of the traditional practice of cutlassing, but is also a matter of economics. Cutlassing has been the mode of orchard maintenance since citrus production began in the valley. All weedkillers would have to be imported, and spraying apparatus would probably have to be rented either from the Agricultural Station in the valley or from one of the three largest producers (CCBH, Salada, or Henry Bowman). The cost of spraying weeds and grasses is therefore prohibitive to most of the smaller growers, unless they own equipment cooperatively, and even the larger growers consider it more profitable to use the older bush-hogging and cutlassing techniques. If citrus prices increase to the extent that a greater profit can be realized, and large producers adopt chemical weedkilling, the smaller growers will no doubt overcome their bias toward scientific methods of orchard maintenance.

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[52]A survey of fifty growers, by the author, revealed that thirty-seven will not use this method of orchard maintenance until either the CCBH or H. T. A. Bowman attempt weedkiller sprays and prove their usefulness. Eleven growers said they would not use the sprays at all, and two growers would use the sprays if they could afford the cost.

Orchard sanitation involves not only weed and grass control, but, more significantly, the general upkeep of the trees and grounds. In other words, annual pruning and disposal of defective fruit are integral parts of citrus cultivation. Pruning is necessary to prevent dead or dying wood from damaging other limbs or fruit and to stimulate fruit production. Any fruit drop that occurs must be collected to prevent pests and diseases from using the decaying fruit as a host. Unfortunately, few producers give adequate attention to sanitation problems. Among fifty growers interviewed in the Stann Creek Valley, controlling over 3,000 acres of citrus, only thirteen, with approximately 900 acres, followed sanitation procedures as recommended by the Agricultural Station and the Caribbean Citrus Research Unit. "Subsistence" production of citrus as a secondary source of income is especially subject to inadequate orchard sanitation.

Harvest

The harvest of grapefruit and oranges is accomplished at different times and by different means. Grapefruit trees bloom twice, February-March and May-July, and the fruit matures seven months later. The fruit is harvested by two persons, a picker and a catcher. The actual picking is done with a thirty-foot pole, with snippers attached, the fruit being cut at the stem and caught by the catcher before it falls to the ground. Grapefruit is

harvested from September to February and totals approximately 200,000 boxes per year, each box weighing eighty pounds.

The variety of orange tree determines the month of blooming and the period of time before maturation. Early oranges, the Washington Navel and Hamlin, bloom April and May and mature eight months later. The late variety, the Valencia, blooms in both December-January and April-May and takes eleven months to mature. All oranges are picked by hand, from aluminum ladders which are used to avoid damaging the trees. The harvest takes place from the end of September to early May, and the yield is nearly 800,000 boxes of ninety pounds each.

Grapefruit and oranges differ in volume of yield. Grapefruit yields range from 200 to 300 boxes per acre, depending upon the variety, tree density, age and quality, and soil fertility. Yields generally average about three boxes per tree, with eighty to ninety fruit comprising each box. While the yield in boxes per acre for oranges is near that of grapefruit, many more fruit (100-130) comprise a contract box. There are also more trees to an acre than in the case of grapefruit.[53] The average yield of oranges is 1.8 boxes per tree, or one-half the Florida average, and

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[53]There are commonly 70-75 grapefruit trees and 100 orange trees per acre.

far below the potential of six boxes if scientific methods were employed by citrus producers.[54]

Trees are usually six years of age or older before they bear enough fruit to harvest, although younger trees can produce commercially if planted on fertile soils. Maximum yields of oranges are achieved from trees that are eight to twelve years old, and decreasing yields then occur until the trees become unprofitable at about twenty-five years of age. Grapefruit trees, however, offer a profitable harvest until thirty-five years of age.

Harvest operations are complicated by the absence of an adequate labor force. Whereas most of the small growers help one another, the larger producers are continuously seeking laborers throughout the harvesting season. The recruitment of labor from the neighboring district of Cayo has been necessary for the Citrus Company since its great increase of orange plantings during the 1950's. Both the British Honduras Fruit Company and the Citrus Company attract harvesters from Stann Creek Town, as well as from rural areas of the valley. Labor recruitment adds to harvesting costs, since the companies must provide most workers with daily transportation to and from the job. Housing is sometimes supplied, particularly to workers

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[54]Interview with Dr. Gordon Maliphant, Director of the Caribbean Citrus Research Unit, University of the West Indies, January 25, 1968.

from the Cayo and Toledo Districts, so some construction has taken place at Pomona and Middlesex.

After picking, the fruit is brought to a grove location where it is put into boxes. The boxes are then placed on a tractor-drawn trailer or carried by hand to a roadside location to be collected by the processing company with which the producer has a contract to sell his fruit. From here the fruit is taken to the factory, by truck or tractor, where it is processed.

Citrus Processing

The two citrus processing companies of the Stann Creek Valley produce different end products (Figs. 5 and 6). Those of the Citrus Company of British Honduras include canned grapefruit segments, single-strength grapefruit and orange juice, juices for the soft drink industry, essential oils, and concentrates of orange juice. The British Honduras Fruit Company produces only frozen orange concentrate, although frozen grapefruit concentrate was also produced until the 1966-67 season. While frozen concentrate better maintains the flavor of the natural fruits, the high cost of factory equipment is a disadvantage.[55] The factory in this case required an investment of approximately BH $500,000.

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[55]Great Britain, Caribbean Commission-Central Secretariat, Caribbean Market Survey: Citrus, p. 7.

Figure 5. Grapefruit canning by the Citrus Company of British Honduras. Women comprise the entire labor force in the tedious task of hand cutting and packing the fruit. The two workers in the center examine each fruit-filled can for citrus worms before it is conveyed to the cooking and sterilizing unit.

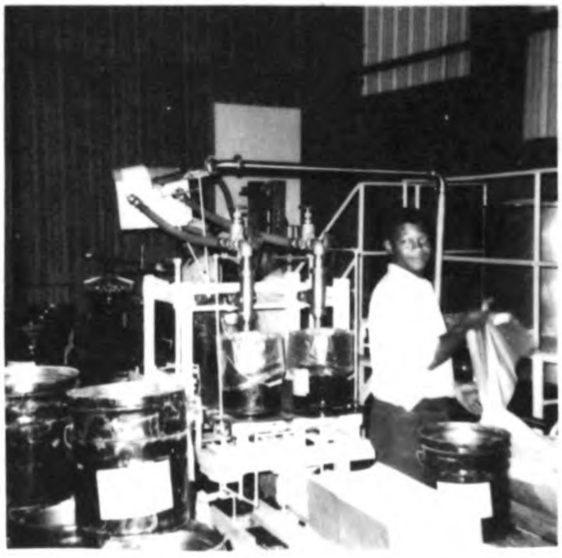

Figure 6. Filling five-gallon pails with cold orange concentrate at the plant of the British Honduras Fruit Company (Salada). The automatic filling device epitomizes the completely automated, modern technology of this company.

The BH $160,000 canning plant of the Citrus Company processes 150 cases of canned grapefruit sections per hour, each case consisting of twenty-four twenty-ounce cans. Grapefruit are placed in baskets, an average of twelve fruit in each, and dipped in hot water. The skins are then easily removed. After a bath in alkali solution to eliminate the pith, the grapefruit are cut into sections and packed in cans by hand. The cans are then sent through a cooker and sterilizer by conveyor, and finally sealed and packed for shipment.

Oranges are stored in wooden bins until they are ready for processing (Fig. 7). Then, by a series of machines, they are washed, bisected, and squeezed (Fig. 8). The juice flows into a series of vibrating stainless steel containers, which separate pulp from the juice, and is then piped to an analyzing room for brix determination and a decision on the amount of sugar required. Water is evaporated from the juice, and the necessary sugar is added. Finally, the warm concentrate is sealed in metal barrels for industrial soft drink purposes or in twenty-ounce cans for consumer sale.

The British Honduras Fruit Company uses the most modern techniques in the processing of oranges into frozen concentrate. As with the Citrus Company, the oranges are stored in wooden bins, which are limed to prevent mold. The fruit is washed and then proceeds to a completely

Figure 7. Unloading oranges for storage before processing. The shaded, wooden storage bins are in the background.

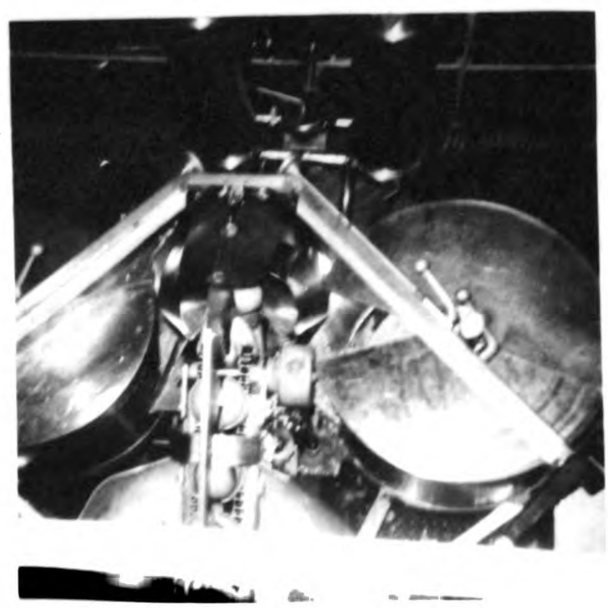

Figure 8. Juice extraction from oranges by the Citrus Company of British Honduras. Plant equipment and operation represent the juice concentrate technology of 1948.

automated unit. Juices are squeezed from the oranges by a machine which cuts inside the rind and crushes the orange. There are six machines of this type, graded according to size of oranges, and each machine operates at the speed of five oranges per second. The juice flows to stainless steel containers, which separate the pulp by vibration. The water content is reduced by evaporation. Through a thermodynamic process, the remaining juice is cooled to approximately 40° F. The amount of sugar necessary for the concentration is determined and automatically added. The sugar is blended in while the temperature drops to 16° F. Metal five-gallon pails are lined with plastic bags, placed on a platform scale set at the prescribed weight, and filled with chilled orange concentrate from overhead pipes. When a weight of fifty-one pounds is attained, the valves automatically close. The lids are then clamped on the pails, which are taken into the refrigeration unit maintained at a temperature of -25° F.

Waste products from fruit processing are handled differently by the two companies. The Citrus Company collects the waste, grinds it up, and spreads it over the orchards to serve as fertilizer. Salada also grinds its waste material, but dumps it in a compost pile a few miles into the jungle. Both methods have the disadvantage of raising the incidence of Mexican Fruit Fly in the valley.

Both companies obtain water from the Stann Creek river system. The Citrus Company pumps water directly from the main stream, while Salada has ponded a tributary. Both purify the water before use by means of a charcoal-sand filter system. Since processing of the citrus adds little pollution, the water can be returned directly to Stann Creek.

The concentrating and canning machinery of the Citrus Company was installed in 1948, and no new additions have been made. Thus, the machinery represents a technology of twenty years ago. In contrast, the British Honduras Fruit Company uses the most advanced technology and can therefore process fruit more rapidly, cheaply, and efficiently. Of course, this is true only if both processors operate at capacity. If the Citrus Company operates at capacity and Salada functions at only 40 per cent, the former easily has an economic advantage.

Transportation and Marketing

Transportation and marketing are integral features of the citrus industry of the Stann Creek Valley. Citrus production and processing require a road network to bring the fruit to the processors and to transport the end products to storage areas and to Commerce Bight, the port for Stann Creek. Marketing of the citrus products is a constant problem shared by both processing companies because of the

intense competition presented by citrus from other producing countries. Transportation and marketing difficulties increase the cost of production and processing. Expansion of citrus acreage within the valley will be aided greatly by planned improvements and future developments.

Transportation of citrus products is solely by road. A railroad once extended from Pomona to Commerce Bight, but this was torn up and the materials used for construction purposes after a disastrous hurricane. Stann Creek Road is the major artery. It has an asphalt surface and extends for fifty miles from Commerce Bight northwestward to Roaring Creek, the new national capital site. Feeder roads, totalling about seventy-five miles in length, have earthen surfaces and extend to economically important areas of the valley. The citrus orchards are therefore accessible by truck. The use of tractor-trailer units is less common.

The port facility for the export of citrus products is at Commerce Bight, two miles south of Stann Creek Town. This location is thirteen miles east of the Citrus Company plant and sixteen miles east of Salada's. Docking facilities are poor and accommodate only ships with less than twelve-foot draft. Ocean-going vessels of twenty-foot draft, used by the CCBH, must anchor about a mile offshore and are serviced by lighters (Fig. 9). Salada owns and uses converted LCT's and LCI's, which can tie up at the

Figure 9. British freighter at anchor at Commerce Bight. Due to shallowness of the water, ocean-going vessels anchor approximately one mile offshore and are serviced by lighters.

Figure 10. Loading barges at Commerce Bight, the port facility for the Stann Creek Valley. All labor is by hand, and each truckload from the Citrus Company of British Honduras (usually 500 cases of canned grapefruit sections) is transferred in approximately fifteen minutes.

dock. This, of course, decreases its transportation and loading costs.

Due to the differing locations of anchorage, loading methods and costs differ between the two processors. Salada transports frozen orange concentrate by truck from its factory to the dock, paying private drivers BH $7.50 per trip. At Commerce Bight the refrigerated LCT or LCI is loaded by hand. Since truck capacity is only five tons, loading the ship takes approximately two days and one night.

The Citrus Company loads trucks with citrus products from its warehouses at Pomona and Stann Creek Town, the private truckers being paid BH $7.50 per trip from Pomona and BH $3.00 from Stann Creek. All labor is piece work with established wages. Since lighterage is necessary, the cargo is unloaded from the trucks to barges (Fig. 10). Only two barges can anchor at the dock, but each has a capacity of 5,000 cases or ten truckloads. The barges are towed by a tug to the ship, which operates out of Liverpool, England, making Belize City and Commerce Bight the last stops after Kingston, Jamaica, and Tampico and Veracruz, Mexico.[56] If no weather problems arise, the ship can be

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[56]The tug and barges are rented from the Belize Estate and Produce Company at a rate of BH $150.00 per day of twenty-four hours for the tug and BH $75.00 per day for the barges. Travelling time from Belize City is also included.

loaded within three days, but poor weather conditions and rough seas cause smaller barge loads, longer loading times, and more costly charges for the ship.

The Commerce Bight port facilities are badly in need of improvement, and plans are being formulated for future development. Tidal and shore currents cause silting, and dredging is necessary to allow ships and barges to dock. Hoping to achieve a hurricane-proof facility, the government of British Honduras has initiated construction of a 600-foot pier out to a depth of twenty-two feet. The total cost is estimated at BH $300,000, but only BH $20,000 has been allotted annually because of concurrent construction costs of the new capital city. Completion by 1972 is proposed, but work on the project is currently suspended.

A new deep-water port is proposed for the Northern Lagoon, approximately twenty-five miles north of Stann Creek Town. This facility would handle all ships currently serving British Honduras and would reduce transportation and labor costs for the processors. Regular shipping schedules might then be established, since excessive loading times and other difficulties would be diminished. A road from this complex will extend southward to Stann Creek Town and connect with the Stann Creek Valley Road.

Shipping from Commerce Bight to foreign markets takes place predominantly during the latter months of the agricultural year (January to July), when peak production

is attained by the processors (Table 7). During the winter months Salada exports from Commerce Bight to Tampa, Florida, since the St. Lawrence Seaway is closed until mid-April. From Tampa the exports are transported in bond to Toronto by refrigerated Thermo-King tractor-trailer units. When the Seaway opens, shipments move directly to Hamilton, Ontario, for distribution.

TABLE 7

CITRUS PROCESSING AND SHIPPING BY THE BRITISH HONDURAS FRUIT COMPANY (SALADA), 1965-1966

Month	Oranges processed (90-lb. boxes)	65° brix produced (gallons)	Shipments (5-gallon pails)
September	---	---	---
October	4,389	2,614	---
November	4,298	4,194	---
December	---	---	---
January	28,757	22,800	9,716
February	47,671	40,206	---
March	81,568	67,968	12,998
April	88,823	68,106	14,500
May-June	78,063	68,696	25,000
July	---	---	---
August	---	---	---

Source: Annual Agricultural Report, 1966, British Honduras Agriculture Department.

Shipping problems are the concern of both processing companies. Since no regular schedule exists for Commerce Bight, the processors are somewhat dependent upon the whims of shipping companies and the availability of space on cargo vessels. However, a ship can usually be secured, in view of the high profit to be gained.[57] Added to the costs of irregular shipping schedules are transportation to, and maintenance of, storage facilities.

The two companies not only produce different end products, but also export to different markets. Salada's market is solely North America, chiefly Canada, while those of the Citrus Company include the United Kingdom, Fiji, France, and the West Indies. Neither of the companies process citrus products for the domestic market, although some fresh fruit is sold by individual growers for distribution to Belize City.

The Citrus Company markets its products through two sales agents in London, while Salada sells through its sales department in Ontario. The sales agents for the former are F. Kassel and Company and the McPheason Trading Company, Ltd., and their commission is 5 per cent of the selling price. Subsequent distribution of the citrus products depends upon conditions in the United Kingdom and foreign markets. Canned grapefruit sections are generally

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[57]Interview with S. A. Spross, January 22, 1968.

consumed in the United Kingdom, but single-strength grapefruit juice is re-exported to Fiji and the West Indies. Orange concentrate is marketed in the United Kingdom, the Ministry of Food purchasing 15 to 20 per cent of the total. Single-strength juice is shipped to the West Indies, while essential oils are shipped to France, Trinidad, and, at times, to Canada and the United States.

Summary

Citrus production and processing in the Stann Creek Valley are handicapped by economic, social, and physical problems and are currently in a static condition. Modern technology has come to the valley, where it has clashed with the traditional "milpa mentality." Because of the latter, modern horticultural research and techniques have largely been ignored, except when proved to be of value by the large growers. But, some of these leaders, such as the Citrus Company of British Honduras, also use poor agricultural practices. If scientific methods of producing citrus can be achieved, and if modern port facilities and transportation networks are constructed, perhaps the economic problems of citrus production can be resolved. The following chapter analyzes the problems of production and processing, and prospects for expansion of the citrus industry in the valley.

CHAPTER IV

PRODUCTION AND PROCESSING PROBLEMS

Agriculture in the tropics is subject to certain adverse physical conditions not encountered in other parts of the world. With respect to citrus cultivation in British Honduras, conflicting viewpoints and inadequate information further complicate the evaluation of potential development. Difficulties are reflected in a lack of communication between government personnel promoting modern technology and the growers practicing traditional agricultural methods. Finally, production is hindered by a lack of experience and the limited financial resources of the growers. The important tasks of developing contacts with the many small farmers, of acquainting them with the basic principles of modern agriculture, and especially of inculcating such principles in the more receptive younger generation are vital to any agricultural endeavor or governmental program.[58]

Although British Honduras has the best natural conditions in the Caribbean area for citrus cultivation, the

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[58]David L. Gordon, The Economic Development Programme of British Honduras (Washington, D. C.: International Bank for Reconstruction and Development, 1955), p. 14.

Stann Creek Valley producers and processors are plagued by a series of interrelated physical, social, and economic problems.[59] Any proposals for future expansion of the citrus industry must take into consideration the integrated effects of such factors as climate, soils, pest and diseases, tradition, market conditions, and financial resources. The solution of problems related to these factors would lead to greater productivity and prosperity for the industry.

Physical Problems

Factors of climate, vegetation, topography, and soils affect the location of citrus orchards within the Stann Creek Valley. The employment of modern technology, however, can decrease the effects of any detrimental conditions. If there is widespread adoption of scientific land clearing techniques and modern horticultural research, citrus yields in the valley will increase significantly and producers will realize a profit on their initial investment. But the profits accrued from greater citrus production must be reinvested for a period of at least five years, if high levels of citrus quality and quantity are to be assured.[60]

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[59] J. Henry Burke, Citrus Industry of British Honduras, Jamaica, Trinidad, Foreign Agricultural Service, Report No. 88 (April, 1956), p. 1.

[60] Interview with Alberto Navarette, District Agricultural Officer, Stann Creek, January 5, 1968.

Site selection for citrus orchards involves the following considerations:

1. Access: Because citrus products are bulky, good roads are necessary for transportation to processing plants and to the port facility at Commerce Bight.

2. Topography: Level or undulating land is best suited for citrus cultivation and permits the use of machinery.

3. Soil: Deep, fertile, well-drained loams are ideal for citrus production.

4. Vegetation: The existence of jungle growth makes land clearance difficult and costly.

5. Rainfall: A minimum of sixty inches is necessary, unless supplementary irrigation is possible. A short drought is desirable to insure good blossoming.

6. Sunlight: Citrus requires a maximum exposure for best production.

7. Wind: Tree growth is hindered by continuous high winds, which disturb the moisture balance of the trees and leave them readily susceptible to insect attacks. Winds also result in branch and fruit damage.[61]

Accessibility

The Stann Creek Valley suffers no severe problems regarding access to local or foreign markets. Though shipping schedules are irregular, the citrus processors have adopted to this situation by producing solely products that can be kept in storage. Road conditions within the valley are adequate to enable maintenance machinery,

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[61] I. Hosein, Citrus Growing in Trinidad, Citrus Research Bulletin No. 7 (St. Augustine, Trinidad: University of the West Indies, 1966), pp. 3 and 4.

sprayers, and harvesters to reach the orchards. The asphalt, two-lane Stann Creek Road extends the entire length of the valley and connects with the Western Highway at Roaring Creek, fifty miles from Stann Creek Town, and with Belize City. All secondary routes converge on Stann Creek Road.

Such access problems as do exist are encountered primarily in summer when the effects are least detrimental. During this period the maximum monthly rainfall occurs, and rivers reach their highest levels. Since bridges exist only on the Stann Creek Road, the method of crossing most rivers is by fording them at shallow places. Due to heavy rainfall during the summer and early autumn months, the dirt feeder roads become impassable for vehicles at times (Figure 11). Fortunately, during the months from June to August the fruit is maturing and the only labor necessary is for spraying and maintenance, both of which can be accomplished whenever good weather conditions prevail.

Topography and Soils

Although topography is an important locational factor for citrus in subtropical climates, it is less significant in the tropics. Flat or nearly level land is a necessity in subtropical areas to reduce the effects of erosion and to provide ease of irrigation. But the Stann Creek Valley does not suffer serious erosional problems, though rainfall is more than adequate for citrus production.

Vegetation growth is rapid and luxurious among the citrus trees, which grow well on slopes of 30 to 45 degrees (Figure 2, p. 37).[62]

The alluvial soils of the Stann Creek Valley are generally sandy, deep, fertile, and free-draining, yet exhibit three characteristics which plague citrus producers. First, there is a significant variation of soil characteristics within any given area. The British Honduras Land Use Survey Team has mapped twelve soils within the valley (Map 5, p. 45). Second, due to the high annual rainfall and high relative humidity, the soils of the Stann Creek Valley exhibit excessive acidity. The optimum soil pH for citrus is from 5.5 to 6.5, while most soils in the valley are 5.0 or lower. Liming is therefore necessary to increase yields. Finally, soils in the valley tend to be deficient in manganese and zinc, and these minor elements must be added to the soils through fertilizer applications.

Vegetation

The heavy annual rainfall in the Stann Creek Valley results in luxurious vegetation growth. Since Hurricane Hattie, in 1961, most of the area originally in rainforest has been occupied by jungle growth, and prospective citrus producers are faced with greater land clearance problems

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[62] See Appendix B.

and rising costs. Once orchards are established, grasses grow among the trees and must be cut at least eight times per year. The grasses create a maintenance problem, yet are beneficial in that they aid soil aeration and stabilization.

Climate

In the location of citrus orchards, a primary concern of growers is suitable climate. The Stann Creek Valley offers the advantages of a frost-free climate, abundant rainfall, long hours of sunshine throughout the year, and a short drought period which stimulates blossoming. In addition, cold fronts from the North American interior decrease the temperature to daily averages of about 65° F. during the months November to April, thereby stimulating three growth and fruit production.

Winds and heavy rainfall are probably the most significant climatic problems affecting the Stann Creek citrus area. Winds of thirty miles per hour can result in fruit damage and drop, plus disturbing the moisture balance of the trees. The upper branches of orange trees are strained when winds in excess of fifty miles per hour are experienced. However, the compact nature of the orange trees makes them far less vulnerable to damage than are grapefruit trees. Very few citrus trees will be toppled even if winds attain hurricane force (seventy-five miles

per hour minimum), because of their intricate and extensive root system.[63]

Heavy rainfall can take place at any time of the year and result in reduced production. The greatest rainfall occurs in the late summer months in the form of thundershowers (Figure 11). These tropical storms cause blossom damage and, when the fruit is maturing, fruit drop and spoilage. An indirect result of heavy rainfall is the increase of fungus diseases and insect attacks on the citrus. The diseases and pests result from pools of water in the groves. Even with alluvial soils and good drainage techniques, the soil becomes saturated, and the excess water will neither drain off nor percolate downward. Fortunately, the valley has long hours of sunshine and a high rate of evaporation to aid in ridding the orchards of the surplus.

Relative humidity averages 85 per cent annually in the valley but causes few difficulties. However, grass and weed growth is stimulated, there is an increased incidence of fruit molds, and precautions must be taken in the storage of fresh fruit for processing. Both companies store fruit in shaded and ventilated wooden bins and process it as rapidly as possible. The British Honduras Fruit Company

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[63]Hurricane Hattie, which passed directly through the Stann Creek Valley, had winds of over 200 miles per hour. Yet, tree damage to citrus was very slight, less than one-half of 1 per cent.

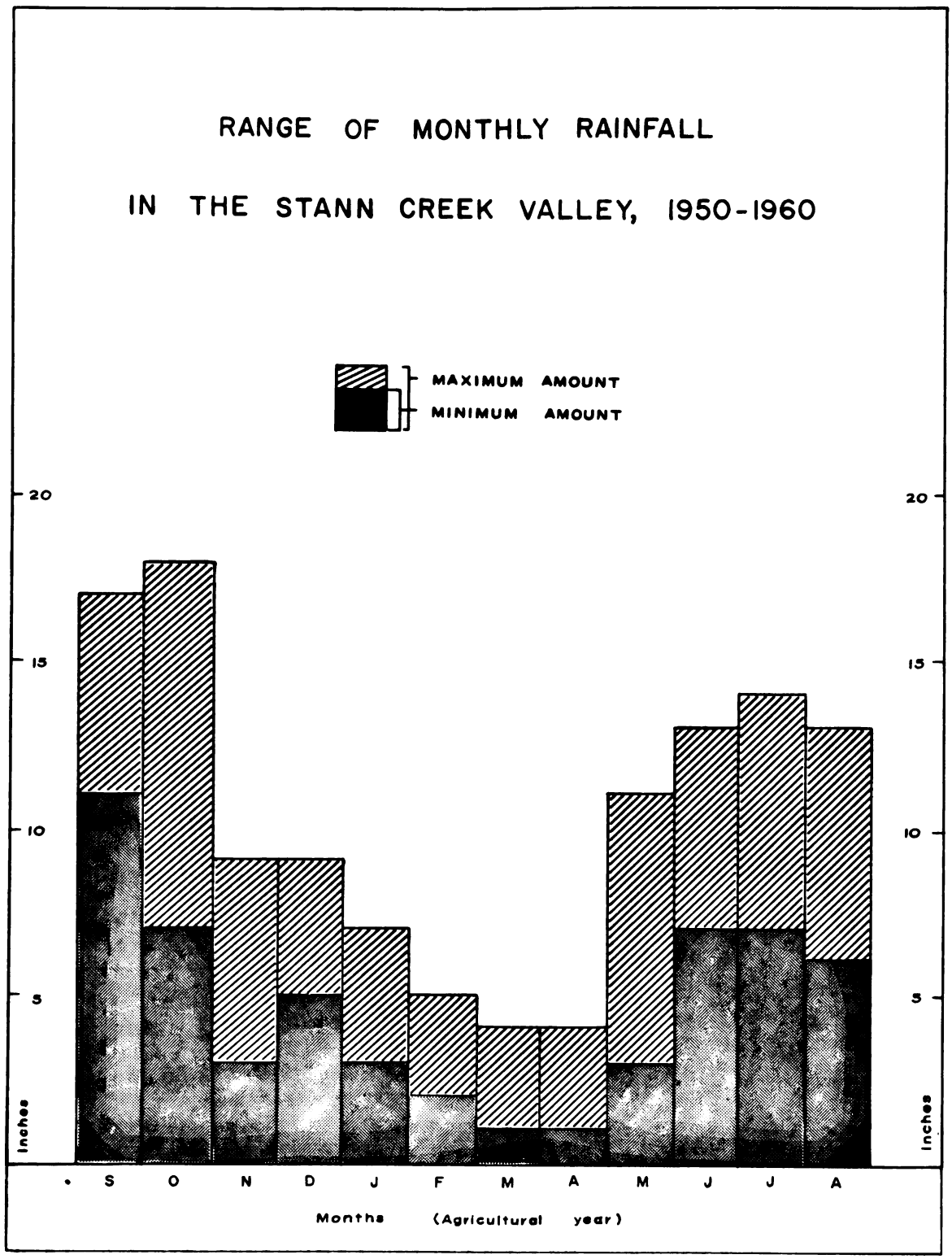

Figure 11

Source: British Honduras, Annual Agricultural Reports, 1950-1960.

also lines the sides and floors of its bins with lime to reduce the effects of humidity.[64]

Since British Honduras lies within the trade wind belt, the dominant wind direction of the Stann Creek Valley is from the east. During the months from August to early November, wind direction is from the southeast, and the valley is threatened by hurricanes. These tropical storms do not usually cause severe damage to the trees, but, depending upon the month of occurrence, can have devastating effects upon the annual fruit yield. If a hurricane occurs in August, all grapefruit will be lost, as will early oranges and many of the maturing fruit. Tree damage is generally slight, with grapefruit being more vulnerable than orange trees. The following year will see citrus yields nearly as high as before the disaster, but completely normal yields will not be achieved for approximately five years.[65] While hurricane losses are apt to be exaggerated, they must be regarded as a negative element in Stann Creek Valley agriculture.[66]

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[64]Interview with S. A. Spross, Managing Director, British Honduras Fruit Company, Stann Creek Valley, British Honduras, January 17, 1968.

[65]Ibid.

[66]F. L. Engledow, Report on Agriculture, Fisheries, Forestry, and Veterinary Matters (London: His Majesty's Stationery Office, 1945), p. 17.

Hurricanes affect the valley on the average of once every five years, and extensive damage occurs once every twenty to thirty years. While they present serious problems, no effective protective devices have yet been developed against the high-velocity winds. Unfortunately for the citrus producers, the hurricane track in the Atlantic Ocean and Caribbean Sea has been moving southward during the present century, and the Stann Creek Valley may therefore receive more frequent visits from devastating storms in the future.

While physical handicaps to citrus production in the valley are not excessive, they must be taken into consideration if further expansion of citrus acreage is contemplated. Most perplexing are the climatic problems, since growers have little control over such phenomena.

Social Problems

Citrus production and processing can be seriously affected by the social conditions and conflicts that exist among the people. Producers and processors must consider the cultural background of the population, if economic success is to be achieved. If traditions in a developing country are violated or ignored by foreign investors, economic ruin may result. Thus, before any foreign investment is made, a thorough study of economic, policital, and social institutions should be undertaken by qualified

personnel and their recommendations carefully considered by management.

A lack of harmony with cultural traditions is currently affecting the British Honduras Fruit Company of Salada Foods, Inc. Entering the valley during the 1962-63 agricultural year, without previous study of cultural factors, the company erected a fully automated factory. It was designed to operate at 70 per cent capacity, or more, with three eight-hour shifts daily, seven days a week. This alienated the local population by going against the following labor practices: (1) Thursday and Sunday of each week are days of rest, (2) no work is to be done after nightfall, and (3) automation is generally avoided, since it reduces the total employment. Further alienation resulted from the fact that Salada was a large North American "intruder" that had purchased extensive areas of land, expected the resident labor to flock to its facilities, and was opposed to operating as a socio-economic institution such as the Citrus Company had become. Residents of the area also feared that Salada might meet with total failure, as has happened to numerous other large foreign enterprises in British Honduras.

Since the disastrous agricultural year of 1966-67, when it offered growers only BH $.50 per box of oranges, the British Honduras Fruit Company has found itself in serious economic circumstances. Operating at only 35 to

45 per cent capacity, Salada is presently weighing the advantages of selling its property. Meanwhile, the Citrus Company of British Honduras has maintained a more paternalistic attitude toward producers and has consequently retained both their loyalty and a viable economic status. The social inertia of the growers is, in fact, a major complaint of government officials in British Honduras:

> . . . the citrus industry has lost the aggressiveness and determination that it showed in former years. Somewhere along the line, growers have lost the motivation that used to impel them forward. They have become complacent, even careless--and in a way reconciled to what amounts to an outmoded paternalistic system. One thing is certain, the old fire has gone.[67]

Another problem is the increasing antagonism between large and small growers in the valley. The Committee of Management of the Citrus Growers' Association consists of nine members, all of whom are elected by the full membership. Members of this committee, however, must together have produced at least 15 per cent of the total fruit delivered by producers to processors during the preceding year of operation.[68] This powerful committee is currently composed of three large growers and six small ones. The smaller growers, however, are increasingly aware of the inferior

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[67]Speech by A. Hunter, Minister of Natural Resources, at Research Day, Caribbean Citrus Research Unit, Stann Creek Valley, January 26, 1968. The Belize Times, February 4, 1968, p. 2.

[68]British Honduras, Citrus (Processing and Production) Ordinance, Section 27, p. 14.

economic and political position to which they have been relegated.[69] Henry Bowman, the third largest grower in the valley and the largest non-corporate grower, is Chairman of the Association and sole supplier of insecticides and fungicides. The Citrus Company of British Honduras has the only large-volume sprayer and allows only the large growers and company foremen to use it. With pests and diseases becoming of such great significance in citrus production, the conflict between large and small growers is likely to increase. The small producers will undoubtedly expect the large growers to pay most of the cost required to rid the valley of these problems. Finally, the small producers are most affected by the high cost of production and low prices, and they are thus most vocal in demanding higher prices by the processing companies.

Social problems are not foremost among citrus production and processing difficulties, but they do form an undercurrent of dissatisfaction. To operate an economic enterprise, producers and processors must contend successfully with local attitudes and customs. If contacts with modern production techniques continue, and citrus prices increase, perhaps the effect of existing conflicts will tend to decrease.

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[69]Interview with Dr. Gordon Maliphant, Director, Caribbean Citrus Research Unit of the University of the West Indies, January 27, 1968.

Economic Problems

Citrus production in the Stann Creek Valley has been increasingly affected by economic problems. Declining yields, rising production costs, a disregard for improved techniques, and low prices for citrus have all adversely affected the citrus industry. Other obstacles to development include: (1) poor communication facilities with Belize City, the economic focus of British Honduras; (2) a poor internal transportation system; (3) inadequate agricultural credit; (4) a shortage of harvesting labor; and (5) high incidence of pests and diseases within the valley.

The decline of prices for citrus has significantly affected the Stann Creek Valley growers. Since the growers must produce and processors must sell at competitive world prices, the following factors are relevant to profitable operation: (1) returns from the sale of citrus products; (2) quantity of fruit available for export; (3) the value of citrus by-products; and (4) the productivity of other citrus areas of the world. The latter factor is extremely important to the economy of the valley, and of British Honduras, since intense competition in foreign markets can drive local prices downward. The valley is a high-cost producer, and citrus is its leading export product. Low prices can therefore depress both the local and colony-wide economy. Figure 12 shows the effects of market competition

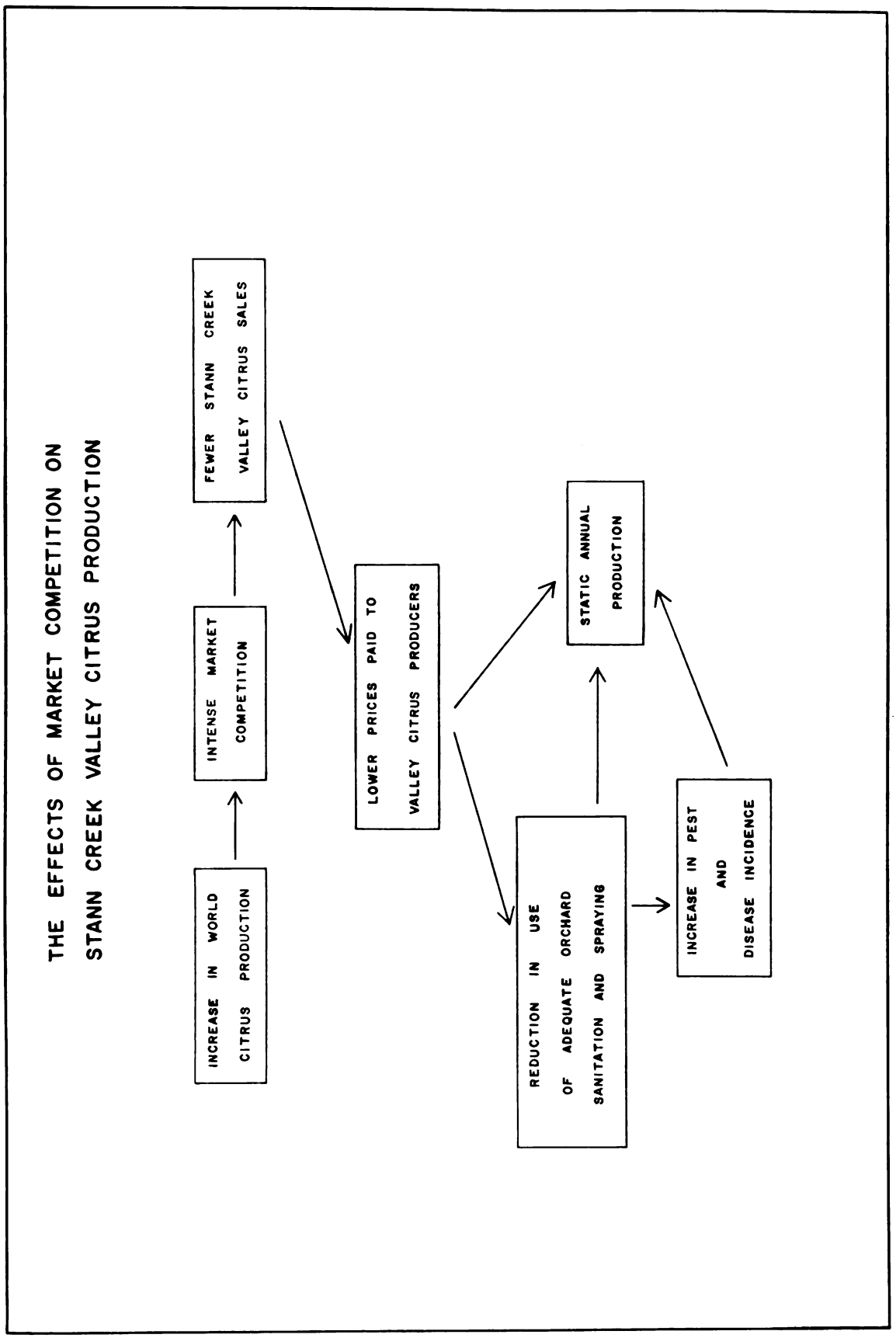
THE EFFECTS OF MARKET COMPETITION ON
STANN CREEK VALLEY CITRUS PRODUCTION
INCREASE IN WORLD CITRUS PRODUCTION
INTENSE MARKET COMPETITION
FEWER STANN CREEK VALLEY CITRUS SALES
LOWER PRICES PAID TO VALLEY CITRUS PRODUCERS
STATIC ANNUAL PRODUCTION
REDUCTION IN USE OF ADEQUATE ORCHARD SANITATION AND SPRAYING
INCREASE IN PEST AND DISEASE INCIDENCE

Figure 12

on Stann Creek Valley citrus prices and production and indicates the necessity for secure markets and stable prices.

Production Costs and Market Prices

Production costs have risen steadily during the past decade, while prices have fluctuated widely. At present, the cost of producing one box of oranges on farms of less than seventy acres is approximately BH $.80, due to the fact that some recommended horticultural techniques are not utilized (Table 8). The price paid by the Citrus Company of British Honduras, to which 90 per cent of the growers sell their fruit, is only BH $.85 to $.90 per box. Therefore, the cost of production is almost equal to the selling price, and for a sufficient profit to be realized, some agricultural investments, such as fertilizing and spraying, are sacrificed each year. Because of large-scale production and higher yields through the use of more intensive methods, farms of more than seventy acres can realize sufficient profits even at this price level.

By selling oranges to Salada, which is currently paying BH $1.25 per box, producers would achieve net profits approximating BH $25.00 to $30.00 per acre. This profit increase would be sufficient for growers to initiate horticultural practices that would serve to increase tree yield and production per grower and provide even greater profits. Though many growers might prefer to deal with Salada, they

TABLE 8

ANNUAL CITRUS PRODUCTION COSTS PER ACRE
USING IDEAL PRACTICES

Operation	Cost	Cumulative Total
Orchard maintenance	BH $48.00	BH $ 48.00
Fertilizers	30.00	78.00
Preventive sprays	20.00	98.00
Harvest operations	75.00	173.00
Citrus Growers' Association[a]	3.60	176.60
Citrus Research Unit[b]	6.00	182.60
Transportation to processors[c]	14.40	197.00*

[a]BH $.02 per box

[b]BH $.033 per box

[c]BH $.08 per box

*Total yield value for one acre of oranges with methods currently used is BH $153.00, since average per acre yield is 180 boxes and the average price is BH $.85 per box

Source: Dr. Gordon Maliphant, Director, Caribbean Citrus Research Unit of the University of the West Indies.

are unable to do so because of coercion practiced by the Citrus Company. Since the sterling market (United Kingdom) reacts to a completely different stimuli than the dollar area markets, price offers to growers can be made as early as August. The dollar area, however, reacts mainly to Florida and California production, and prices paid by Salada cannot be determined until late November or early December. To capitalize upon this time variable, the Citrus Company signed contracts with producers of oranges in September of the 1967-68 agricultural year. If any producer did not

agree to sign, the company would neither buy that grower's grapefruit nor oranges at a later date. Thus, only those growers who produced solely oranges and were willing to gamble could wait until Salada announced its prices. It was these producers who comprised the 10 per cent of valley growers who contracted their produce to the British Honduras Fruit Company.

The government of British Honduras has encouraged growers to sell citrus almost equally to both processors, for the two market areas, for the following reasons:

> 1. The United Kingdom may gain entry into the European Economic Community, and that presently assured market would no longer be of free access to growers.
>
> 2. Hard currency (dollar area) prices, though they do fluctuate widely, are generally higher than sterling prices. Growers should therefore sell to these markets to gain larger profits and to reduce the trade deficit that exists with the dollar area.
>
> 3. Having two foreign-owned processing companies in the valley is good for the colony's economy and should benefit the growers in the form of higher prices for their fruit if free competition exists.[70]

Although selling citrus to the dollar area market through Salada is more profitable, the fluctuating prices annually offered to producers precludes any economic planning by the growers. Beginning in the 1962-63 agricultural year, Salada has offered the following prices per box of oranges, BH $2.80, $2.00, $1.57, $1.25, $.50,

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[70]Interview with A. Hunter, Minister of Natural Resources, British Honduras, January 26, 1968.

and $1.25. Fortunately for the growers, only once have prices fallen below the costs of production. Salada will probably attempt to stabilize prices at approximately $1.25.[71] If this occurs, perhaps growers can gain larger profits, force the Citrus Company to raise its prices, and utilize modern agricultural methods.

Production costs affect processors as well as producers. Transportation difficulties to foreign markets have been mentioned previously, but problems in obtaining equipment, supplies, and repairs, should be noted. British Honduras has to import 80 per cent of all items consumed within the colony. With the exception of lime, for instance, all sprays and fertilizers for citrus are imported. Stann Creek Town is little developed as a commercial center. Thus, growers and processors have to send to Belize City for desired items and pay the transportation charges to Stann Creek. A loss of time and money results from the indirect route to Belize City, 105 miles by road, although Stann Creek Town lies only thirty-five miles directly south along the Caribbean coast. Salada has attempted to remedy this situation by having its ships bring most items of possible use to Commerce Bight when fruit shipments are in progress. But Belize City remains the chief source of supply for the Stann Creek citrus industry, and until better transportation facilities are available or needed supplies are provided in

[71]Interview with S. A. Spross, January 22, 1968.

Stann Creek stores, the loss of time and money will continue to be a significant economic problem.[72]

Labor Availability and Costs

Labor constitutes a limitation on citrus development, due to its scarcity and low productivity. Labor shortages influence the whole scope of the citrus economy, since production and processing depends upon supplementary labor from both the valley and neighboring districts. Sufficient labor cannot be supplied from within the valley. Yet, no importation of temporary labor from Belize City takes place, despite large numbers of unemployed persons there, because most are "accounted for by those workers who shun available employment in agriculture."[73]

In citrus production labor demands are seasonal, while the processing companies employ factory and maintenance personnel for the entire year. During the peak of the harvest season, as many as 3,000 workers may be required, while only about 900 are necessary for operation of the factories and for orchard maintenance during the remainder of the year. Therefore, the valley labor supply must

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[72]A new road is projected between Belize City and Stann Creek Town, roughly paralleling the Caribbean coast.

[73]William E. Spruce, "Basic Data on the Economy of British Honduras," U. S. Bureau of International Commerce, Overseas Business Reports, OBR 64-63 (June, 1964), p. 2.

increase from October to May by more than 2,000 persons. At least 50 per cent of the necessary increase comes from other districts on a seasonal basis, while Stann Creek Town and valley residents provide the remainder.

The seasonal nature of the citrus industry and the general attitude of the people have resulted in low productivity and high wage rates (Table 9). Agricultural output is lower and wages higher than in neighboring areas.[74] Labor productivity must increase if Stann Creek citrus products are to compete successfully in world markets. To decrease prices is an alternative method to achieve competitive status, but this is not desirable socially or economically. The Belizean people are proud of their high standard of living, compared with that of the rest of Central America, but are dependent upon high-cost items of local production or imported foodstuffs and consumer goods. The government of British Honduras and the citrus processors are attempting to develop higher labor productivity and lower unit cost, but efforts have thus far failed.

Because of producing different end products, the two companies also differ in the composition of their labor force. The Citrus Company of British Honduras employs mostly women, since the grapefruit canning section of the plant is

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[74] A. N. C. Thomas, Some Opportunities for Agricultural Investment in British Honduras (Belize City: Government Printing Department, 1959), p. 2.

TABLE 9

WAGE RATES FOR CITRUS LABOR IN THE STANN CREEK VALLEY

Type of Work	Piece Rate	Hourly Rate
Harvester	BH $.08-.15 per box	BH $ .32- .50
Field worker	---	.36
Tractor driver	---	.45
Mechanic	---	.45
Warehouse worker	.45 per 100 cases	2.50-3.00
Factory worker		
Canner (female)	.05 per 3 cans*	.20- .40
Factory hand (male)	---	.45- .50
Foreman	---	.70- .80

*Canners are paid an additional BH $.05 for each citrus worm removed during the canning process.

Source: Survey of Wage Rates and Normal Hours of Work in British Honduras, British Honduras, Labor Department.

not automated, and women are considered better workers at the tedious tasks of peeling, cutting, and packing. In the orange-juice concentration section, unskilled male workers are employed. The British Honduras Fruit Company employs unskilled men for its automated concentration process, which involves fairly menial tasks and supervisory chores. Since the methods of the Citrus Company represent an earlier stage of technology, it must employ nearly double the number of laborers required by Salada. Both companies add to their labor costs by providing daily transportation of workers between Stann Creek Town and the factory or harvesting sites.

Labor is organized effectively in Stann Creek, with the citrus employees belonging to the Southern Christian

Workers Union. Collective bargaining has resulted in an eight-hour workday and a maximum forty-eight-hour workweek. Many citrus workers are paid by piece rates, but the Citrus Board has established minimum wages of BH $2.50 per day for men and $1.60 per day for women. Other benefits for labor, such as sick pay, accident compensation, and vacations exist only for permanent employees of the two companies.[75] The Citrus Company is also under an agreement with the Southern Christian Workers Union to discuss labor wages for each agricultural season. Finally, labor practices follow closely the Contracts of Employment (Indigenous Workers) Convention, 1939, and employment is governed by the following laws:[76]

1. The Trade Disputes (Arbitration and Inquiry Ordinance, 1939, which provides for the appointment by the government of Boards of Arbitration when disputes between employers and workers cannot be resolved by negotiation or conciliation.

2. The Factories Ordinance, 1942, which provides for the registration of factories and the safety of employees.

3. The Workmen's Compensation Ordinance, 1959, which prescribes benefits in cases of injury and death arising out of and in the course of employment.

4. The Labor Ordinance, 1959, which regulated conditions of employment.[77]

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[75]See Appendix C.

[76]"Labor Conditions in British Honduras," International Labor Review, Vol. 48, (November, 1943), pp. 655-656.

[77]British Honduras, Department of Social Development and Economic Planning, Investment Opportunities (Belize City: Government Printing Office, 1967), p. 11.

Labor deficiencies will remain significant problems in the Stann Creek Valley for many years. No mechanization of the harvest is yet possible, and the national government does not allow temporary immigration of foreign labor unless a definite need can be demonstrated. Moreover, there exists a shortage of able, skilled, and technically proficient managers for agricultural estates.[78] The government should perhaps assume a more active role in the mobilization of local labor to assist in the harvest of crops.[79] In other words, something should be done to reduce the great number of unemployed persons in Belize City and vicinity and to make this group more productive to the total economy.

Agricultural Credit

A definite need exists for expanded credit facilities to stimulate further agricultural development. There is a severe shortage of credit for present and prospective citrus growers in the Stann Creek Valley, due to the lack of investment capital. Credit unions and cooperatives, however, make a limited number of small loans to established farmers.

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[78] Interview with E. A. Castillo, Labor Inspector, Department of Labor, Belize City, British Honduras, December 27, 1967.

[79] Interview with Mr. F. Tillet, Chief Labor Inspector, Department of Labor, British Honduras, December 27, 1967.

The government agencies responsible for issuing loans to developers are the Agricultural Credit Fund and the Development Finance Corporation, but neither of these is of assistance to the present or potential citrus growers. The United States Agency for International Development does offer assistance, but only to American investors.

The Agricultural Credit Fund was initiated in 1951 with a capital of BH $250,000 and the objective of providing loans for the development of sound agricultural and pastoral enterprises. These loans are available for the development of land; the purchase of livestock, agricultural machinery, vehicles and implements; erection of farm homes and buildings; and the provision of services and small loans to members by producer associations. Although it establishes loan limits of BH $20,000 to individual borrowers, the ACF sets no limit on loans to producer associations. Terms of the loans are up to fifteen years, and interest is at 6 per cent.

The Development Finance Corporation finances any agricultural operations that promise a fair chance of success. However, the DFC is most likely to encourage those schemes that represent technological innovations or the introduction of new crops. Most of the BH $250,000 that served as founding capital has been loaned, and no new funds appear to be forthcoming.

Neither the AFC nor the DFC has sufficient capital for adequate aid to agriculture in British Honduras, and,

as previously noted, neither extends aid to the citrus industry. Since citrus cultivation is considered to be a developed sector of the economy, growers are ineligible for AFC or DFC assistance.[80] The British Honduras government is urging private enterprise to provide funds for agricultural loans, but difficulties in collecting payments discourage investors.

American investors in citrus development in the valley are eligible for assistance from AID. This agency will pay up to 50 per cent of the cost of feasibility surveys for promising development projects. If no investment results, the United States government retains the survey findings, while if investment does occur the investor obtains exclusive rights to the survey with no payment to the government. Moreover, AID will insure all American projects from the following hazards: (1) inconvertibility of local currency, (2) inability to transfer profits to the United States, (3) nationalization, and (4) war, revolution, or insurrection.

Diseases and Pests

Since the incidence of diseases and pests can result in serious citrus losses, some control measures should be

used by the growers. Financial aspects, however, present almost insurmountable barriers. The cost of preventive or curative measures is largely beyond the financial abilities of all but the five largest producers, though agricultural and research personnel have repeatedly attempted to impress upon the growers the necessity of disease and pest control to raise production and profits. The producer must also overcome his sense of fatalism which tends to accompany agricultural endeavors. Many growers feel that diseases and pests are natural features of citrus production and that no effective methods can be utilized to reduce or eliminate these hazards.

Citrus diseases in the valley attack primarily the trees, while the fruit is the principal subject of damage by pests. The following are diseases which presently affect citrus and its production in the valley:

1. Gummosis or "foot rot"--attacks the trunk of the tree, causing the bark to rot. It is caused by a soil-inhabiting fungus. Exudation of gum from the affected area will take place, and the tree dies when it becomes girdled with gummosis-affected bark. The conditions leading to its development include: (a) presence of water or moist soil in contact with the trunk over a sufficiently long period, (b) low planting of the tree or bud union, (c) susceptible rootstock, (d) bark injuries, and (e) favorable soil and air temperatures.

2. Greasy spot--affects foliage only. Beginning symptoms are yellowish-brown areas that eventually are visible on both sides of the leaves. A severe attack of this disease may cause premature dropping of the leaves. Either a soil fungus or rust mites are the cause.

3. Citrus scab--attacks leaves, twigs, and fruit, resulting in foliage reduction and fruit drop. The leaves become crinkled, stunted, and distorted. Resultant growths are lesions which are raised, corky, and wart-like.[81] Only young tissues of grapefruit are susceptible to attack by this disease, which is caused by a fungus dispersed in spores by rain splash.

4. Thread blight--infects twigs, fruit, and leaves. This disease, caused by a fungus, occurs in wet areas of grapefruit orchards and results in long, brown threads on susceptible tissues.

5. Sooty mold--prevents sunlight from reaching the leaves. It is a fungus growing on honeydew secreted by insects on leaves and fruit.

6. Melanose--is the principal fruit blemishing disease, especially of grapefruit. This disease, which also attacks foliage, is caused by a fungus which reduces the vigor of the tree and causes dieback. Spores of the fungus are carried by rain splashes to susceptible tissue where moisture is necessary for infection to take place. Dead wood is the principal source of infection, and pruning is therefore essential in affected areas.

7. Xyloporosis--a citrus virus, causes pits and depressions in the wood and gum pockets in the bark. Fungi are therefore afforded an entry and cause rotting. The trees will become yellow and unthrifty, and spread of the disease is through infected budwood.

8. Exocortis (citrus virus)--results in scaling of the bark, severe stunting of the tree, and reduced yields, as the normal flow of nutrients within the tree is impeded by gum deposits.

9. Psorosis--is usually accompanied by gum erudation and produces scaling of the bark on the tree trunk and large branches. Destruction of the bark represents advanced stages of this virus, which is spread by infected budwood.

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[81]"Citrus Cultivation--Pests and Disease," Transcript of a radio talk by M. K. Chopin, Principal Agricultural Officer, December 16, 1964.

10. Tristeza--is the most prominent citrus virus, attacking susceptible rootstocks, particularly Sour Orange. It is spread by aphids and affects the bud union region, where conducting tissue in the bark is destroyed. It thus leads to the demise of the tree. Symptoms of tristeza include ring barking or root damage.

11. Premature fruit drop--affects the young fruit buds of citrus trees, forming them into hard nodules that do not mature. No control measures for this increasingly serious disease have been found, since the causes are as yet unknown.

Appropriate preventive sprays and planting practices can lead to the elimination or reduction of the various citrus diseases. Treatment for gummosis, which results in tree losses of approximately 1 per cent per annum, is accomplished by removing the infected bark and painting the cut surface with Bordeaux paste, a fungicidal dressing. The control for greasy spot, citrus scab, and thread blight is a copper spray applied during the dormant period before the flowering of the trees. Sooty mold is controlled by an oil spray including aldrin, dieldrin, or malathion. Control of melanose is through copper fungicides, while the sole method of controlling the four citrus viruses is by use of virus-free budwood in the propagation of the citrus.

The prevention or cure of these diseases, however, costs money, and the majority of valley citrus producers practice only those control measures that do not require large outlays of capital. Unfortunately, foliage and soil sprays are the only effective means of reducing most citrus diseases, and the cost of these sprays is beyond the ability

of the growers to pay unless citrus prices are raised or agricultural credit can be established.

Though not specifically a disease problem, citrus in the Stann Creek Valley also suffers what may be called "premature aging." The ravages of diseases, pests, and poor nutrition result in citrus trees achieving a production peak at approximately ten years of age and maintaining commercial production levels for only ten more years in the case of oranges and twenty more years for grapefruit. Citrus trees in subtropical areas produce commercially for forty years or more. The usual sequence is that "young trees grow well, carry a good canopy of leaves, and produce good crops, but from ten to fifteen years and onward they begin progressively to bear poorer and sparser foliage, until at twenty years they frequently have the appearance of trees in an advanced stage of senescence, and have insufficient leaves to be able to make appreciable growth or to carry good crops."[82]

Accompanying premature aging is a change in fruit quality. As tree age increases, the fruit rind becomes thicker and seeds more numerous, thereby decreasing the quality of the fruit. The problems of premature aging and change in fruit quality are probably direct results of the

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[82]T. Wallace, A. F. Camp, and H. R. Hinton, Wallace Report (St. Augustine, Trinidad: University of the West Indies, 1958), p. 22.

heavy annual rainfall, high humidity, and acidic soils, plus poor fertilizer practices.

Although technically not a disease, parasitic vegetation also affects valley citrus trees. Certain algae species (Cephaleuros virescens) kill leaves and twigs and also play a part in causing premature aging, but they are easily controlled by copper sprays. Another parasite, mistletoe, gradually engulfs individual trees, killing all foliage unless removed by hand or sprayed with copper. Older groves, no longer important for commercial production, exhibit these characteristic vegetation parasites.

Of even greater significance to valley citrus production than diseases and parasitic vegetation are citrus pests. Due to the lack of an adequate spraying program for the entire valley, annual production losses amount to from 10 to 20 per cent of the total citrus crop. For example, in the 1967-68 grapefruit season the Citrus Company of British Honduras realized a total of 215,000 cases of canned grapefruit, rather than the projected 236,000 cases, due to the ravages of the Mexican Fruit Fly (Anastrepha ludens). Several of the growers lost more than 50 per cent of their grapefruit crop because no control measures were taken to effectively reduce the incidence of this insect.

Ranked according to importance, pests that attack citrus in the Stann Creek Valley include:

1. Mexican Fruit Fly (Anastrepha ludens).
2. Wee-wee Ant (Atta cephalotes).
3. Orange Dog Caterpillar (Papilo cresphontes and Papilo anisiades).
4. Drunken Baymen Wasp (Trigona coruina).
5. Citrus Weevil (Exopthalmus viticollus and Exopthalmus lunaris).
6. Ground Mole.
7. Scales: Purple (Lepidosaphes beckii), Citrus Snow (Unaspis citri), and Dictyospernum (Chryomphalus dictyosperoni).
8. Rust Mite (Phyllocoptruta oleivora).
9. Aphids: Green (Aphis spiraecola) and Black (Toxoptera aurantii).
10. Blue-green Beetle (Pachnaeus citri).
11. Leaf-eating Bee (Melipona reficrus).
12. Citrus Nematode (Tylenchus semipenetrans).

By far the most destructive and widespread of these pests is the Mexican Fruit Fly. It has been present in British Honduras for at least twenty years, but only since 1964 has the incidence reached alarming levels.[83] To determine grapefruit losses due to the Fruit Fly, a survey was undertaken in 1966 by the Caribbean Citrus Research Unit of the University of the West Indies. Before the survey,

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[83]L. Walter van Whervin, A Survey of the Status of the Mexican Fruit Fly (Anastrepha ludens Loew) in British Honduras (Mona, Jamaica: University of the West Indies), p. 2.

losses of fruit had been estimated at more than 50 per cent, but this estimate was proved to be excessive (Table 10).

The Fruit Fly deposits its eggs beneath the skin of the fruit, and the larva feeds on the fruit itself. After the infested fruit drops, pupation occurs in the ground. If orchard sanitation is good and all fallen fruit is gathered rapidly, the larva do not have time to leave the fruit and enter the ground for pupation. Thus, interruption of the life cycle takes place. Other control measures are a spray of malathion or a protein bait containing malathion. The Fruit Fly prefers grapefruit, but will transfer to oranges toward the end of the grapefruit season. Spraying all citrus trees throughout the agricultural year is therefore a necessity.

Wee-wee Ants, also known as Parasol or Leafcutter Ants, are a particular threat to young citrus trees. Since citrus leaves form the basis for the fungus upon which the ants feed, these ants completely defoliate trees and carry the leaf particles back to the main nest.[84] Stripping a tree in a day is not uncommon for these industrious pests which are widespread in the valley. To control the ants, it is essential for the queen ant to be killed. The nests, which are in the ground, are found by following the trail of

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[84]H. J. Quayle, Insects of Citrus and Other Subtropical Fruits (Ithaca, New York: Comstock Publishing Company, Inc., 1938), p. 246.

TABLE 10

ESTIMATED GRAPEFRUIT LOSS TO THE MEXICAN FRUIT FLY
IN THE STANN CREEK VALLEY, 1966

Milepost Locations	Number of Groves	Acreage	Non-Infested Yield (in boxes)	Infested Yield (Losses in boxes)[a]
4-7	8	122	4,437	437
12	2	400	-----	---[b]
13	1	400	-----	---[c]
14-16	9	34	2,605	787
16-18	13	46	1,452	1,401
18-20	13	51	2,349	1,243
20-22	15	54	4,455	1,937
Melinda Road	6	72	5,839	6,445
Totals	67	1,179	21,137	12,250

[a]Estimated.

[b]Losses unknown. Fruit from trees were over 90 per cent infested.

[c]Losses unknown. Fruit from trees were not infested, since recommended control measures had been applied.

Source: Citrus Research, 1966, Caribbean Citrus Research Unit, University of the West Indies.

ants to the entrances. Three methods have been devised to destroy the nest and the queen ant: (1) Carbon bissulfide or methyl bromide is blown into the nest and the vapors set on fire, (2) aldrin dust is blown into the nest or dieldrin solutions poured into the major opening, and (3) protein baits in the form of small green pellets, and consisting of aldrin and other chemicals, are used to attract the ants, which carry the bait back to the nest. The protein bait method is usually very effective, but disadvantages include high cost (BH $5.00 per pound of bait), lack of attraction to ants when the ground is wet or the pellets are not fresh, and the fact that applications must be after dark since the ants are primarily nocturnal in nature.

Various types of sprays eliminate most citrus pests, with the exception of the ground mole, which must be trapped and killed; the Drunken Baymen Wasp, the nest of which must be discovered and destroyed; and the citrus nematode, which is reduced by fumigating the citrus seed beds and treating budded plants with fumazone. The mole kills the citrus trees by feeding on the roots, as does also the nematode, while the wasps feed on young shoots and bore holes in the fruit. The magnitude of the mole and nematode problem depends upon rainfall, soil type, agricultural practices, age and condition of the trees, and the amount of available soil water. A summary of minor citrus pests is presented in Table 11.

TABLE 11

MINOR CITRUS PESTS, THEIR EFFECTS, AND MEASURES OF CONTROL

Pest	Damage	Control
Orange Dog Caterpillar	Leaves	Picking by hand
Citrus Weevil	Roots	Aldrin
Scales	Fruit	Malathion and oil
Rust mite	Leaves and fruit	Zineb (sulfur spray)
Aphids	Young growth	Systemic insecticides
Blue-green beetle	Leaves	Barium fluosilicate
Leaf-cutting Bee	Leaves and maturing oranges	Malathion

Source: Interview with Caribbean Citrus Research Unit personnel.

Diseases and pests are serious handicaps to citrus production in the valley. The physical structure of the valley is favorable for an aerial spray program, if the cost is not prohibitive, as a possible solution to citrus losses thru pests and diseases. Aerial spraying may, in fact, be the only feasible method of eliminating the disastrous effects of the Mexican Fruit Fly. If a protein bait is sprayed, a blanket spray is not necessary, thus reducing the normal cost to BH $250.00 per hour. Despite the fact that the government has experimented with "crop-dusting," the most economical system of large-scale pest control, it has never followed through with practical applications. Utilizing chemicals non-toxic to humans

and animals, the application of a simple three-spray cycle can be as effective as previous work using ground equipment.[85]

Since 10 to 20 per cent of the total yield, and approximately 1 per cent of the trees, are lost annually as a result of these depredations, a scientific spray program is needed if the potential productivity of the valley is to be realized. Canopy and soil spraying, however, cannot correct the lack of vigor and premature aging of trees, where factors such as poor drainage or poor nutrition prevail. Conversely, fertilizer applications are of reduced value if foliage and fruit are attacked by diseases and pests and proper control measures are ignored. Thus, spraying must be accompanied by proper nutrition and good cultivation techniques, if production levels are to increase significantly.

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[85]Interview with Dr. Gordon K. Maliphant, January 27, 1968.

CHAPTER V

PROSPECTS FOR THE CITRUS INDUSTRY

The future of the citrus industry in the Stann Creek Valley appears somewhat bleak, but much depends upon the availability of foreign markets, adequate labor supplies, and citrus research. Raising production levels is as much a necessity as is the development of markets for citrus products. Although the future of the citrus industry seems to depend primarily upon probabilities, it is currently at a crossroads and can become either a liability or a distinct asset to the economy of British Honduras.

Labor

There is little prospect of obtaining adequate labor supplies for expansion of citrus acreage within the valley. Large numbers of unemployed persons reside in Belize City, but they do not accept jobs in agriculture. Therefore, the need exists for large-scale seasonal importation of agricultural labor from other areas. Labor is presently recruited from western Cayo District and the southern part of Toledo District. Additional labor may be available from these sources or may one day become available from the new capital,

to be located fifty miles west of Stann Creek Town at Roaring Creek.[86] No program for large-scale foreign immigration is contemplated by the government.

Low labor productivity, which is explained by the lack of an agricultural tradition and by the seasonal nature of agricultural operations, is a situation which numerous agents are attempting to improve. Influenced by the government's emphasis on the need for high labor productivity, for the "economic betterment of an independent Belize," the large producers are offering higher wages and the added incentive of bonus pay. As yet little progress has been achieved. The Stann Creek Valley remains a high-cost, low-volume citrus producer and will probably continue to be so.

Any expansion by foreign investors must involve foreign field managers, due to the inexperience of native residents. Investors must, however, be familiar with local labor conditions and local customs. Foreign field managers must be prepared to stay for an extended period of years so as to sufficiently train members of the resident population to occupy managerial positions.

Citrus Research

The development of citrus research facilities in the Stann Creek Valley has closely paralleled the increase

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[86]Interview with Allan Arthurs, Stann Creek District Representative, January 5, 1968.

in citrus production. First established in 1933, a district agricultural station is located in the valley to provide budded citrus plants (6,000-9,000 per year) to growers and to conduct experiments to determine the best strains of crops. In 1940, the station was disbanded in favor of a corps of farm demonstrators charged with carrying out experiments and demonstrations on the individual farmer's land, with the farmer participating. These individuals usually have more than an elementary education and have some informal on-the-job training in agriculture. The "agstat" was revived in 1950, however, and today both agencies are in operation.

The government's awareness of the importance of agriculture to the total economy is reflected by the increased support of agricultural education and extension programs from BH $98,000, in Development Plan II (1958-1964), to $359,000 in Development Plan III (1964-1970). Agricultural training is provided by Lynam Agricultural College, established in the valley in the mid-1950's. Offering secondary education with full academic programs in agriculture, and teaching modern agricultural techniques, its impact has continued to grow.[87] Despite its rudimentary facilities and pioneering nature, Lynam is already making

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[87]Interview with Father Kramer, Director, Lynam Agricultural College, January 10, 1968.

an important contribution to scientific agriculture in British Honduras.[88] In fact, some of its graduates are away studying on specialist programs at the university level, and a few have already taken positions such as Plant Pathologist with the Department of Agriculture.[89] In addition, the school provides budded citrus plants at BH $.25 each to any producer interested in replacing old trees or planting new acreage.

Beginning in January, 1967, with the construction of its station in the valley, the Caribbean Citrus Research Unit of the University of the West Indies has become the principal center of citrus research in British Honduras. Staffed with only an agronomist, secretaries, and several field workers, totalling six persons, the unit is primarily concerned with study of the life cycle of the Mexican Fruit Fly and the effects of sprays and protein baits upon this and other pests. Some study of premature fruit drop and Wee-wee Ants, and possible eradication treatments, has also been conducted. Funds were approved by the United Kingdom in April, 1968, for the unit to expand its research program and to deal especially with some of the urgent problems of disease and pests currently facing the citrus industry.

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[88] The Belize Newsletter, Office of Information, No. 11 (up to March 11, 1968), p. 2.

[89] Ibid.

Even before its permanent establishment in the Stann Creek Valley, the Caribbean Citrus Research Unit conducted numerous experiments concerning the effects of fertilizers upon citrus yields and fruit quality (Tables 12, 13, and 14). Basic factors involved in yield and quality include fruit size, color, rind thickness, juice content, total soluble solids, total acids, and the sugar-acid ratio. As a result of these tests, growers have been given the following advice and information:

1. If fertilizers are applied to orchards, the quantity should depend upon tree age, production capacity of trees, and nutrient status of the particular orchard.

2. A mixed fertilizer of nitrogen, phosphorous, and potassium (16-8-16) should be used for best results.

3. Fruit maturation time will be delayed by large applications of potash fertilizer.

4. Citrus yields increase by one or two boxes per tree if soils are limed to reduce acidity.

5. Liming the orchards should be accomplished with pulverized limestone to insure adequate percolation through the soil.

6. Lime should not be applied with other fertilizers, since the nitrogen and phosphorous content of the soil will then be reduced.

7. The addition of nitrogen to the soil should be accomplished by using calcium ammonia nitrate rather than sulphate of ammonia, which may result in higher yields but also increases soil acidity.

8. Magnesium is necessary for citrus, two to three pounds per year being ideal for oranges and five to eight pounds for grapefruit.

TABLE 12

EFFECTS OF NITROGEN FERTILIZERS ON CITRUS YIELDS PER TREE

Experimental Field	Yield with Sulphate of Ammonia Application (boxes)	Yield with Calcium Ammonia Nitrate Application (boxes)
1	2.5	2.0
2	2.5	1.9
3	2.4	1.8
4	1.9	1.4
5	2.1	1.3
6	1.9	1.7
7	2.3	2.2
8	2.3	1.7
9	1.8	1.6

Source: Citrus Research, 1966, Caribbean Citrus Research Unit, University of the West Indies.

TABLE 13

YIELD OF GRAPEFRUIT TREES, WITH MAGNESIUM (KEISERITE) FERTILIZER

Treatment per Tree per Year	Average Yield per Tree per Year (boxes)
A (six pounds)	8.9
B (twelve pounds)	8.5
C (eighteen pounds)	8.4
D (no treatment)	6.3

Source: Citrus Research, 1966, Caribbean Citrus Research Unit, University of the West Indies.

TABLE 14

EFFECT OF LIME ON CITRUS YIELDS

Orchard Location	Yield per Tree	
	Not Limed	Limed
	(boxes)	
Melinda	1.5	2.6
Pomona	2.1	4.0
Agstat	1.8	2.5
Middlesex	2.2	3.6
Lynam	1.8	2.7
Melinda Road	1.6	2.8

Sources: Caribbean Citrus Research Unit, Citrus Company of British Honduras, and Stann Creek District Agricultural Station.

A new fertilizer program has been presented by Dr. C. C. Weir, of the Citrus Research Unit. Fertilizer quantities depend primarily upon soil texture and tree size, rather than tree age (Table 15). The tree size is measured as the diameter of the area covered by the tree. Within the orchard, twelve representative tress are selected and the average size obtained.

TABLE 15

FERTILIZER APPLICATIONS ACCORDING TO TREE SIZE

Tree Diameter in Yards	First Application[a] (pounds per tree)	Second Application[b] (pounds per tree)	Elements
2	1	1.5	
3	2	2	Applied
4	3	2.5	when
5	4	3	deficiency
6	5	4	symptoms
7	6	4	appear
8	7	5	

[a]Six weeks before blossom.

[b]Four to five months after blossom, with 20 per cent nitrogenous fertilizer.

Source: A General Citrus Fertilizer Program, C. C. Weir.

Research on the development of virus-free strains of budwood has been conducted not only by the Citrus Research Unit but by the District Agricultural Station as well. There are six steps in the development of virus-free citrus:

1. Testing of local commercial varieties to find those which are virus-free and can be used as budwood material.
2. Search for naturally occurring nucellar Valencia orange and Marsh grapefruit, the predominant citrus species in the valley.

3. Production of nucellars, which require fifteen years before budwood is available.[90]
4. Introduction of virus-free plants from other countries.
5. Rootstock trials for the viruses tristeza, psorosis, exocortis, and xyloporosis.
6. Registration of all citrus nurseries and enforcing regulations that compel the use of only virus-free budwood for citrus plants.

In summary, the value of demonstration and propagation work depends largely on its accessibility, and, with the availability of both the Agricultural Station and the Caribbean Citrus Research Unit, no grower should feel that research facilities are lacking or inadequate. At these two facilities citrus growers can see a variety of improved techniques in use, obtain disease-resistant budwood, and seek advice on agricultural problems. If the facilities are used and scientific practices adopted, greater citrus yields and disease reduction can result. Only through continuous research can citrus horticulture develop and prosper.

Economic Opportunities

Economic opportunities exist for Stann Creek Valley citrus producers and processors, but are presently restricted

[90]Nucellar seeds are found within the citrus fruit and bear the same characteristics as the parent tree, except that they do not contain the virus. The seeds produce trees more vigorous and having higher yields than the parent tree. Nucellar seedlings provide a simple method of cleansing present commercial citrus varieties of all viruses, without interfering with the characteristics of these varieties.

by the lack of sufficient markets, inadequate price levels, and poor transportation systems. While the opportunities should not be overlooked, and perhaps their implementation should be a governmental policy, economic developments within Latin America, Anglo-America, and Europe will determine the degree to which they materialize.

The possibility of fresh fruit exports, which command higher prices than those of processed products, per box of fruit, is economically desirable but unlikely to take place because of four factors. First, the export of fresh fruit depends upon a reliable foreign market. A decline of citrus production in the United States, the Philippines, Brazil, or the Mediterranean countries results in greater Belizean sales. However, foreign markets are usually inundated with citrus from alternate sources, and competition is intense. The United States, for example, is entering the British market behind a citrus promotion campaign by Sunkist, and its citrus tonnage exported to the United Kingdom in 1967 was consequently double that of 1966.[91] Second, the export of fresh citrus encounters special problems with respect to blemished fruit, storage, refrigeration, the availability of refrigerated ships, and shipping schedules. Fresh fruit export would necessitate the construction of a deep-water

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[91]Howard Fox, "Britain--Target for World Citrus," Citrus and Vegetable Magazine, V, No. 12 (December, 1967), p. 28.

port so as to reduce losses from loading delays, rough handling, and pilferage. A third deterrent to fresh citrus export is the extremely poor marketing system. No grading for quality takes place, and no market information services are available to growers. There is no wholesale market where fair and reasonable prices are established. Therefore, the citrus growers have no incentive to turn out quality produce which should command high prices. Finally, the harvest of fresh citrus for export requires modes of operation different from those used when the fruit is to be processed. Care must be taken not to damage or bruise the fruit, and no stems can be allowed. Gloves must be worn by pickers and handlers, harvesting cannot be done when the fruit is wet, and the harvested fruit cannot be exposed to sunlight for long periods.[92] Careful supervision is needed at all times.

There are at least four possible market areas for fresh fruit exports, one of which is constituted by the former British Caribbean possessions. In all cases, the fruit would have to be of high quality and shipped regularly. A reciprocal trade agreement could perhaps be arranged with Jamaica, which does not have the capacity to feed itself, by which Jamaica would provide light industrial and consumer

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[92]H. Harold Hume, Citrus Fruits (New York: Macmillan Co., 1957), pp. 317-318.

goods in exchange for citrus products. Barbados also offers opportunities for fresh fruit sales.

The second market possibility is the United Kingdom. All other areas in Europe are closed to British Honduras citrus fruit, due to the intense competition and political considerations. To compete with other citrus suppliers to Great Britain, the Stann Creek Valley must reduce production costs and have an assured, protected market at all times. At present, the valley enjoys a partially assured market only for fresh grapefruit. With its shipments arriving in England at the end of the Mediterranean season, other tropical producers offer the only competition, but even then countries such as Brazil supply large quantities of fruit. Thus, Commonwealth ties are a necessity, but even this potential market will be lost if Britain enters the European Economic Community (Common Market).[93]

A third prospect is the internal or domestic market, which is presently underdeveloped but could probably be enlarged through advertising programs, quality control, and improved marketing methods and facilities.[94] Preferring fresh citrus fruit to processed products, the population of British Honduras, though small, can significantly increase its citrus consumption.

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[93]Interview with Dr. Gordon Maliphant, January 25, 1968.

[94]Great Britain, Caribbean Commission, Central Secretariat, Caribbean Market Survey, p. 14.

Yet another possible sales area is the Central American Common Market. Political differences between the United Kingdom and Guatemala over control of British Honduras are perhaps the greatest obstacle, but cultural differences are also significant. Factors to be evaluated in considering closer economic ties with the Central American countries include: (1) the large size of the potential market, four times that of the Caribbean area; (2) the difficulty of selling produce in Central America due to high production costs in British Honduras; (3) the lack of available investment capital for British Honduras in the Central American republics; (4) the necessity of drastic reorientation of trade; (5) the higher living standards in British Honduras than elsewhere in Central America; and (6) the differences in religion, race, and cultural viewpoints that exist. However, the necessity for the integration of BH into a larger economic community, once independence is attained, has been well stated by Waddell:

> In a world of artificial markets, quotas, subsidies, tariffs, and restrictions, it might well seem advisable for such a small country as British Honduras, which cannot hope to have any significant influence on world markets, to protect its industries by attaching itself in a close and permanent fashion to some larger politico-economic unit.[95]

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[95]Waddell, pp. 107-108.

Everything considered, the development of an important fresh fruit export does not appear likely in the near future of the Stann Creek Valley. High production costs, intense competition, lack of assured markets, and fluctuating market demands preclude any immediate large-scale programs being initiated. In addition, the outlook for higher citrus prices is not good. The United Nations Food and Agricultural Organization has estimated that world supplies of oranges for export by 1970 will be some 10 per cent in excess of estimated requirements. The valley, if continuing to lack protected foreign markets, should maintain its emphasis upon the export of processed citrus products.

Since high costs currently inhibit investment in imported fertilizer and sprays, cheaper means of providing these agricultural aids should be found. Costs of liming the orchards can be reduced drastically if local sources of lime are utilized. It now costs BH $11.00 per ton to freight lime by truck from Cayo District, and with the orchard soils requiring approximately one-half ton per acre, this source is too costly at present citrus prices. Lime could be exploited near St. Margaret's Creek, just beyond the western end of the valley. This dolomitic limestone has not been utilized to date, because a crusher purchased for the purpose does not adequately pulverize the stone and no further investment has been undertaken. British Honduras may not possess the industrial potential

to produce commercial fertilizers domestically, but the development of available local fertilizer resources might reduce citrus production costs and allow growers to invest any savings in the importation of additional fertilizers from abroad.

An economic opportunity lies in the utilization of citrus waste (e.g. orange and grapefruit rinds) for cattle feed. Being palatable, digestible, laxative, and containing a high carbohydrate concentration, citrus wastes present a potentially profitable by-product of citrus processing.[96] Better transportation facilities would be needed, however, since the nearest important cattle area is in Cayo District more than sixty miles to the west. A rotary dryer and grinder would also be necessary to process the citrus waste into transportable material, and trucks would be required to distribute the feed locally or ships to carry it to countries of the Central American Common Market. Although possibilities for the utilization of citrus waste have been studied intensively by Salada Foods' British Honduras Fruit Company, no implementation has been projected because of the inadequate transportation facilities and the lack of a large-scale cattle industry within the colony.

Expansion possibilities involving the citrus producers and processors of the Stann Creek Valley can only become

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[96]Interview with S. A. Spross, January 22, 1968.

realities if transportation facilities are improved and foreign markets are opened to citrus products. Furthermore, to make Stann Creek citrus competitive with that of foreign countries, cost factors must be reduced and labor productivity increased. But, the industrial sector of the economy must expand if the first possibility is to be realized, and cultural views toward citrus horticulture must change before the second will materialize.

Future Development

Progress in achieving stability of citrus prices, the adoption of improvements in citrus production, and the development of markets will determine the prospects for expansion of the citrus industry in the Stann Creek Valley. Despite the fact that much of the good land in the valley has already been utilized for citrus, acreage in citrus orchards could approximately double.[97] The three areas of potential large-scale development are shown on Map 6 and may be described as follows:

1. The Stopper soils, 19-21 miles from Stann Creek Town.
2. An area due west of Middlesex on rolling granite-based country and on old river deposits.
3. Along the banks of the upper Mullins River.[98]

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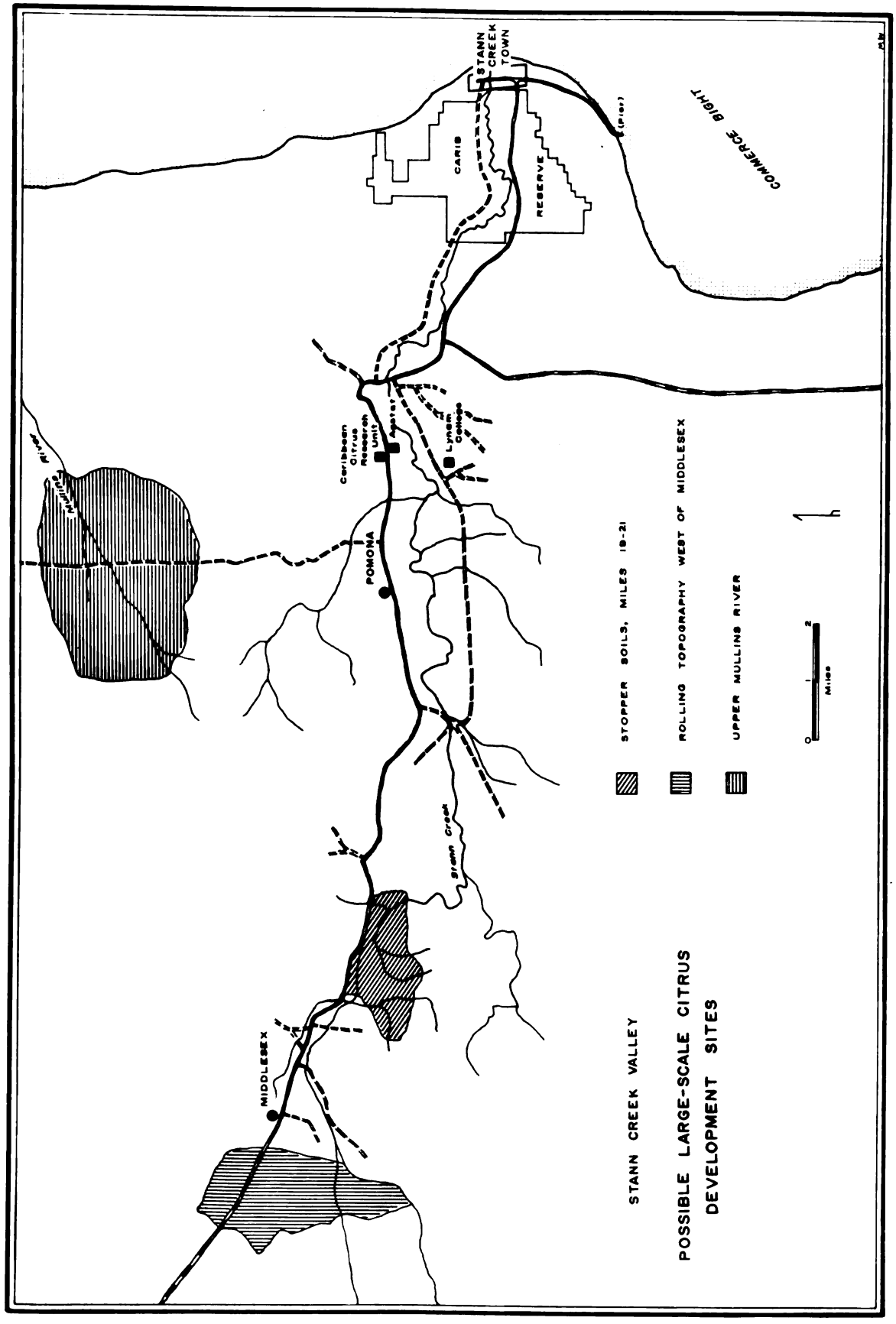
[97] Interview with R. N. Wedderburn, January 27, 1968

[98] A. C. S. Wright, op. cit., p. 167.


STANN CREEK TOWN
CARIB RESERVE
COMMERCE BIGHT
Caribbean Citrus Research Unit
Lyndon College
POMONA
MIDDLESEX
Stann Creek
STANN CREEK VALLEY
POSSIBLE LARGE-SCALE CITRUS DEVELOPMENT SITES
STOPPER SOILS, MILES 18-21
ROLLING TOPOGRAPHY WEST OF MIDDLESEX
UPPER MULLINS RIVER
Miles

Map 6

Before expansion takes place, certain factors must be considered: (1) original cost of the land, (2) taxes on land and income, (3) cost of land clearance, (4) cost of planting, (5) cost of construction of housing and other buildings, (6) length of time required to realize profits, and (7) potential profits.

Land costs are relatively low and are influenced by accessibility, proximity to existing citrus areas, and the possibilities for citrus cultivation. In the Stann Creek Valley, the basic price for potentially good citrus land is BH $7.00 per acre. If the prospective buyer leases the land, 6 per cent interest is charged, and a location ticket is available upon purchase of at least fifty acres. Land prices are also increased by various other factors, the more important being:

1. Land within ten miles of district headquarters: adds 25 per cent to the value.

2. Frontage on main road: adds 75 per cent.

3. Land within one mile of main road: adds 35 per cent.

4. Frontage on feeder roads: adds 50 per cent.

5. Land within one mile of feeder road: adds 25 per cent.

6. Frontage on other roads: adds 25 per cent.[99]

These prices and premiums are for undeveloped land only. Developed land prices are subject to the owner's discretion and range from BH $500 to $1,500 per acre.

Land taxes should be investigated carefully by prospective developers. Taxes on land are based upon the proximity to roads. Land within one mile must pay BH $.10 per acre, per year, while land one to two miles from a road is taxed at BH $.05 per acre. Land that is purchased but remains undeveloped is subject to the Rural Land Utilization Tax, which imposes heavier rates on undeveloped land within two miles of a trafficable road than on land farther away. On land within the two-mile zone the tax rate is BH $2.00 per acre per year for each of the years 1968 and 1969 and $3.00 per acre for 1970 and future years.[100] On land outside of the two-mile zone the rate is BH $.50 per acre annually.[101] However, the Minister of Natural Resources

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[99]Interview with Mr. Card, Land Survey Office, Belize City, British Honduras, February 5, 1968.

[100]British Honduras, Government Information Service, Rural Land Utilization Tax: A Beneficial, Just, and Equitable Piece of Legislation (Belize City: Government Information Service, 1966), p. 7.

[101]Ibid.

may exempt any land from tax if it is in the interest of the colony that he should do so. If such land area exceeds 1,000 acres, the consent of the legislature must be obtained.

Income taxes and customs duties are other items to be investigated by developers. Incomes of more than BH $8,000 are subjected to graduated surtaxes to a point where a $25,000 annual income is subject to a 45 per cent tax. However, an agreement exists with the United States that if American investors are involved no double taxation will take place. Upon application to the British Honduras government, customs duties may be exempted on certain capital goods required for construction and operational purposes if their equivalents are not produced in British Honduras. Fuel imports, which are of vital importance, bear the regular custom duties.

Establishment of a citrus farm of 100 acres or more can be an expensive undertaking (Table 16). Depending upon the type of land to be cleared, per acre cost by mechanical means ranges from BH $40.00 to $120.00. The more fertile land is usually covered by the densest vegetation and therefore costs the most. To level and further prepare the cleared area for orchards costs an additional BH $20.00 per acre. Budded citrus plants from Lynam Agricultural College or the District Agricultural Station cost BH $.25 each and the approximate number of trees per acre is eighty. Shops, garages, and machine sheds can be constructed with local

materials (lumber, stone, or cement blocks), but tractors, trailers, and ancillary implements are also needed and must be imported.

TABLE 16

EXPENDITURES FOR ESTABLISHMENT AND OPERATION OF A 100-ACRE CITRUS FARM IN THE STANN CREEK VALLEY

Investment	Cost	Cumulative Total
Land (best available)	BH $ 1,900	BH $ 1,900
Land clearance	10,000	11,900
Land preparation	2,000	13,900
Planting materials	2,000	15,900
Farm buildings	8,000	23,900
Annual maintenance*	200	24,100
Equipment	25,000	49,100
Annual maintenance*	2,000	51,100
Annual wages*	6,000	57,100
Fertilizers*	3,000	60,100
Orchard sprays*	2,000	62,100
Orchard maintenance*	4,800	66,900

*Cost of operation of orchard, per year, for a five-year period before yields can be harvested commercially.

In summary, expenditures will prevail for approximately five years before net profits can be realized by investors. Land taxes, wages, maintenance costs, fertilizers, and control sprays constitute expenses amounting to more than BH $18,000 per year on a farm of 100 acres. Thus, the total expense for the first six years of citrus production is about $139,000, and income for the first large yield, at the end of the sixth year, would be approximately

BH $29,000.[102] Considering the small margin of profit relative to the large capital outlay, a minimum of seven years of profitable production would be necessary before the original investment would be recovered. An increase in citrus prices obviously means larger profits and more attractive investment opportunities. If stable prices are offered, a 100-acre citrus estate could be a profitable enterprise for the long-term investor.

Plans for investment in citrus must take into consideration the long-term basis of profitable operations. Provision must be made for recurrent expenditures until the citrus enterprise is in full commercial production. Investment has thus far proved to be more successful by the private sector of society, since state-sponsored land settlements have failed in the Stann Creek Valley. Prospects for extension of present acreage would be good were it not for overproduction in the world at large. Many growers will not expand their acreage, and probably no large foreign investment will take place, unless higher and more stable prices are paid by the processing companies. Finally, new foreign enterprises dealing in Stann Creek Valley citrus are not eligible for the tax exemptions offered by the British Honduras government for other new foreign investments,

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[102]Yields with fertilizers and control sprays should average four boxes per tree of oranges, and BH $.90 per box of fruit is the average price received by producers.

because citrus is a portion of the economy considered to be no longer a pioneer industry.

Summary

Although numerous production, processing, transportation, and marketing problems beset the citrus industry of the Stann Creek Valley, the industry is nevertheless highly important to the total economy and demonstrates that large-scale commercial agriculture can be established in British Honduras. It currently provides about 25 per cent of the gross domestic product and is therefore of vital significance to the government of British Honduras and to the population of the valley. The future success of the industry depends upon the following factors:

1. Increased sales promotion to expand present markets and to open new ones.
2. Establishment of efficient marketing procedures, both locally and abroad.
3. Provision of adequate transportation facilities.
4. Development of uniformly high fruit quality.
5. Increased production at decreased costs.
6. Better control of citrus pests and diseases.

The problem of finding adequate markets for citrus products has plagued the processors since the late 1950's and is likely to enlarge if the United Kingdom becomes a member of the European Economic Community. The protection

offered by the British Commonwealth relationship is of great importance, since no substitute markets for Stann Creek citrus products are presently accessible.[103] In fact, the Citrus Growers' Association feels that as long as the industry can produce products of good quality, it is the moral obligation of the United Kingdom to take them in preference to those from non-British Commonwealth sources.[104] In the principal foreign markets, competition is especially keen from citrus produced in Brazil and other tropical countries that have lower production costs. Perhaps an affiliation with the Central American Common Market would improve the industry's prospects, yet, Waddell states that:

> However important a part sugar and citrus may be playing in the present economy of the country, the problems of world markets are likely to restrict their expansion, and as the country develops their role may be expected to become less significant.[105]

Though higher yields are necessary to reduce production costs and expand markets, such yields would cause an increase in total labor costs. Therefore, greater attention is being given by citrus growers and government officials to the need for improved labor productivity. Without an

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[103] United States, Department of State, Economic Trends and Their Implications for the United States--British Honduras (Washington: United States Department of State, November 1, 1967), p. 6.

[104] Interview with H. T. A. Bowman, Chairman, Citrus Growers' Association, January 5, 1968.

[105] Waddell, op. cit., p. 92.

increase in output per worker, citrus expansion is limited by the excessive number of additional laborers required.

In summary, the citrus industry of the Stann Creek Valley is affected adversely by the following factors: (1) certain climatic conditions, (2) limited investment capital, (3) labor shortages, and (4) the need for improved production techniques.

The high annual rainfall and humidity make grass and bush control difficult, as is also true of tree sanitation. Frequent rains also limit the effectiveness of spraying. Fortunately, a period of less rainfall occurs in March and April, which aids blossoming, leaf flush, and fruit stimulation. High velocity winds, with the exception of hurricanes, present no serious threat to the trees themselves, but fruit drop can occur and thereby inflict heavy losses on potential yields.

No agricultural loan funds exist for citrus producers, and a great majority of the citrus operations are of a "subsistence" type. A definite need exists for expanded credit facilities to stimulate further citrus development. The Agricultural Credit Fund and Development Finance Corporation are responsible for agricultural loans, but funds are presently depleted. Moreover, since citrus is considered a developed portion of the agricultural economy, growers are ineligible for financial assistance.

The small population of the valley and of the entire colony is a critical factor in the future of the citrus industry. An immigration policy to provide an adequate labor force has been recommended by Evans and Downie, with the secondary objective of relieving population pressures in the Caribbean islands.[106] By its early refusal to affiliate with the West Indies Federation, British Honduras rejected wholesale immigration as a solution to its labor shortages, which will thus remain a handicap for future citrus developers.[107]

The cultivation techniques of citrus producers in the valley remain rather poor, resulting in a low yield. Agricultural methods not significantly employed include the application of fertilizer and of sprays for pests and diseases, which presently account for annual fruit losses of from 10 to 49 per cent. These practices, properly implemented, would approximately double the present yield of oranges per tree from 1.8 boxes to 3.5 or 4.0 boxes. An increase of as many as six boxes per tree has been

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[106]Great Britain, Colonial Office, Report of the British Guiana and British Honduras Settlement Commission, by C. Evans et al. (London: His Majesty's Stationery Office, 1948) and J. Downie, An Economic Policy for British Honduras (London: Her Majesty's Stationery Office, 1959).

[107]A. J. Crosbie and P. A. Furley, "The New Belize--Prospects for British Honduras," Scottish Geographical Magazine, 83, No. 1 (April, 1967), pp. 57-58.

predicted by agricultural personnel in Belize City. Fertilizer utilization and disease and pest control thus contribute to a reduction in total unit cost and provide a high return on the investment.

A spray program for the control of citrus pests and diseases within the valley is possible if a concerted effort is made by all growers. Perhaps the government of British Honduras should initiate an aerial spray program to reduce losses by pests, particularly the Mexican Fruit Fly. The Citrus Growers' Association should aid producers in purchasing fertilizers and sprays, but the dilemma is that the Committee of Management of the Association is controlled by large growers who are the sole suppliers of these materials. Therefore, some cooperative scheme or government assistance should be initiated, with provision for local supplies of insecticides and fertilizers. Control of pests and diseases would undoubtedly lead to increased citrus yields.

Accompanying possibilities for disease and pest control are further developments in research. The agricultural knowledge of the valley residents will increase through the activities of Lynam Agricultural College, which is funded by government and private subsidies, and the Caribbean Citrus Research Unit, which is an entity of the University of the West Indies and is funded by the government of the United Kingdom. While the purpose of Lynam is to teach

modern agricultural techniques, the functions of the Citrus Research Unit are to develop disease-resistant citrus stocks, study citrus pests and diseases, and test the effects of fertilizer and spray treatments. These two facilities, along with the District Agricultural Station, are vital to future agricultural education, citrus yield increases, and citrus acreage expansion.

Conclusion

While it is obvious that the economy of British Honduras will continue to depend heavily upon the agricultural sector, the prospects are slight that citrus cultivation will expand rapidly and become relatively more significant. For example, the 1964-1970 Development Plan projection of 2.5 million boxes of citrus fruit by 1970 will not even be approached, since citrus production had reached only about 1.1 million boxes by 1967-68. The idea of a third citrus processing factory has been suggested but cannot be considered seriously, in as much as the 1970 fruit production estimate, if realized, would not equal the present combined processing capacities of the British Honduras Fruit Company and the Citrus Company of British Honduras. The Fruit Company (Salada) is presently unable to obtain sufficient fruit to operate at more than 40 per cent of capacity. Therefore, while large-scale and rapid expansion of present acreage may be desirable, little

development will be effected until transportation facilities are improved, labor supplies become more abundant, citrus prices increase, and adequate pest and disease control programs are initiated.

Perhaps this study's most important conclusions are that citrus yields and acreage within the valley could approximately double, but economic and physical difficulties prevent the utilization of necessary horticultural techniques to bring this about, and that polarization of large-versus-small growers will probably intensify as economic conditions in the industry worsen. Though some expansion has been achieved by "subsistence" growers, their poor cultivation practices result in little increase of total valley yield. The Stann Creek Valley citrus producer is faced with a high production cost compared with that of most other tropical citrus producing areas. An increase of capital and immigration from abroad might lead to some improvement. But, the general lack of faith in the future of the citrus industry is reflected in: (1) a desire by Salada Foods, Inc., to sell its factory and land in the Stann Creek Valley; (2) the lack of governmental assistance in spray, fertilizer, and citrus-expansion programs; (3) governmental procrastination in the development of adequate port and transportation facilities; and (4) inadequate progress in opening new market areas through reciprocal trade agreements.

Finally, large developments by foreign investors, though unlikely in the future, are a benefit to valley citrus production. Although exploitation and the extraction of capital has historically been a problem, large investors in citrus now tend to have a greater respect for local conditions and people.[108] These foreign developers initiate modern methods of horticultural production. Large landowners in the Stann Creek Valley achieve a more productive land use than do the small farmers, and, thus, expansion by this type of investor is desirable. Until economic and physical problems are alleviated, and economic development plans implemented, however, citrus production and processing within the valley will either remain static or progressively degenerate.

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[108] C. L. Dozier, Indigenous Tropical Agriculture in Central America: Land Use, Systems, and Problems, Publication 594 (Washington: National Academy ofSciences--National Research Council, 1958), p. 134.

APPENDICES

APPENDIX A

CITRUS PRODUCERS OF THE STANN CREEK VALLEY

Producer	Farm Acreage	Acreage in Oranges	Acreage in Grapefruit
I. East of Pomona			
Jaime Usher**	362	76	14.5
John Kuylen**	129	60	30
Charles Butler	50	5	--
Karl Gabrouel	50	30	20
Manuel Wong	50	22	28
Emanuel Murillo	49	16	8
Rose Anderson	47.5	32.5	15
Lynam College	36	18	18
Arthur Taylor	30	3	2
Henry Bowman Jr.	28.5	19.5	8.5
Allington Pandy	26	1	--
Charles Cord	20	3.5	--
James Emanuel	19	2	3
Alfonso Castillo*	16	2.25	--
Maurise Leslie	5	3	1
(2 locations)	16	7.5	5
Godfrey Paget	16	7	6
Alejo Parera	16	6	1
Angus Cayetano	15	.5	.5
Carling Smith	15	8.5	5
Ernest Gillett*	12.3	4	1.5
Charles Kuylen	12	3	9
Donald Kuylen	4	4	--
(2 locations)	12	1	8
Nathaniel Santos	12	--	2.5
Windford Bainton	10	7	.3
Cleo Hope*	10	3	2
Egbert Irving*	10	5	3
Lionel Irving	10	5	4
Reuben Nicassio	10	.25	.25
Casilta Rodríguez	10	1	22
Charles Santos	10	2	2.5
Balwin Subal	10	.5	.5
Lloyd Thompson	10	4	6

Appendix A (Continued)

Producer	Farm Acreage	Acreage in Oranges	Acreage in Grapefruit
George Westley	10	--	.5
Israel Whyte*	10	3	3
Alfhens Trapp*	9.75	2	1
William Catrouel	9	5	4
C. J. Morrill	9	6	--
Perfério Uarín	9	1.25	1
Joe Merghon	8	4	4
Eric Smith	8	2	6
Patrick Middleton*	7	3	2
José Rivas	7	4.25	2
Adusto Ciego	6	1.5	1.5
Lloyd Sareny	6	2	1.25
Julian Parera	5.5	--	5.5
P. Alvarado	5	2	3
Thomas Baide	5	1	--
Lionel Dawson	5	3	2
Frederick Flores	5	.75	.75
Gus Francisco	5	2	3
Rufus García	5	2	2
Andy Hyde	5	1	--
Greville Kerr	5	4	1
Santos López	5	.5	--
James Swasey	5	4.5	.25
William Terry	5	1.5	1.5
Forestry Department	--	1	4
Walter Slusker	--	--	--
Total	1,297.55	420.25	254.30
II. West of Pomona			
Citrus Company of British Honduras**	2,000	1,600	400
British Honduras Fruit Company**	1,545	1,200	--
H. T. A. Bowman**	700	400	200
Seytie Ritchie	300	20	14
Charles Burrell	108	17	3
Reuben A. Bennett	50	18	4
Wilfred Ritchie	50	8	5
Myra Kurushi	48	3	--
Shirley Bailey (2 locations)	35 45	18 18	7 22
Adella Marín	40	9	2.5
Arthur Frazer	37	6	6

Appendix A (Continued)

Producer	Farm Acreage	Acreage in Oranges	Acreage in Grapefruit
Thomas Hayes	9	7	2
(2 locations)	37	5.5	5
Edward Archer	30	4	26
Nichols Morris	30	15	3
Antonio Zabaneh	30	25	1
William Bowman	28	14	14
Harry Evelyn*	25	1	4
(2 locations)	25	10	6
Luther Holmes	10	5	2
(2 locations)	25	8	--
E. B. Parkins	25	11.5	10
Hazel Smith	24	7	.5
N. L. Usher	24	14	8
Hilda Higgins	23	6	3
Lui Evelyn	22	7	4
(2 locations)	12	6	4.5
Henry Smith	22	5	3
Peter Pate	20	5	1
Maraldo Sánchez	17	10	3
(2 locations)	20	--	5
Gilbert Waite	20	10	8
Clarine Willacey	16.5	6	9
(2 locations)	20	5	1.5
Vicente Muñoz	19.5	1	1
Lancelot McKenzie	16	5	2
Isaac Daniels	15.5	5	1
R. A. Belisle	15	7	7
R. E. Belisle	15	4	9
Joseph Taylor	15	8	7
Michael McPherson	14	2.75	4
(2 locations)	5	5	--
Gregorio Swass*	14	2	1
Seytie Wright	12.5	7	5
Mary Telrey	11	.5	--
Ezekiel Barera	10	3.5	3.5
Manford Butler	10	7	1
Aston Campbell	10	4.25	2
Martin Figueroa	10	5	5
Louis Flores	10	3	1
Benjamin Harris	10	1	6
Frank Rubio	10	4	6
Myrtle Sheram	10	5	5
(2 locations)	--	1	--
Floys Wagner	10	5	5

Appendix A (Continued)

Producer	Farm Acreage	Acreage in Oranges	Acreage in Grapefruit
S. G. Belisle	9	1	--
Horace Fand	9	4	3
(2 locations)	9	4	2.5
Evelyn Sánchez	9	6.67	.5
Alfhens Trapp	3.75	1.75	--
(2 locations)	8	3.75	4.25
Lowell Burgess	8	4	4
Jack Martin	8	3	1
Madelene McLeon	8	2	2
Chon Prida	8	4.5	1.5
Felix Cook	6	3.5	1.5
Richard Taylor*	5	2	1
Eddie Powell	3	1	--
Arthur Morgan	--	9	1
(2 locations)	.5	.3	--
Cyril Belisle	--	3	--
Fred Belisle	--	5	--
Cyril Morena*	--	1	3
Byron Ritchie	--	--	--
Dalton Ritchie	--	4	4
Eric Smith	--	3.5	3.5
John Stevenson	--	5	--
Emilio Zabaneh	--	23.5	--
(2 locations)	--	15	--
Total	5,809.25	3,701.47	891.25
Valley Totals	7,106.80	4,121.72	1,145.55

*Location tickets, all others are freeholders.

**Commercial citrus producers.

APPENDIX B

SOILS OF THE STANN CREEK VALLEY

	Name	Topography	Parent Material	Limiting Factors for Citrus Production
1.	Turneffe coarse sand	Flat	Sand	Low fertility
2.	Monkey River silty clay loam	Flat	Alluvium	Water control and low humus
3.	Silkgrass loamy sand	Gentle slopes	Granite	Difficult weed control and low fertility
4.	Granodoro fine sand	Flat to undulating	Granite	Fine sand and difficult weed control
5.	Melinda silty clay*	Flat	Alluvium	Slow drainage and low fertility
6.	Melinda fine sandy silt*	Flat to undulating	Alluvium	Leaching and erosion
7.	Canquín fine sandy clay loam*	Flat	Alluvium	None

Appendix B (Continued)

	Name	Topography	Parent Material	Limiting Factors for Citrus Production
8.	Canquín fine sandy loam*	Flat	Alluvium	None
9.	Stopper coarse sandy clay loam*	Rolling	Granite	Erosion and accessibility
10.	Currassow fine sandy clay*	Flat to undulating	Sandstones and shales	None
11.	Stopper brown gritty loam and sandy loam*	Flat to undulating	Granite and alluvium	Slow drainage
12.	Canquín sandy loam*	Flat	Alluvium	None

*Soils utilized for citrus production.

Source: Land in British Honduras: A Report of the British Honduras Land Use Survey Team, A. C. S. Wright et al., 1959.

APPENDIX C

UNION AGREEMENT BETWEEN THE CITRUS COMPANY OF BRITISH HONDURAS AND THE SOUTHERN CHRISTIAN WORKERS UNION, 1967-1968

1. Increases in wages of 2.5 per cent for hourly, daily, and piece workers.

2. In the event of any work stoppage beyond the workers' control, four-hour wages will be paid for work less than, and up to, four hours. The same agreement is binding for eight hours.

3. Vacation leave or vacation leave pay:

   a. Male or female workers who work 600 hours or more in any one year of employment shall receive 5 per cent of their total annual earnings up to five years of service; for six to ten years, 6 per cent; and for over ten years, 7.5 per cent.

   b. Weekly workers with less than ten years service shall continue to receive two weeks leave with full wages, and three weeks shall be given those with ten or more years of service.

4. Sick leave: each case is considered on its own merits.

   a. Fully paid sick leave upon verification by a doctor's certificate.

   b. Fully paid sick leave cannot exceed 12 days in any one year.

   c. Accident compensation for first three days is only for ship and pier workers.

   d. In case of death, the deceased worker's family will receive BH $50.00 in addition to the cost of a decent burial.

Source: R. Castillo, President, Southern Christian Workers Union, Stann Creek, January 29, 1968.

APPENDIX D

CITRUS VARIETIES OF THE STANN CREEK VALLEY

I. Grapefruit (*Citrus Paradisi*)

- A. Marsh seedless
- B. Duncan seedless
- C. Foster pomelo (pink)

II. Oranges (*Citrus Sinensis*)

- A. Valencia
- B. Hamlin
- C. Parson Brown
- D. Washington navel
- E. Pineapple
- F. Centenniel
- G. Temple
- H. King Mandarin

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