1991

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Iowa State University, 1991

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by

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A Dissertation Submitted to the
Graduate Faculty in Partial Fulfillment of the
Requirements for the Degree of
DOCTOR OF PHILOSOPHY

Department: History
Major: Agricultural History

Approved:

Signature was redacted for privacy.

In Charge of Major Work

Signature was redacted for privacy.

For the Major Department

Signature was redacted for privacy.

For the Graduate College

Iowa State University
Ames, Iowa

1991

INTRODUCTION

Cacao is the agricultural raw material for the manufacture of chocolate bars and cocoa drinks, and an assortment of cosmetic products and oil derivatives in industrialized countries. Most tropical agrarian societies produce cacao. For its nutritious qualities, the crop has attracted such vivid descriptive terms as the "magic bean," "the golden pod" and "food of the gods."[1] Cacao, however, suffers from a wide variety of plant diseases estimated at 2.6 billion dollars in financial losses to farmers annually.[2] Ghana, which dominated world cacao output from 1911 to 1978, experienced the crippling Swollen Shoot plant epidemic in the 1930s. Today, cacao cultivation is declining in Ghana partly because farmers lack the means to control certain pests and pathogens.[3]

The dangers of cacao plant pestilence and disorders have long historical precedents. Diseases destroyed cacao trees in the western hemisphere, the gene-center of the plant, and where the earliest plantations flourished. For this reason, cacao production shifted from the neotropics to West Africa. In the modern world, a crisis of plant diseases confront all cacao growing countries. Some of these countries like Ghana and Nigeria, have faced formidable problems of pathogenic attacks in their cacao plantations for decades.

The menace of plant diseases holds implications for Ghana's economy which has since colonial times relied heavily upon cacao export revenues. Until 1978, the largest cacao plantation system in the world was concentrated in Ghana's tropical rain forest of some 30,000 square miles.[4] These plantations are costly long term investments which has since the 1890s earned hard currency from world markets to underwrite economic improvements in Ghana. Since independence in 1957, cacao export revenues have paid for capital goods and raw materials for domestic manufacturing plants. This means that the crop provides income to rural populations, and created jobs for urban industries.[5]

Moreover, manufacturing enterprises in many industrialized countries depend upon regular supplies of cacao beans to sustain production. Hence, if diseases and pests are able to impair cacao plantations, supplies to overseas industrial plants would diminish significantly. Ghanaian cacao farmers would lose their source of livelihood. The government of Ghana, because of its heavy dependence on cacao export revenues, would also forfeit its economic viability. In industrialized countries, manufacturers of cacao products would languish and face ultimate collapse. Accordingly, as this project aims to demonstrate, the Agricultural Department in Ghana has sought to contain cacao plant diseases in the country's forest belt since the early twentieth century.

These endeavors improved with advances in the state of technical knowledge on cacao plant pathogens over time. This project also discusses the significance of cacao diseases in Ghanaian society, economy and politics from 1910 to 1966. This shows that apart from their biological and economic dangers, monocultures could potentially generate political difficulties as occurred in Ghana after World War II. The political repercussions produced two inter-related turning points in Ghanaian history. First, the event contributed significantly to Ghana's decolonization process. Above all else, it focused the energies of the Ghana government to design and concentrate research and extension services after 1948 to cope with cacao pathogens in Ghana.

Despite their economic significance, plant diseases have remained an unexplored field in African historiography. The neglect of Agricultural Science in African historical research has probably derived from the assumption that the Natural and Physical Sciences bear little interaction with the Social Sciences and the Humanities. Scholarship in the Social Sciences and Humanities to date, has overlooked possible intersections with the Natural and Physical Sciences when explicating social phenomena in Africa. This work on cacao plant pests and pathogens offers a departure. It blends material from the Humanities and Natural Sciences to deal with an important aspect of Ghana's major agricultural export

commodity.

Analytical Framework

An adaptation of the concept of "Induced Institutional Innovation," in agricultural economics and development provides an analytical tool for this work. This analysis considers the colonial and post-independent politicians, bureaucrats and technocrats as "political entrepreneurs" who responded to compelling biological and economic forces through public research and extension services. The political entrepreneurs encompassed the executive and legislative branches of government which formulated policies, and used bureaucratic institutions like the Department of Agriculture and Agricultural Research Stations to contain cacao diseases in Ghana. The technocrats comprised of virologists, mycologists, entomologists and plant pathologists in the service of the Agricultural Department in Ghana.[6]

The national policy makers innovated Ghana's cacao economy as an investment designed to maintain Ghana's competitive position in world markets.[7] In the Ghanaian context, the state intervened to protect the nation's cacao crop from pathogens since the national livelihood depended directly upon this monoculture. Advances in biological research at the Central Cacao Station from 1938, and that of the West African Cacao Research Institute from 1944 to 1966,

occurred because the government was determined to pre-empt the pre-mature decline of Ghana's cacao economy.

This study posits that before the introduction and development of cacao plantations in 1879, the external sector of Ghana's agriculture was extractive in character. At this historical stage, this sector was tied to foreign markets based on the extraction and export of indigenous produce like palm oil, palm kernels, timber and wild rubber. After 1879, two sets of innovation occurred in the external sector, resulting in the emergence and preservation in Ghana of the world's largest cacao plantations.

As defined in this study, the two facets of development involved the indigenous sphere and the scientific sphere. The major actors in the indigenous sphere were migrant agrarian entrepreneurs who secured land and used family members and kinship connections to transform the external sector into the country's exported-oriented cacao economy. As Robert Szereszewski, an economist explained, "the adoption of cacao represented the innovating activities of African agriculturists ... cacao ... was the real revolutionary element of the economy" and its adoption created "new enclaves of innovation on the margin of the traditional economy."[8] To this, Polly Hill, an anthropologist, has added, "The migrant cocoa farmers of southern Ghana were real economic innovators, people who bent their energy and intelligence to the business

of cocoa farming with supreme success."[9] The indigenous sphere of Ghana's export agriculture, as defined in this analysis, has attracted considerable literature and requires no further elaboration here.

The onset and spread of cacao morbidity induced an institutional innovation in the scientific sphere of Ghana's cacao economy. Here, the major actor was the state, operated under politicians, bureaucrats and technocrats. Between 1910 and 1943, the entomologists, mycologists, virologists, and travelling inspectors in the Department of Agriculture, initiated efforts to combat cacao diseases in Ghana's rain forest. The political entrepreneurs and bureaucrats also enacted statutes to protect the industry and created public research institutions to examine the dynamics of plant pathology and the most efficient means to eradicate them in Ghana. With the onset of the Swollen Shoot cacao virus in 1936, the government intervened decisively to protect cacao plantations from disease because a large proportion of most rural dwellers and the national livelihood rested heavily upon the cacao crop.

Organization of Work

This study has nine chapters. The first deals with the problem of cacao plant diseases from an international perspective. The chapter identifies and discusses a variety

of fungi, micro-organisms and insect-borne diseases that have afflicted cacao farms in Ghana and elsewhere in the tropics over time. The chapter also offers a comparative survey of plant diseases that have ruined cacao estates in selected tropical regions in the past. Also considered are the theoretical and chronological origins of plant morbidity in general to determine whether cacao diseases in Ghana or elsewhere were endogenous or exogenous. This chapter also evaluates the gravity of pest and disease menace to the cacao crop and examined the economic implications of plant diseases for agrarian societies.

The second and third chapters focused on the beginnings of cacao disease control programs in Ghana from 1910 to 1943. These chapters analyzed the initiatives of the colonial Department of Agriculture to extirpate cacao diseases in Ghana from 1910 up to 1943. These preliminary ventures laid the groundwork for the Cacao Research Station of 1937-1938 to build its research work on Capsid insects, the Black Pod fungus and after 1936, the cacao Swollen Shoot virus. The strategies which the Agricultural Department recommended to farmers to suppress these biological hazards provided the basis for examination in this part of the study.

Chapter four considers the emergence and objectives of the West African Cacao Research Institute in Ghana between 1939 and 1944. This section dealt with British initiatives

during World War II to eliminate cacao pathogens from its Ghanaian colony and British West Africa in general. The analysis outlines the dynamics of state involvement in the fight against cacao pathogens in Ghana. The government's use of trained research personnel, particularly biochemists, entomologists, agronomists, mycologists and virologists were examined to show the changing patterns of state efforts to curb cacao plant diseases in the West African rain forest.

Chapter five explains the government's post-war emergency programs to eradicate the cacao Swollen Shoot epidemic. However, as chapters six and seven have shown, Ghanaian nationalists politicized the government's Swollen Shoot control programs because of the rising tide of nationalism in the colony. Political disturbances in Ghana after World War II arose in part from government recommendations to cut out diseased trees. The cut-out order, to some degree, determined the course of Ghanaian rural and nationalist politics prior to self rule in 1957. The dynamics of rural unrest and their significance in the nation-wide political agitation for self determination is therefore explicated within the context of the cacao plant virus problem. Decolonization in Ghana was therefore not uniquely urban in character. There were strong undercurrents of agrarian discontent in the movement towards self rule in the former British Gold Coast colony that is today Ghana.

The political upheavals created a turning point in the government's program of cacao disease control. In 1948, commissions of enquiry from Britain, the Food and Agricultural Organization of the United Nations and that of Justice Arko Korsah in 1951, outlined research possibilities and stressed the best means to eradicate the cacao plant pathogens in Ghana. This crucial turning point in the agricultural history of Ghana paved the way for the suppression of cacao pathogens in Ghana under state auspices up to 1966.

The rest of this study --chapters eight and nine-- considered the flow of research findings from the Cacao Research Institute through the Ministry of Agriculture to cacao cultivators in Ghana's forest belt. The dissemination of research information, the movement of chemicals, spraying equipment and compensation payments to farmers who lost their cacao trees to the cutting out programs are some of the issues addressed in this segment. The extent to which the Cacao Research Institute and the Department of Agriculture assisted the state to overcome the destructive effects of cacao diseases have received critical evaluation in the final chapter.

Endnotes

[1]The gene-center of the cacao plant is the Upper Amazon valley in South America. According to an Aztec legend, the cacao tree originated in paradise where it grew in the garden of one of the gods. From here the tree reached the earth for man's delight. For this reason, a Swedish scientist gave the plant its botanical name, Theobroma Cacao, the Greek for "Food of the Gods." See for example, L. A. Are, Cacao in West Africa (New York & London: Pergamon Press, 1975), 5-6; R. Whymper, Cocoa and Chocolate : Their Chemistry and Manufacture (London: J.A. Churchill, 1912), 4; C. J. J. Van Hall, Cocoa (London: McMillan and Company Limited, 1941), 1; Eileen M. Chatt, Cocoa (New York: Interscience Publishers Incorporated, 1953), 5; and "Golden Harvest," Information Services Department (Accra, Gold Coast: Government Printing Press, 1953), 1.

For its special delicacy, cacao has attracted various epithets such as the "Golden Bean," see John Phillips, Kwame Nkrumah and the Future of Africa (New York: Frederick Praeger Publishers, 1960), 84; another author has described it as "the magic of the golden pod of cocoa," see S. La Anyane, Ghana Agriculture - Its Economic Development From Early Times to the Middle of the Twentieth Century (London: Oxford University Press, 1963), 4, 38-39, and 100.

Perhaps, the most vivid terms are those of Michael Dei Anang. Parts of his narrative reads: "These gold-bearing trees,"; "[t]hese golden pods make a drink surpassing all beverages in richness and sustaining power. This is an ambrosia of the gods celebrated in ancient song," and "These far-fetched seeds of Gold,"; "These pods that bear the colour of gold...are by the Spanish called cacao." See his, "Cocoa Comes to Mampong," in Part VIII of Waywardlines From Africa. A Collection of Poems (Nendeln-Liechtenstein, Germany: Krause Reprint, A Division of Krause-Themison Organization Limited, 1970), 11, 20-21.

One poem compares the cacao beverage in glowing terms with tea and coffee. According to one Enrique Perez Guitierez:

> Beside a cup of tea we chat,
> Beside one of coffee, we argue;
> With a cup of chocolate, we all--children,
> adults, and older folk - feel the
> pleasure of life.

In Sarah Jeannette Scheer, The Oil Syndrome and Agricultural Development (New York: Praeger Special Studies, Praeger Scientific Publications, 1985), 66; see also Arthur W. Knapp, The Cocoa and Chocolate Industry (London: Sir Isaac Pitman and Sons Limited, 1923), 6.

[2]Two agricultural scientists provided this estimate: H. C. Evans and C. Prior, "Cocoa Pod Diseases: Causal Agents and Control," Outlook on Agriculture (hereafter O. A) 16 no.1 (1987): 35. However, the financial loss to Ghana from cacao diseases cannot be measured accurately: see for example, Harrison G. Wehner, Jr., "The Supply Function of Ghanaian Cacao: A Comment," Journal of Farm Economics (Hereafter J. F. E.) 18 no.2 (May, 1966): 467.

Nigeria, like Ghana, has historically confronted severe cacao diseases: see Michael Watts and Robert Shanton, in "The State and Agrarian Transformation in Nigeria," in The Politics of Agriculture, ed. Jonathan Parker (London: Sage Publication Incorporated, 1984): 176.

[3]Alan B. Mountjoy and David Hilling, Africa: Geography and Development (London: Barnes and Noble Books, 1988), 238-9.

[4]Ghana's total land area under cultivation has changed over the years. In 1944, estimated acreage of land in Ghana amounted to 59,000,000, with 29 percent in the rain forest. H. B. Waters, "Agriculture in the Gold Coast," Empire Journal of Experimental Agriculture (Hereafter E. J. E. A.), 12 no.46 (April, 1944): 8.

In 1956, another source indicated that of Ghana's 91,843 square miles of territory, only 9 percent of the 31,000 square miles of rain forest was under cacao planting: D. H. Urquhart, Cocoa (London: Longman's Green and Company, 1958), 103. Two years later, The United States Department of Agriculture (U. S. D. A.), placed Ghana's total land area under cacao at 3,954,000 acres: see, "Ghana's Agricultural Trade in Farm Products," Foreign Agricultural Service (Hereafter, F. A. S.) U. S. D. A. M. 34 (Washington D. C.: Government Printing Department, April 1958), 13; (available at the Land Tenure Center, University of Wisconsin, Madison).

In 1981, the acreage under cacao had grown to 4,100,000: see "Ghana - Hopeful Signs," The Courier no.66 (March-April, 1981), 28 (available at the Land Tenure Center at the University of Wisconsin at Madison) The latest available estimate is 1.87 million acres: see Mountjoy et al. Africa (1988), 238-9.

Land acreage devoted to cacao planting in Ghana has been estimated regionally as follows: Ashanti Region: 1,580,635; Brong Ahafo: 1,003,992; Eastern: 549,201; Central: 424,333; Western: 317,653; and for the Volta Region: 348,463. The total resources in land under cacao production is 4,224,227: cited from E. N. Omaboe and I. Neustadt, The Economy of Ghana. Vol I. (London: Alex and Darwin, London 1966), 237.

In 1976, Ghana's land area was estimated at 91,843 square miles. The formal incorporation of the former British mandated Trans Volta territory after World War I accounted for the difference, although the two colonies were administered jointly after World War I. See, for example Ghana: Background Notes (Bureau of Public Affairs, U. S. Department of State, January 1976), 3. (also available at the Land Tenure Center, University of Wisconsin, Madison).

5Ghana's economic well being is historically tied to cacao. See for example, Anonymous, "The World's Cacao," Agricultural News (Hereafter A. N.) 16 no.406 (November, 1917), 363; and Anonymous, "The Gold Coast Cacao Industry," Tropical Agriculture (Hereafter T. A.) 12 no.12 (July, 1935): 311-2. These sources have shown that between 1923 and 1932, the cacao crop accounted for 77 percent of Ghana's total exports. The commodity also represented 95 percent of the nation's agricultural exports. This trend still applies today. By 1966, cacao was still the major source of taxation to finance development programs in Ghana.

[6]Paladino Paolo, "Science for Whom?": Agricultural Development and the Theory of Induced Innovation, Agriculture and Human Values (Hereafter A. H. V.) (Spring-Summer, 1987): 53-64. Yujiro Hayami and Vernon W. Ruttan, Agricultural Development. An International Perspective (The John Hopkins University Press, Baltimore & London, 1985), 79.

[7]The concept of state which appears here synonymously as "political entrepreneurs," is an operational definition derived from Yale H. Ferguson and Richard W. Maunsbach, The State, Conceptual Chaos and the Future of International Relations Theory (Boulder & London: The University of Denver, 1989), 54-60.

In the "Many Meanings of the State," the analyses perceive the state among dozens of other definitions, as "government," "bureaucratic politics" and "executive."

[8]The concepts, scientific sphere, external sector etc. are the author's own formulations based on a re-appraisal of

the analytical approach adopted in A. G. Hopkin's, An Economic History of West Africa (New York, N.Y.: Columbia University Press, 1973), chapters 1 & 2 which dwelt on "The Domestic Economy: Structure and Function," and "The External Trade: the Sahara and the Atlantic."

See also, Robert Szereszewski's Ph.D dissertation submitted to the University of London, England in 1964, 6-9, 12, 34, & 54 and Jan S. Hogendorn, "Economic Initiative and African Cash Farming: Pre-Colonial Origins and Early Colonial Developments," in Colonialism in Africa, ed. Peter Duignan and L. H. Gann 4 (1975): 284.

[9]Polly Hill, Migrant Cocoa Farmers in Southern Ghana (London: Cambridge University Press, 1963), 21.

LITERATURE REVIEW

The role of indigenous Ghanaian farmers in the creation of Ghana's cacao economy has attracted considerable documentation.[1] However, government-sponsored projects to eradicate cacao plant diseases have virtually remained a terra incognita in African historiography. On this account, sharply contradictory views have appeared in the existing literature regarding state support, particularly under colonial rule, to cacao production.

Kwame Nkrumah, a Ghanaian nationalist politician in I Speak of Freedom (1957), and George Padmore, a noted Pan-Africanist, along with several social scientists including Polly Hill, Barbara Ingham and G. B. Kay have ascribed the emergence in Ghana of the world's greatest cacao economy solely to migrant farmers. This school of thought failed to explore literature in the natural sciences to explicate social phenomena in Ghana. This omission has entrenched the view that the state restricted itself solely to the collection of cacao excise taxes and left the cultivation of the crop to rural Ghanaians in the forest belt.[2] A second category of sources, including Kwamina B. Dickson's Historical Geography of Ghana and Alan McPhee's Economic Revolution in British West Africa have viewed government involvement as crucial to cacao growing.

Despite their apparent adversarial position with the

aforementioned school of thought, this latter group of social scientists like the former, excluded evidence from scientific sources to support their perceptions.[3] Scholarly publications in the natural sciences provide detailed and reliable data on state-sponsored research into the most dependable means to extirpate cacao diseases in Ghana. These scientific sources, however, have their limitations. Though readable, they tend to be extremely technical for the average reader.

Government ordinances and reports from Ghana's Agricultural Department and the erstwhile West African Cacao Research Institute (WACRI) have examined various facets of cacao pathogens in the period under review. But while the legal enactments impressively spelt out the laws governing disease control policy, they failed to present any evidence on their impact in Ghana. The yearly reports of the Agricultural Department helped to evaluate the department's beginnings, progress and difficulties in controlling cacao diseases in Ghana from the early twentieth century to date. These reports could not be evaluated independently with other primary sources of comparative depth and have remained at best as a lop-sided presentation on the role of the state in fighting plant pests and diseases in Ghana.

The aforementioned deficiencies were not altogether irremediable. Accounts from various farm magazines, especially Foreign Agriculture, World Crops, Agricultural

News, Tropical Agriculture, and The Gold Coast Farmer and The Ghana Farmer have served to evaluate various government policies and projects on cacao pathogens in Ghana from the early twentieth century. World Bank reports and publications from the Food and Agriculture Organization also provided independent evaluations on the cacao disease problems after 1945. These sources considerably counter-balanced the inherent dangers of depending heavily upon colonial and post-colonial government documents on Ghana's cacao disease control programs.

Endnotes

[1]The outpouring of literature on various aspects of Ghana's cacao economy is extensive. A sample of these sources proved useful for this work. See, for example, C. G. Bhatacharya and P. N. Potakey, "A Study of Cocoa Farming and Cocoa Farmers in the Eastern Region of Ghana Using an Integrated Household Survey," Technical Publication Series no.18, Institute of Statistical Social and Economic Research (Accra: University of Ghana, 1969); Polly Hill, Studies in Rural Capitalism in West Africa (London: Cambridge University Press, 1970); Raymond Bixler, The West African Cocoa Story (New York, N. Y: Vantage Press, 1972); and more recently, Christine Okali, Cocoa and Kinship: the Matrilineal Akan of Ghana (London: Kegan Paul International, 1983).

[2]Kwame Nkrumah, I Speak of Freedom (New York, N.Y: Frederick A. Praeger, 1961), 83. See also the author's Ghana: The Autobiography of Kwame Nkrumah (New York, N.Y: Thomas Nelson and Sons, 1957), 23.

[3]State-sponsored scientific agricultural research to protect cacao pathogens in Ghana has attracted a myriad of controversial views. Apart from Nkrumah, George Padmore, a Pan-Africanist stated similar views. See, George Padmore, The Gold Coast Revolution (London: Dennis Dobson Limited, 1958), 197.

Until his death in Ghana in the early 1960s, he remained a close confidant of Ghana's first President, Kwame Nkrumah.

Over the years, these perceptions assumed the forms and force of ex cathedra statements and several social scientists have willy-nilly supported these assertions. See for example, Polly Hill, Migrant Cacao Farmers in Southern Ghana (London: Cambridge University Press, 1963), 11.; G. B. Kay, The Political Economy of Colonialism: A Collection of Documents and Statistics: 1900-1960 (London: Cambridge University Press), 6; Barbara Ingham, Tropical Exports and Economic Development (London: McMillan Press, 1981), 13-14.

The same views have appeared in the underlisted works, which like all other sources, completely ignored government initiatives to eradicate cacao pathogens from Ghana's rain forest: Andrejs Krassowski, Development and the Debt Trap (London: Croom Helm Limited, The Overseas Development Institute, 1974), 5; Christopher Gunnarson, The Gold Coast Industry: 1900-1939: Production Prices and Structural Change (Printed in Sweden: A. V. Centralen Lund, 1978), 14; see also, R. H. Green and S. H. Hymer, Cocoa in the Gold Coast: A Study

in the Relations Between African Farmers and Agricultural Experts," Journal of Economic History, 31 (September 1966): 299-319; Crawford Young, Neal P. Sherman and Tim H. Rose, Cooperatives and Development: Agricultural Politics in Ghana and Uganda (Madison: The University of Wisconsin Press, 1981), 163; A. G. Hopkins, "Innovations in a Colonial Context: African Origins of the Nigerian Cocoa-Farming Industry," in Studies in the Economic History of Africa and India, ed. Clive Dewey and A. G. Hopkins, (London: Athlone Press, University of London, 1978), 397.

Other scholars whose works appear below, have viewed state participation as crucial to cacao growing in Ghana. The reader is warned that like their opponents, their interpretations were not derived from any in-depth analytical studies on the incidence and control of cacao diseases in the country. See for example, Alan Mcphee, The Economic Revolution in British West Africa (London: Frank Cass and Company Limited, 1971), 41; Arthur W. Knapp, The Cocoa and Chocolate Industry (London: Isaac Pitman and Sons Limited, 1923), 80; Keith Hart, The Political Economy of West African Agriculture (Cambridge University Press, 1982), 98; W. H. Beckett, Koransang Cocoa Farm, 1904-1970 Technical Publications Series no.31. Institute of Statistical Social and Economic Research (Legon, Accra: The Universities of Ghana Press, 1972), 1 (available at the Land Tenure Center, University of Wisconsin, Madison).

Two Ghanaian academics who positively discussed the government's control of cacao pathogens in Ghana are: S. La Anyane, Ghana Agriculture: Its Economic Development from Earliest Times to the Middle of the Twentieth Century (London: Oxford Universities Press, 1969), 169-170; Kwamina B. Dickson, A Historical Geography of Ghana (London: Cambridge University Press, 1969), 169-170.

METHODOLOGY

Prior to the actual research, the author systematically searched for biological terms in entomology, mycology, virology and plant pathology in order to delineate the technical terms entailed in this project with accuracy and precision. Using this tool as a starting point, the author closely studied the available literature on Ghana's agricultural history and politics from 1910 to 1966 in order to place the role of the state on cacao disease control into its precise chronological and socio-economic context.

The collection and analysis of data for this study involved the identification of relevant primary documents on Ghanaian agricultural and administrative history. These documents included British Colonial Office records and correspondence pertaining to cacao plant diseases, annual reports and bulletins of the Gold Coast Department of Agriculture (later Ghana's Agricultural Ministry) Ghanaian parliamentary debates on Swollen Shoot control and the findings of committees of enquiry into cacao diseases in Ghana. Pertinent information in secondary sources on cacao pathogens were matched with a wide variety of primary source materials from farm magazines and journals, agricultural reports, and colonial office records. This methodology helped to approach the containment of cacao diseases from the perspectives of both the natural sciences and the humanities.

The procedure also served to determine and build an accurate picture of government perceptions and response to the cacao disease menace in Ghana from 1910 to 1966.

The author then integrated, synthesized and organized the assortment of sources chronologically, paying particular attention to historical turning points. These turning points included the period when the state acknowledged the disease problem in the first decade of the twentieth century. In this phase, the government's department of agriculture advised farmers on disease eradication without any scientific backing. After 1925, modest research efforts into entomological and mycological hazards in the cacao plantations commenced in the Eastern Province of Ghana. Similarly, virologists in the colonial Department of Agriculture intensified research after 1936 into the bionomics of the cacao Swollen Shoot virus in Ghana. Generally, the period from 1925 to 1943 may be characterized as the era of scientific research without practice. A significant turning point in the fight against cacao disease occurred after 1944 with the creation of the West African Cacao Research Institute. At this historical stage, the state sponsored research into cacao morbidity and implemented the results in the field with remarkable consistency.

The highlight on turning points held a distinct advantage. It helped to sharpen the analysis on how the

application of scientific research into the larger society unleashed political turbulence in Ghana after 1948. The creation of commissions of enquiry directed and focused research on how best to cope with the public relations component of the application of research findings in the larger Ghanaian society.

I THE PROBLEM OF CACAO PLANT DISEASES FROM AN INTERNATIONAL PERSPECTIVE

Cacao in the World Economy

Cacao has been an article of international commerce since the sixteenth century.[1] In the modern world, the crop provides a classic example of global labor specialization and economic inter-dependency. Today, cacao is produced in tropical agrarian societies and manufactured in temperate industrialized regions. From the production side, millions of farmers cultivate cacao in tropical countries. The geographical zone of West Africa is the major cacao producer in the world. Nearly 80 percent of global output comes from Ghana, Cote D'Ivoire, Brazil, Nigeria and Cameroon. Production in these countries, along with those from Papua New Guinea, Mexico and the Dominican Republic, accounts for 90 percent of world output.[2] The rest emanates from the neotropical countries of Ecuador, Panama, Columbia and Venezuela along with the Caribbean countries of Grenada, Haiti, Trinidad and Tobago. In Asia, cacao farms also thrive in Ceylon, Indonesia, the Philippines, Samoa and lately Malaysia.

Cacao cultivation in agrarian cultures depends upon markets in industrialized nations for its viability. North

America and Western Europe import about 80 percent of the world's raw cacao. Eastern European and Far Eastern markets absorb the rest. Historically, the United States, commanding about 25 percent of the market, has remained the world's foremost importer and consumer of cacao. The former Federal Republic of Germany, Holland, the United Kingdom, the Soviet Union and other Eastern European states are also important consumers.[3]

A few industrial companies dominate the manufacture of cocoa products in each of the main consuming countries. In the U.S., the biggest cacao manufacturing corporations have been Hershey Foods Corporation, Mars Incorporated, General Foods Corporation and W. R. Grace and Company. In the United Kingdom, Cadbury-Schweppes Limited, Rountree Mackintosh Limited and the U.K. Biscuit Holdings Limited are the major producers. In Switzerland, the established cocoa manufacturers are Nestle and Interfood Corporation.[4]

A chain of subsidiary firms service these manufacturing plants. These firms purchase cacao from producer nations, cover the costs of insurance, freight, warehousing and the eventual distribution of the commodity to manufacturers. A network of brokers buy manufactured cacao in bulk for shipment to distributors and consumers throughout the world. These diverse economic operations provide employment for hundreds of thousands of individuals world-wide. To Ghana and other major

producers, cacao is a cash crop that earns hard currency from world markets to finance internal economic programs. Since colonial times, cacao revenues have virtually underwritten most of Ghana's development projects.[5] The crop's significance as an international commodity is therefore apparent from the production and consumption aspects.

Consequently, if plant pests and diseases are able to restrict cacao output significantly, producer countries like Ghana, would face considerable economic insolvency. Given the intricate network and mechanisms of the global economy, enterprises that purchase, manufacture and redistribute the cocoa products in the larger world economy, would undergo economic stagnation.[6] Indeed, cacao cultivation in tropical countries, over the last three hundred years, has also signified a permanent struggle to overcome numerous cacao plant pests and diseases. Originally considered as "Food of the Gods", the cacao tree, is subject to a variety of insect, fungi and virus attacks. Rodents, particularly monkeys, birds and many zoological forms have caused havoc to the crop, reducing this idealized "Food of the Gods" to food for vermin. Thus, cacao conforms to an unwritten biological law that every organism is subject to its genetic condition and the external environment.[7]

Cacao diseases fall under four major categories: entomological, virological, vertebral and mycological. Of

these, fungal (mycological) diseases are perhaps the most varied and complex. Insect attacks on the cacao tree are no less significant. An entomologist, P. F. Entwistle, has indicated that over 1,500 different insect species feed on cacao.[8] Of these, however, probably less than 2 percent have become major pests of economic importance. Capsids or mirids, have been the most dangerous insects whose feeding habits severely damage the stem tissue of the cacao tree. Capsids are prevalent in the rain forest of Africa, the Caribbean, Central and South America where cacao grows.[9]

Several viruses also afflict cacao. One such example is the virulent Cacao Swollen Shoot Virus. First noted in Ghana in 1936, this plant virus is now present in Nigeria, Cote D'Ivoire, and Liberia, though less significant in the Western Hemisphere and Asia. Other cacao plant viruses are listed as the Cacao Mottle Leaf Virus, Cacao Yellow Mosaic Virus, the Ceylon Cacao Necrosis Virus and the Cacao Trinidad Virus. These viruses vary in terms of disease symptoms, characteristics, geographical spread and economic significance. In the main, however, these plant pathogens are tree-killing diseases against which few cacao species have any form of resistance.[10]

Vertebrates, or rodents, represent another category of cacao plant pests in tropical countries. Vertebrates that have historically ravaged cacao farms to the present, have

been bats, birds, the field mouse and monkeys. Parrots, woodpeckers, rats, squirrels and flying foxes have especially caused considerable spoliation among cacao trees in the tropics.[11] The problem arises because many animal groups find the sugary pulp surrounding the raw beans in the cacao pod attractive.[12] In 1912, for example, squirrels fed intensively on cacao in Sri Lanka. In 1914, rodent attacks on cacao in the Portuguese West African island of Sao Thome proved particularly extensive. In 1952, Sierra Leone cacao suffered an unprecedented 25 percent loss from monkey depredations.[13]

In Ghana, rodents have continually damaged cacao pods since the plant's introduction in 1879. In the 1961-2 crop season, the percentage of loss to rodents came to 11 percent of total annual yield. Nigeria, Ghana's West African neighbor, has reported similar yearly losses to rodents ranging up to 15 percent.[14] These West African examples of vertebrate damage to cacao is also true of the Pacific. In Sabah, now part of modern Malaysia, yearly losses due to rodents have ranged between 3-6 percent.[15]

Most cacao diseases have emanated from fungal attacks, resulting in an economic loss of about 30 percent of the crop. In Cameroon, the Black Pod fungal disease is an ever-present problem, afflicting between 20-80 percent of the pods. Nigeria, like other cacao producers, has suffered persistently, especially in 1955, from the Black Pod fungal

disease.[16] In 1934, H. R. Briton-Jones, a British plant pathologist, published pertinent findings on cacao fungus diseases. This publication confirmed that, the Phytophthora Palmivora, the fungus which caused the Black Pod disease, was common in cacao growing nations. The Palmivora afflicted every part of the cacao plant. This fungus have also attacked most crops of economic importance, especially coconuts, cotton and citrus trees.[17]

The list of fungal diseases Briton-Jones and others have discussed is extensive.[18] One more example of a fungus disease is the Thread Blight fungus. In 1925, H. A. Dade, a government mycologist in Ghana, expressed concern about the heavy infections it caused to some cacao farms, sometimes to the extent of 100 percent.[19] There is also the Pink Fungal Disease which has attacked cacao and over one hundred and forty other plants on a global scale. On cacao, the fungus grew on the bark of the tree and then penetrated the plant tissue. The cacao bark would then split and slough away from the wood. When old, the tree would develop numerous cracks. Malaysian plant pathologists have described the disease as the "Writing Fungus," because to them, the fissures it creates resembled hieroglyphic writing.[20]

Two other authors, G. Frolich and W. Rodewald have discussed other fungi types which have damaged cacao and other economically important plants over time. Three of these

pathogenic fungi were the Diplodia, Anthracnose and the Thielaviopsis Pod rot. Diplodia, or the charcoal rot cacao disease arises from a fungus, Diplodia Theobromae. Distributed world-wide, the fungus parasitized several plant hosts. In cacao, Diplodia destroyed cacao plant budding and shoots. A heavy infection usually defoliated the tree completely.[21] The Thielaviopsis fungus, caused the Thielaviopsis cacao pod rot disease. The pathogen, first noted in Ecuador, is present in Costa Rica. This fungus has a much wider geographical distribution. Bird activity in cacao plantations, and infrequent harvesting helped the disease to take a heavy toll of the crop. The fungus would usually penetrate the cacao fruit through any wounds birds might have inflicted. In the process, the wall of an infected pod rapidly would weaken and could be crushed like an egg-shell.[22] Other fungus types attacked the cacao roots. H. A. Dade, gave the name "collar crack" to the Armillaria Root fungus after a careful study of it in Ghana and Togo after World War I. The affliction here is basically root rot. By this means, the fungus destroyed the root system which eventually killed the cacao tree.[23]

Apart from the plantations, cacao stored away in warehouses was subject to fungal and insect damage. In 1963, a mycologist from the Food and Agricultural Organization discussed diseases among cacao in warehouses awaiting shipment

to manufacturers overseas. The insects involved, the Ephestia Elutella, Cadra Cantella, the Cigarette Beetle and their larvae have persisted in both tropical and temperate warehouses. Since stacked cacao re-absorbed water at room temperature, they generally developed molds. These in turn, have jeopardized the commercial quality of the raw cacao beans from past to present.[24]

Because of its value as an international commodity, cacao diseases have global economic implications. Diseases destroy crop quality. Bacteriological agencies might trigger undesirable enzymic processes and chemical reactions within the plant's tissues. Fungi and other forms of bacteria distort the appearance, color, odor, and flavor of the produce, and might render it altogether worthless to the consumer. Moreover, the presence of other micro-organisms in the crop, may pose a public hazard because they produce toxic metabolites within cacao which induced enteric diseases. Financially, it must be reiterated, that crop loss due to cacao fungus disease alone range from 10 to 30 percent or 1.8 million tons, the equivalent of $2.6 billion yearly. If successfully controlled, cacao producer nations, like Ghana, would be assured of steady incomes for economic improvements.

The economic implications of plant diseases on a global scale are enormous. In the mid-1960s when this study ends, pests, insects, weeds and mammals of all kinds destroyed about

35 percent of the world crop output. When post-harvest losses are added, the figure rose to 48 percent. For Africa and other societies dependent upon export agriculture, the need to control plant diseases is paramount.

The origin of plant diseases is not certain. From Pliny's Natural History in 79 A.D., agriculture in the ancient world took a toll from plant diseases.[25] This means plant morbidity has a long history. What is clear is that plant diseases generally arise from endogenous and exogenous factors. An entomologist, R. C. Shaddock, has maintained that ecosystems always attain a balance among diverse animal and plant species in the natural forest. However, when farmers clear the land to farm a single crop, pathogenic micro-organisms that previously fed on several plants in the natural forest now consume the farm crop. In essence, the planting of a vast extension of terrain with selected crops, always offered favorable conditions to the pests to multiply.[26]

Plant diseases could also be exogenous. Though plant pathogens occur in natural plant communities, they seldom reach epidemic proportions. The co-evolution of the host and parasite over a long time frame always produced some degree of co-existence among plants and animals in the natural forest. The introduction of exotic pathogens into the natural forest often resulted in plant epidemics because no natural equilibrium has emerged between the new host plant and endemic

diseases.[27] Conversely, some pest problems have occurred when exotic crops reached new biotic communities. The new crop usually attracted predators or parasites in the new ecosystem. These parasites or predators may become serious pests mainly because the newly introduced species lack natural resistance to potential diseases. Again, human commerce and migration helped to transfer crops, and in the process, inadvertently introduced plant pests and diseases across time and space. Also, vertebrates have disseminated plant morbidity geographically when they fed on the crop and dispersed the seeds along with the disease.28

This overview has shown that plant pests and diseases pose serious difficulties to cacao growers in the tropics. The impact of cacao diseases in Central and South America and the Caribbean lends further support to these assertions. Cacao originated from the tropical forest of the Upper Amazon basin in South America. The demand in Europe for cacao in the seventeenth century encouraged European planters to develop cacao plantations in the neotropics and in the Asian islands of Sri Lanka, Indonesia, and the Philippines.

Because of the slave trade, no European nation encouraged cacao planting in Africa until the nineteenth century. During the sixteenth and seventeenth centuries, when zoological and biological forms spread across the world, Europeans emphasized plantation systems in the tropics to support exotic crops.

These agricultural operations, in turn, required labor inputs which generally came from African slave labor.[29] From the sixteenth to the early nineteenth century, African kingdoms remained in a state of war to satisfy European demand for slaves. The pre-occupation to secure African manpower for farm work in the neotropics voided the emergence of commercial cacao farming in Africa until colonial rule in the 1880s.[30]

The introduction of cacao to the West African island of Fernando Po dates to 1822 when African manpower export was in abeyance and Europe required agricultural raw materials for industrial purposes. Despite the late start, West Africa later dominated world cacao production. The ruinous impact of diseases in the older cacao growing countries of the Western Hemisphere made this possible. For example, by the early twentieth century, over 80 percent of the world cacao crop came from the neotropics and less than 1 percent from Africa. Today, West Africa produces nearly 80 percent of the crop.

A brief historical survey of the nature and impact of specific cacao diseases from selected countries in the Western Hemisphere is offered here. Ecuador provided a classic example. From 1740 to 1895, this country was the world's principal cacao producer. However, by 1950, Ecuador, with 15,000 tons could only supply 3 percent of world output compared to 37,000 tons at the beginning of World War I. This sudden drop in output emanated from two deadly cacao fungal

diseases: the Monilia Pod Rot, which struck in 1917 and the Witchbroom disease, officially noted in 1927. The two plant pathogens caused such havoc that many cacao planters inevitably abandoned their farms.[31]

The Ecuador example compared with similar developments among cacao plantations in Surinam. Surinam, also in South America, originally exported small quantities of cacao in 1725, and reached an annual average productive capacity of 10,000,000 pounds from 1870 to 1895. But within the period between 1905 and 1912, Surinam cacao almost vanished from the international market. The destructive effects of the Witchbroom plant disease was the causative factor. Eventually as in Ecuador, farmers cleared their cacao fields in favor of banana and coffee plantations.[32]

Such was the gravity of Witchbroom cacao disease in the Western Hemisphere that the state government of St. Lucia and other countries in the Western hemisphere enacted ordinances against the introduction of cacao diseases from neighboring Latin American countries. The introductory part of the legal instrument stated:

> Whereas it has been represented to me by the Imperial Department of Agriculture for the West Indies that a fungoid disease known as the Witchbroom is a serious enemy to cacao plantations and it is important that the disease should be kept out of all cacao growing areas in the West Indies...

The proclamation, then detailed the gravity of the blight and

its intended remedy with the words:

> And, whereas the same disease has lately appeared in Surinam, and it is believed to be gradually spreading over cacao cultivated areas of the continent of South America, now therefore, I, Harry Langhorne ... Administrator of the Island of St. Lucia, in virtue of the power and authority in me vested by the Plant Protection Ordinance, 1895, do hereby prohibit from the date hereof until further notice, the importation into this colony directly or indirectly from the continent of South America, and East and South of the Isthmus of Panama, of any cacao plants or parts or portions whatever of the cacao tree.[33]

The recourse to legal enactments failed to stop the spread of biological hazards to cacao in the neotropics. The Witchbroom disease destroyed several South American cacao economies. Venezuela provided one such example. This country was then the world's leading supplier of cacao until Ecuador later out-produced it. Production in Venezuela peaked between 1923 and 1925, when it exported approximately 22,000 tons of cacao. But owing to the Witchbroom disease, Venezuelan cacao exports fell drastically.[34] The same experience applied to cacao farms in British Guiana. Also an important cacao producer, exports from British Guiana declined gradually from 1923 to 1930. As in Venezuela, the incidence of the Witchbroom cacao fungus disease was chiefly responsible for the decline.[35]

Further examples abound. In Colombia, a cacao disease, described as "Buba" or "Cushion gall" became prevalent in

1938. The disease appeared in ten other countries in South and Central America. The "Buba" which sterilized the plant's floral cushion, created concern in western Colombia, Nicaragua and Costa Rica, where it was most visible. The cause of the cushion gall disease is unknown. However, it is attributed to a variety of causes ranging from virus infections, the depredations of eriophyid mites, genetic abnormalities, mineral deficiency, mineral toxicity, bacterial and fungal infections.[36]

A similar situation applied to Brazil. Here, the Portuguese introduced cacao in 1749 into the state of Bahia, which to date produces 96 percent of the country's yearly output. But Brazilian cacao, as in Ghana, has suffered from Capsid pest attacks. The Monalion Bondari and Molanion Parviventre Bahiense Capsid species have been the most deadly. Graf ants, or the Azteca paraensis, and leaf-cutting ants, the Alta Cephalotes, along with leaf beetles like Wodonota Theobromae and Cacarema, have continually destroyed cacao fruits and defoliated the plant's branches. Brazilian cacao also suffers from the Black Pod disease. Locally known as Brown Rot, this disease is historically the worst cacao pathogen in Brazil accounting for some 30 percent of crop loss in the country.[37]

Cacao Disease in Central America and the Caribbean

In Central America, the six main cacao producing countries are Mexico, Guatemala, Honduras, Nicaragua, Costa Rica and Panama. In fact cacao farming in Central America, especially in Mexico, had long ante-dated the voyages of Christopher Columbus in 1492. As elsewhere in the tropics, cacao from these countries has suffered interminably from diseases. As in Brazil, the major disease in Central America is the Phytophthora Palmivora, a fungal disease that accounted for 40 percent of production loss per year in the region.

While plant diseases have posed difficult problems to cacao growers in South and Central America, their dangers in the Caribbean have been just as formidable. The older cacao growing centers in the West Indies, namely Haiti, Martinique and Guadeloupe lost their importance in cacao growing because of plant diseases.[38] Trinidad and Tobago which grew more than 90 percent of cacao in the British West Indies offers a standard example. Lying off the coast of Venezuela, Trinidad, along with Grenada and Jamaica produced fine grade cacao. Such cacao came from large estates that ranged from 5 to 1,000 acres.[39] But between 1911 and 1920, the Island's yearly average production of 32,500 tons slumped to 18,000, and after 1946, averaged only 20,000 per annum. The decline in output resulted partly from soil exhaustion but principally because of the Witchbroom fungus disease which afflicted cacao estates

from 1928.[40] Beetles added to the havoc when they bored small holes through the branches which caused the boughs to fall in windy weather. In short, owing to plant pathogens, cacao planting in the West Indies declined.[41]

Introduced to the West African mainland in the 1880s, African cultivators produced cacao with family labor, which is still the mode of production today. Unlike paid workers, family labor minimized the cost of production, which in turn, reduced world cacao prices especially in the 1930s and 1940s. Cacao producers in the neotropics could not compete partly because they used paid wage labor on large plantations. Such a mode of production proved unprofitable when cacao diseases ravaged the farms. Cacao diseases discouraged new plantings and rather compelled many farmers to abandon thousands of hectares of valuable land. Most planters actually cleared their cacao fields to support other farm crops like fruits in Trinidad and coffee in Guatemala. Meanwhile, as cacao trees grew older in the Western Hemisphere, they became more vulnerable to diseases and cultivators did not replace them when they died.

While African cacao exports increased, disease and lack of replanting diminished output in the neotropics. Whereas by 1800, Latin America produced 80 percent of world cacao, by 1938-9, the percentage had dipped to 30 percent to date.[42] Because it was free of cacao diseases, only the area of Bahia

in Brazil has remained a major producer of cacao in South America. The fate of cacao growing in the Western hemisphere clearly illustrates the dangers of plant morbidity and their potential economic repercussions.

The Problem of Cacao Diseases in Africa

Although the greatest cacao growing region in the world, West Africa is also subject to the dangers of cacao plant diseases. When introduced into Western Africa in the late nineteenth century, cacao for sometime remained free from pests. Before World War 1, however, a different situation emerged.[43] Since 1910, three Capsid insect species, Sahlbergella Singularis, Sahlbergella Distantiella and the Helopeltis have extensively impaired cacao trees in Ghana. From 1936 to date, a plant disease, the Swollen Shoot virus heavily destroyed cacao plants in the country. This phenomenon compelled the government of Ghana to order the destruction of more than a 100,000,000 trees from 1944 to 1962.[44]

To eradicate the disease, the government resorted to several devices, involving agricultural science research, the use of pesticides and a disbursement of funds to compensate affected cacao farmers in rural Ghana. This cut-out campaign, resulted in considerable economic discontent and political disturbances in Ghana especially in 1948. The Capsid, Black

Pod and Swollen Shoot diseases are the focus of this work and require no elaboration at this stage.

Suffice it to reiterate that Cacao diseases are not peculiar to Ghana. In Cameroon, cacao plantations developed on volcanic soil at the foot of the Cameroon mountains. From 1904 to 1906, the cultivation of the crop in this erstwhile German protectorate passed through a crisis when the Brown Pod disease ruined about 40 percent of the cacao plants. A contemporary farm magazine reported that, "The people became discouraged and rubber began to be substituted for cacao..."[45] As in Ghana, Capsid pests, notably, Sahlbergella Singularis, and Sahlbergella Distantiella and the Helopeltis also caused extensive ruin.[46]

Similarly, Nigeria, a former British West African colony possessed by 1949, over 25,000,000 cacao trees spread over 245 square miles of farmland. Like Ghana, these farms became infected with the Swollen Shoot cacao virus which destroyed about 10 percent of the trees. Again, Nigeria, like other countries in the West African rain forest, has encountered difficult problems with the Black Pod and Capsid pest diseases up to modern times.[47]

The former Portuguese West African islands of Sao Thome and Principe probably experienced the worst cases of Capsid and fungal attacks. The Portuguese introduced the crop to Sao Thome in 1822 where farmers took up the plantings vigorously

in 1870. The island reached its highest production level of 32,000 tons in 1912. The figure gradually decreased to 7,200 per year. The cause of the problem was plant diseases. In March, 1909, cacao planters in the island met to discuss the issue with considerable concern.[48] The Colonial Council of Lisbon, requested the Portuguese Minister of Colonies to dispatch a technical mission to study the diseases and the best means to eradicate them. The Portuguese government delegated two agronomists, Jose de Almeida and A. Cannas Mendes to Sao Thome. They were able to identify the etiology of diseased pods and the putrefaction of cacao roots in the island. In their view, the fungus Phytophthora Faberi, particularly active under wet conditions, was the principal cause of cacao pod diseases.[49]

Henri C. Navel, another agronomist, also examined insect pests in Sao Thome and Principe in 1920. He reported that the Heliothrips Capsid extracted the juices of the cacao leaves at feeding thereby killing the trees. Navel also discovered that rodents, especially rats and monkeys were also destructive of cacao in the islands. These vertebrates were most active at night when the farmers vigilance was most relaxed. The creatures generally broke the ripe pods open to suck the sugary pulp surrounding the seeds. This activity which incapacitated the crop's ability to ferment, subsequently resulted in the loss of its commercial worth. Navel also

confirmed the presence of the Phytophthora Faberi fungus in Sao Thome. The fungus accounted for the Black Rot cacao disease. By means of vegetative structures called filaments, the fungus penetrated and fed upon the internal tissues of the fruit which the produce required for its development. In this way, the fungus ultimately rendered the cacao beans altogether worthless for commerce.[50]

The problem of cacao diseases also exist in Cote D'Ivoire, the leading cacao exporter in the world today. Cacao reached Cote D'Ivoire from Ghana in the late 1890s. But unlike Ghana, European concessionaires operating on private estates, took up its cultivation for export. Like Ghana, the country belatedly established its first agricultural research station in 1944. Henri Alibert, an entomologist, researched and published his findings on plant diseases in 1951. Typifying the West African forest belt, Alibert determined that the Heliothrips Capsid insect often damaged cacao trees in the country. Such insect depredations permitted the entry of the fungus Calonectria Rigidiuscula to wreak further havoc.[51]

Historical Case Studies of Cacao Diseases in Asia

Asian cacao exports have derived mainly from the Philippines, the Indonesian island of Java and Sri Lanka. Malaysia, Oceania (Samoa) have also exported cacao. It is

true that Asian cacao output, compared to the world average, has remained insignificant. But it is important to note that like the rest of the tropical world, Asia is not exempt from the bane of cacao plant pests and diseases.

In 1680, the Spanish introduced cacao into the Philippines. The archipelago until 1898, remained a Spanish colony. By 1902, no information existed in print about cacao plant diseases in the islands. In 1903, under American rule, the Bureau of Government Laboratories in Manila issued a bulletin on insect diseases to cacao farmers. The foreword of this document noted that, "The publication of this material at this time is in response to an urgent demand on the part of growers that will help them to combat the more serious pests."[52] The injurious insects ranged from those attacking cacao roots to those that ravaged the tree's trunk and leaves. Large and ferocious black ants, a species of the Cicada family, came up as the most destructive insects. The adults gnawed the bark from the large roots and caused decay. At the same time, the insects created openings for the entry of insidious white ants locally known as the Anay, to effect more damage.[53]

Another predaceous insect of the Philippines was the culiclic, capable of "destroying nearly every conceivable class of material except articles made of metal."[54] The adult, measuring about 43 millimeters, has forefeet specially adapted

to burrow the ground to the tender roots of the cacao plant. The mouth parts of the culiclic served as a lancet which pierced the epidermis to suck the plant's sap into its stomach. The insect deposited its larva about 10 to 12 centimeters below ground surface, preferably near the cacao roots. The larva gradually worked further downward to about 80 centimeters clinging tenaciously to the roots. The young rootlets are the principal food gathering organs of the tree. When the larva consume the moisture in the roots, they impaired the plant's ability to secure nutrients and moisture for their nourishment.[55]

Also destructive were lamellicorn beetles which lived underground where the cultivator could not disturb them. Measuring about nine millimeters, and described as "the hardest of insects to combat," the effects of its work only became apparent when the tree turned flaccid and totally unable to bear fruit. This eventually warns the grower that "the tree is being killed by an unseen enemy."[56] Insects that have attacked the trunk of the cacao tree also came up for discussion. The agricultural bulletin identified the flat-headed borer of the Ceramycidae family as a major threat. The insect gnawed the inside of the tree and was able to reduce the trunk to "fibrous sawdust."[57]

In Java, where the Dutch initiated commercial cacao farming, a report appearing in 1908, affirmed that many

planters have given up cacao cultivation because of cacao diseases. Neither was the disease situation any different in the island of Sri Lanka. Here the Helopeltis insect of the Capsid variety, attacked the island's cacao farms as they had previously done in Madras, South India, and in Malaysia.[58] In 1906, the prevalence of diseases was such that cacao in Sri Lanka declined. On June 3, 1907, Herbert Wright, a fellow of the Linnean Society (an agricultural association), and the controller of the Sri Lanka Experiment Station at Paradeniya, declared to the Liverpool Chamber of Commerce, that over fifty insect and fungoid pests are known to attack the cacao plants.[59]

Overall, the problem of cacao plant pests and diseases is not peculiar to Ghana. This brief historical overview of cacao growing countries in the tropics shows that plant diseases deserve attention in agricultural historical studies. The chapters that follow focus on the effects of the Capsid, Black Pod and Swollen Shoot cacao diseases in Ghana from 1910 to 1966.

Endnotes

[1]Cacao was important in the Aztec domestic economy in pre-Columbian America. In the early seventeenth century, the Spanish transplanted cacao from its gene-center in the Upper Amazon and elsewhere in South and Central America to the West Indies and commenced the commercialization of the crop primarily for the consumption of the European aristocracy. See: G. B. Masefield, A Short History of Agriculture in the British Colonies (London: Oxford Clarendon Press, 1950), 29 and 70; Are, Cacao (1974), 4-5; C. A. Krug and E. Quartey-Papafio, Food and Agricultural Studies no. 63: World Cocoa Survey (Rome, Italy: Food and Agricultural Organization of the United Nations, 1964), 4; Chatt, Cocoa (1953), 5; Anonymous, "Cocoa: World Production and Trade," March-August 1930, (London: His Majesty's Stationery Stores, 1930), 7; Empire Marketing Board no. 27 (Hereafter E. M. B.), 7; Commodity Yearbook (Hereafter C. Y.) (New York: U.S. Department of Commerce, 1949), 128; and George Brown Tindall, America: A Narrative History Vol.II, Second Edition (New York & London: W. W. Norton and Company, 1988), 19-21.

[2]Patrick Yeung and Shamster Singh, "Global Supply of Demand for Cocoa," in Cocoa Production: Economic and Botanical Perspectives, ed. John Simmons, (New York & London: Praeger Publishers, 1976), 342.

[3]Ibid., 351; C. Y. 1939 (1939), 322; and Cocoa Production, ed., Simmons, (1976), 342.

[4]Ibid., 360; see also "Marketing and Distribution System for Cocoa," United Nations Commission on Trade and Development (Hereafter U.N.C.T.A.D.) Doc TC/BC-1/164 (January 9, 1974) for general information on this subject.

[5]Shell Ghana Limited, "Cocoa: The Basis of Ghana's Economy," SPAN 5 no. 3 (1962): 146-149; A. W. Cardinall, The Gold Coast (Accra, Gold Coast: Government Printer, 1931), 3.

[6]The available literature on global economic interdependency is extensive. The version in the text is an over-simplified synthesis from the underlisted sources: Samir Amin, "Underdevelopment and Dependence in Black Africa: Their Historical Origins and Contemporary Forms," Social and Economic Studies (Hereafter S. E. S.), 22 no.1 (March, 1973): 178-187; Anibal Pinto and Jan Knakal, "The Center-Periphery System Twenty Years Later," S. E. S. 22 no.1 March, 1973): 34-89; O. Sunkel, "Big Business and Economic Dependency," Foreign Affairs (Hereafter F. A.) 24 no.1 (1972): 517-531; Immanuel

Wallerstein, "Independence in an Independent World: The Limited Possibilities of a Transformation Within a Capitalist World Economy," African Studies Review (Hereafter A. S. R.): 17 no.1 (1974): 1-26; Peter Evans, "After Dependency: Recent Studies of Class, State and Industrialization," Latin American Research Review (Hereafter L. A. R. R.): 20 no.2 (1985): 149-159; John D. Rusk, "Africa Rights Monitor Structures of Neo-Colonialism: The African Context of Human Rights," Africa Today (Hereafter A. T.) 33 no.4 (1986), 71-73; and Michael Hodd, "Africa, the I. M. F. and the World Bank," African Affairs (Hereafter A. A.): 86 no.344 (July , 1987): 331-340. See also, Susan M. Martin, Palm Oil and Protest. An Economic History of Ngwa Region, Southeastern Nigeria, 1800-1980 (Cambridge: England, 1988).

[7]This discussion refers to the nature-nurture theories in an abbreviated form.

[8]P. F. Entwistle, "Insects and Cacao," in Cocoa, ed. G. A. R. Wood and Laas (London & New York: Longman's Green and Company, 1985), 366-7.

[9]C. A. Thorold, Diseases of Cacao (Clarendon: Oxford University Press, 1975), 73.

[10]Ibid., 53.

[11]Ibid., 64.

[12]Ibid.

[13]Ibid., 51-52.

[14]Ibid.

[15]F. R. Irvine, West African Crops Vol. II (London: N.P., 1969), 42.

[16]Thorold, Diseases (1975), 53.

[17]H. R. Briton-Jones, The Diseases and Curing of Cacao (London: McMillan and Company Limited, 1934), 93 ff.

[18]Evans, O. A. (1987): 35.

[19]Briton-Jones, Diseases of Cacao (1934), 51.

[20]Ibid., 52-55.

[21]G. Frolich and W. Rodewald, Pests and Diseases of Tropical Crops and their Control (London: Pergamon Press Limited, 1970), 238 & 250.

[22]Briton-Jones, Diseases of Cacao (1934), 17., and Irvine, African Crops (1969), 243; and Briton-Jones, Diseases of Cacao (1934), 17-20.

[23]T. A. Rohan, Processing of Raw Cocoa for the Market: Food and Agricultural Organization Agricultural Studies no.60 (Rome, Italy: Food and Agricultural Organization of the United Nations, 1963), 154.

[24]SPAN 3 no.1 (1960): 22-25.

[25]David Pimentel, "The Ecological Basis of Insect Pest Pathogen and Weed Problems," in Origins of Pest, Parasite, Disease and Weed Problems, ed. J. M. Cherrett and G. R. Sagar (Oxford: Blackwell Scientific Publications, 1977), 14.

[26]R. C. Shaddock, "Dynamics of Plant Diseases," in Disease and Weed Problems, ed. Cherrett and Sagar (1977), 95.

[27]Anonymous, "New Crops and New Pests," A. N. 22 no.22 (February 14, 1903): 1; F. J. Simmonds and D. J. Greathead, "Introductions and Pest and Weed Problems," in Weed Problems, ed. Cherrett and Sagar (1977), 104 ff.

[28]A. H. Bunting, "Pests, Population and Poverty," Tropical Science (Hereafter T. S.), 14 no.1 (1972): 41-42.

[29]Literature on African slave participation in the plantation systems in the Western Hemisphere include, S. Greenfield, "Slavery in the New World," Journal of Inter-American Studies (Hereafter J. I. S), II (1969): 4 ff.; rather than developing plantation systems in Africa, Europeans exported firearms. Firearms significantly facilitated the accumulation of African manpower for export, though this has been the subject of historical debate. See for example: S. Tenkorang, "The Importance of Firearms in the Struggle Between Ashanti and the Coastal States: 1708-1807," Transactions of the Historical Society of Ghana (Hereafter T. S. H. G.) 14 (1968): 2ff; R. A. Kea, "Firearms and Warfare on the Gold and Slave Coasts from the Sixteenth and Nineteenth Centuries," Journal of African History (Hereafter J. A. H.) 12 no.2 (1971): 195; W. A. Richards, "The Import of Firearms into West Africa in the Eighteenth Century," J. A. H. 21 no.1 (1980):43; Gavin White, "Firearms in West Africa: An Introduction," J. A. H. 12 no.1 (1971): 212; J. E. Inikori, "The Import of

Firearms in West Africa: 1750-1807: A Quantitative Analysis," J. A. H. 18 no.3 (1977): 351-352.

[30]Before colonial rule, some West African Kingdoms exported palm kernels, palm oil and rubber to Europe. These were the main commodities that replaced the forced manpower exports to the neotropics. These agricultural items were obtained in an extractive capacity and not from plantation systems.

Rubber and palm oil trees grew wild. Indigenous entrepreneurs tapped them for commercial purposes. Until the advent of European imperial rule in the last quarter of the nineteenth century, no large scale plantation systems geared for international commerce emerged in the West African rain forest. Labor shortage, and geographical limitations were the principal constraints to commercial agriculture in this period. For a study of the Ghanaian example, see Robert Szerewski, "Structural Changes in the Economy of Ghana (The Gold Coast), 1891-1911," Ph.D. dissertation, University of London, 1964. (introductory chapters.) A discussion of West African export agriculture is available in Hopkins, An Economic History (1974), chapters 3-5; see also Alan Mcphee, The Economic Revolution (1971), introductory chapters.

[31]Thorold, Diseases of Cacao (1975): 7; Anonymous, "Cacao in Ecuador in 1910," A. N. 11 no.3259 (March, 1912): 105; and Anonymous, "The Cacao Industry of Ecuador," A. N. 21 no.517 (February, 1922): 54-55.

[32]Anonymous, "Diseases and Insect Pests," C. Y. (1949), 130; P. F. Entwistle, Pests of Cocoa (London: Longman's Group Limited, 1972), 18-19; Thorold, Diseases of Cocoa (1975), 7.

[33]Anonymous, "Cacao Diseases in Surinam," A. N. 1 no.1 (April 25, 1902), 14; Anonymous, "Thread Disease of Cacao," A. N. 4 no.79 (April 1905): 117; Anonymous, "Prevention of Plant Diseases," A. N. 7, no.151 (February 8, 1908): 41.

[34]John Ndubeze Ukegbu, "The Cocoa Industry and the Gold Coast," M. S. Thesis, Cornell University (1954), 84.

[35]Anonymous, "Cacao Diseases in British Guiana," A. N. 4 no.80 (May 1905): 137; and Anonymous, "Witchbroom Disease of Cacao," A. N. (May 1905): 135. See also Thorold, Diseases (1975), 135; the decline of cacao plantations in the Western Hemisphere because of diseases and Africa's rise to position of major producer, can be found in the sources listed below: Anonymous, "Increasing Cacao Production," A. N. 6 no.3139

(August 24, 1907): 271; Anonymous, "Cacao and Coffee in West Africa," A. N. 11 no.27 (April 25, 1903): 135; Anonymous, "The Production of Cacao in Africa," A. N. no.1 (August 25, 1902): 7; B. C. Meridian, "World Cacao Production and Trade," B. I. I. 5 (1941), 46; V. D. Wickizer, Coffee, Tea and Cocoa: An Economic and Political Analysis (Stanford, California: Stanford University Press, 1951), 264; and Christopher Gunnarson, The Gold Coast Cocoa Industry 1900-1939: Production Prices and Structural Change (Printed in Sweden: A. V. Centralen Lund, 1978), 4, and 9-11.

[36]Thorold, Diseases (1975), 7ff.

[37]Krug and Papafio, World Cocoa Survey (1964), 7, 41, and 51.

[38]Anonymous, "Cocoa Production in the British Empire," B.I.I. 17 (1919): 40-41.

[39]B. C. Meridian, "World Cocoa Production and Trade," Foreign Agriculture (Hereafter F. Ag.), 5 (1941): 53-54.

[40]Ukegbu, M. S. Thesis (Cornell, 1954), 85; and Krug and Papafio, World Cocoa Survey (1964), 86.

[41]R. Whymper, Cocoa and Chocolate: Their Chemistry and Manufacture (London: J. A. Churchill, 1912), 33.

[42]Gunnarson, The Gold Coast Cocoa Industry (1978), 6.

[43]C. N. Williams, The Agronomy of the Major Tropical Crops (London: Oxford University Press, 1975), 97; Krug and Papafio, World Cacao Survey (1963), 2; McPhee, Economic Revolution (1971), 40-43; Anonymous, "Cacao in Portuguese Africa," A. N. 2 no.32 (July 4, 1903): 222; Anonymous, "Cacao Culture in the Gold Coast," A. N. 2 no.37 (September 12, 1903): 297; F. N. Howes, "The Early Introduction of Cocoa to West Africa," T. A. 23 no.9 (1924): 172. See also Gunnarson, Gold Coast Cocoa (1978), 4.

[44]This phenomenon has received in-depth evaluation in chapters 8 and 9 of this study.

[45]A. N. 13 no.305 (January 3, 1914): 4.

[46]Krug and Papafio, World Cocoa Survey (1964), 41.

[47]The historical origins of the problem of cacao diseases in Nigeria is much more involved. See, for example, W. A.

Lamborn, "The Agricultural Pests of the Southern Provinces of Nigeria," Bulletin of Entomological Research (Hereafter B. E. R.), 5 (April 1914-March 1915): 197-214; A. D. Peacock, "Entomological Pests and Problems of Southern Nigeria," B. E. R. 3-4 (May 1912-February 1914): 191-219; Anonymous, "Cacao in the Southern Provinces of Nigeria," A. N. 14 no.349 (September 11, 1915): 299.

Nigeria's cacao disease problem, as in Ghana and elsewhere in the tropics, has persisted to date. See for example, Ayo Abidogun, "Cocoa Research in Nigeria: An Ex-Post Investment Analysis," The Nigerian Journal of Economic and Social Studies (Hereafter N.J.E.S.S.) 20 no.1 (March 1978): 21-36; and Samson A. Ayanlaja, "Rehabilitation of Cocoa (Theobroma Cacao L.) in Nigeria: Physical and Moisture Retention Properties of Old Cocoa Soils," T. A. 63-64 no.3 (July 1987): 237-239.

[48]Krug and Papafio, World Cocoa Survey (1964), 145.

[49]Jose de Almeida and A. Cannas Mendes, Les Plus Graves Maladies Du Cacaoyer a Sao Thome (Imprimerie A Editora, 50 Largo do Conde Barao, 1910), Introduction; and Anonymous, "Armillaria on Cacao in Sao Tome," T. A. 57 no.2 (April 2, 1980): 155-185.

[50]Henri C. Navel, Les Principaux Ennemis du Cacaoyer aux Iles de San Thome et de Principe. Rapport sur une Mission d'Etude Agricole et Phytopathologique (Paris: Emile Larose, Libraire Editeur, 11 Rue Victor Cousin 1921), 71; Almeida and Mendes, Maladies du Cacaoyer (1921), 36-41.

[51]Henri Alibert, Les Insectes Vivant Sur Les Cacaoyers en Afrique Occidentale (Dakar: Memoires De L'Institut Francais d'Afrique Noire no.15, 1951), 10-13 & 20.

[52]Charles C. Banks, Preliminary Bulletin on Insects of the Cacao. Bulletin no.1 Biological Laboratory, Entomological Division (Manila, Philippines: Bureau of Public Printing, 1904), 7; see also Anonymous, "Insects of the Cacao Tree," A. N. 3 no.66 (October 22, 1904): 346.

[53]Banks, Bulletin on Cacao (1904), 7.

[54]Ibid., 5.

[55]Ibid., 11-13.

[56]Ibid., 18.

[57]Ibid., 19.

[58]Anonymous, "Cacao in the Dutch East Indies," A. N. 3 no.64 (September 24, 1904): 313; Anonymous, "Cacao Industry in Java," A. N. 7 no.159 (May 30, 1908): 175.

[59]P. F. Entwistle, Pests of Cocoa (Longman's Group Limited, London 1972), 20. J. B. Carruthers, "Ceylon: Cacao Cankers in Ceylon," A. N. 1 no.2 (May 10, 1902): 29-30; Anonymous, "The Cacao Canker in Ceylon," A. N. 2 no.35 (August 15, 1903): 263. Anonymous, "Cacao Cultivation in West Africa," A. N. 6 no.138 (August 10, 1907): 20.

II "AN INCIDENTAL ADJUNCT." THE BEGINNINGS OF THE CAPSID, BLACK POD AND SWOLLEN SHOOT CACAO DISEASE CONTROL IN GHANA, 1910-1925

Ghana, formerly the Gold Coast, became a British colony in 1874. The cacao tree, introduced from the off-shore island of Fernando Po in 1879, immediately seized the imagination of Ghanaians, and the country's Eastern Province witnessed a phenomenal expansion of cacao farming.[1] From 1911 till 1978, Ghana remained the foremost cacao exporter in the world. The mainstay of the country thereafter centered on cacao exports, though important minerals like gold, manganese, diamonds and bauxite brought in revenue. By 1910, however, cacao diseases, as will be seen later, became prevalent in Ghana's rain forest. The extent of the damage to the nation's cacao economy, compelled the colonial administration to respond since the technical expertise and financial resources the project required lay beyond the capabilities of the cacao growers.

Ghana's Department of Agriculture formally devised strategies in the early twentieth century, especially from 1910 to 1943, to minimize the danger of Capsid pests, fungal attacks and the Swollen Shoot cacao virus disease. These efforts proceeded along two well-defined historical phases: the era of "restrained involvement," which straddled the period from 1909 to 1943, and the period of "aggressive interventionism" which characterized the 1944-1966 time-frame. In the period of "re-

strained involvement," (the subject of this and the next chapter) the Agricultural Department initiated directives in an advisory capacity, leaving cacao farmers to implement them. However, when in 1936 the Cacao Swollen Shoot Virus threatened to obliterate cacao plantations in Ghana, the Department of Agriculture intervened more directly to extirpate the plant virus disease from the country's forest belt.

The Policy of Restrained Involvement

The Agricultural Department initially pursued a "restrained involvement" approach to cacao diseases partly because the problem was an incidental adjunct to the department's original program to introduce, propagate and disseminate commercial crops in Ghana. The colonial administration originally aimed to promote export agriculture. The policy conformed to a major tenet of British policy that required each colony to pay its way.[2] Each dependency had to develop internal resources to generate revenues to run the government. In Ghana, the colonial government promoted cacao farming while minimizing administrative costs. This meant using a small body of trained expatriate personnel, with the support of lesser skilled local personnel.[3]

Both in theory and practice, the colonial administration, predicated on indirect rule, provided a two-tiered governmental structure. The centralized administration

remained at Accra, the capital. The government divided the country into the Eastern, Central, and Western Provinces, collectively referred to as the Colony. The Ashanti Region and Northern Territories occupied Ghana's middle belt and northern regions in that order. These five territorial divisions were further divided into 152 districts, covering a land area of 91,843 square miles. Apart from a few square miles of Savannah grassland along the coastal belt and the midlands, much of the Colony and Ashanti lay in the forest belt, ideally suited for cacao growing. The predominantly savannah vegetation in the Northern Territories precluded cacao cultivation.[4]

The principle of private entrepreneurship guided colonial agricultural policy. The government provided a framework of law and order to permit market mechanisms to regulate Ghana's cacao economy. The government initially restricted its participation in agriculture to the taxation of the cacao produce and the provision of smidgen scientific advice to farmers.[5] The Department of Agriculture was an administrative arm of the colonial government along with the departments of Justice, Defence, Finance and External Affairs.[6]

A Director of Agriculture supervised the Head office of the Agricultural Department, first established at Aburi in 1890, but later transferred to Accra in 1904. The director of the Department was a member of the colonial Executive and

Legislative Councils. He advised the Governor on agricultural policies. He also introduced agricultural ordinances in the Legislative Council. The Director toured the countryside to appraise farm-related issues. His Deputy became Acting Director whenever the substantive director went on leave. A clerical staff and an office superintendent, supported the Head Office.[7]

Below the Head Office level, the professional staff fell into two categories. There were technocrats concerned with research and experimental work and a field staff of agricultural officers. The research staff divided into sections: soil chemistry, botany, and plant breeding. Later, plant pathology, entomology and mycological divisions were added. The technical staff served at all Agricultural Experiment Stations which the colonial government located in each soil zone in Ghana.[8]

Agricultural Experiment Stations

The government established a number of agricultural stations throughout the country to promote export agriculture. The premier experiment station in Ghana emerged at Aburi in the Eastern Province, located in an agricultural district 24 miles north of Accra.[9] From 1890 to 1929, the Agricultural Department established more botanical stations. These experiment stations in chronological order of appearance, were

Tarkwa, in the Western Region (1903); Kumasi, in Ashanti Region (1906); Asuantsi in the Central Province (1907); and in 1919, one station appeared at Tamale in the Northern Territories. Other farm experiment stations emerged at Kibi and Peki-Blengo both in the Eastern Province in 1912 and 1913 in that order. Agricultural stations emerged at Wiawso in the Western Region (1915); Juaso (Ashanti Region, in 1916) along with two others, at Wa and Gambaga in the Northern Territories in 1918.

Each station specialized in propagating suitable commercial crops in the locality. In this venture, the scientific staff of the Royal Botanical Garden at Kew, and the Imperial Institute in England assisted the Agricultural Department to promote exotic and indigenous plants in the various Agricultural Experiment Stations in Ghana.[10] The variety of commercial crops which the agricultural experiment stations distributed to Ghanaian farmers were numerous. Some of these plants were palm oil, cola, cinnamon, sisal, hemp and soya beans. Others were rubber, rice, peanuts, ginger, coconuts and cacao.[11] The experiment stations developed the crops with the expectation that, "these (plants) would develop rapidly if at some future date any of them should give promise of a profitable extension."[12] Up to 1930, the botanic stations experimented with indigenous and exotic plants and seeds in Ghana, and encouraged local farmers to plant them.[13]

At each experiment station, both in theory and practice, a curator, with the help of an overseer and a gang of laborers, implemented the Director's orders on plant and seed experiments. Itinerant instructors at each botanic station visited and instructed farmers on the technique of growing economic crops for export. The itinerant instructor in each village was accountable to an Agricultural officer who represented and promoted the Department's agricultural policies. The district's agricultural officer also took directives from the Provincial Agricultural executive.

The Director of Agriculture was the overall policy-maker. He drew up the itinerary of farm inspection tours in consultation with the Commissioner of the Province where the tour was scheduled. The itinerant instructor submitted a diary at the end of the month showing the work accomplished, which his superior officer approved and confirmed.

The Awareness of Cacao Diseases in Ghana by 1910

From its inception in 1890, the Agricultural Department did not anticipate plant pathogens in any of the crops it promoted, and therefore had no clear-cut policies to protect Ghana's plantations from diseases. Research training in mycology in British universities were in its primary stages. Accordingly, British colonial response to cacao plant pathogens began when these diseases occurred on agricultural

experiment stations and in private farms. In 1913, the agricultural field staff noted of the Asuantsi Botanic Station that, "two cacao trees were attacked by true canker and a number were cut-out and burned to prevent the disease from spreading."[14] When private farms suffered from diseases, the Department outlined the problem as "due [more] to opening new farms than in tending existing ones with the result that diseases are getting a firm hold." Yet another explanation was that, "considerable damage is being done to the trees by various insects and fungoid pests, but too little or no attention is paid to them by the owners."[15]

The fungoid pests were the Black or Brown Pod. A British chemist in 1912 considered cacao fungus diseases in Ghana as "a matter of no small importance," and considered "canker" and "black rot" as the two most deadly cacao diseases in Ghana. According to him, the Black Rot arose from a parasitic fungus, Phytophthora Infestans which attacked the plant. The tissues within the cacao pod or fruit eventually turned into a black pulpy mass, while the fungus appeared on the outer surface of the pod as a white mold.[16] To quote one source, "it is only natural to expect in a country such as this, where no precautions are taken to guard against pests, that when any virulent form of fungoid disease get established, its multiplication is almost certain."[17] No systematic studies of fungoid diseases among cacao trees under Ghanaian conditions

were available before 1914. The Department expressed the hope that R. H. Bunting, the first Government mycologist appointed in 1914, would undertake the much needed research.

The Department's major fungal problem was the Black Pod cacao disease:

> [T]he disease of most apprehension is the black or brown pod disease (Phytophthora Faberi) which is undoubtedly on the increase and the measures we have been recommending for its control i.e. the burying of the diseased and empty shells does not meet with much favor because of the additional labor entailed.[18]

The urgent need to stem the spread of the Black Pod disease was apparent, yet the exigencies of World War I, wartime staff retrenchment, and the unsettled post-war conditions, delayed research. Moreover, after the first global war, Bunting had to confront fungal problems pertaining not only to cacao but to a variety of crop diseases such as millet, bulrush, garden eggs, and corn. Cash crops like sisal, hemp and rice also required the Department's attention.

The worst damage to cacao arose from Capsid pests. Before 1909, the Department gave no attention to Capsid insects. In fact, only a few of its officers were familiar with the insect's appearance.[19] In that year, an itinerant instructor of agriculture in Ghana discovered Capsid insect depredations in the cacao districts he visited in the Eastern Province.[20] Agricultural officers further reported that Capsids caused the most damage at Bompata, Ashanti, and in the Eastern provinces,

particularly at Anum, east of the Volta River, Begoro, Mpraeso and Krobo. The travelling instructor also acknowledged the insect's presence at Abremposu, eighteen miles east of Begoro:

> Most of them are in new cacao plantations. On examining the latter, stalks were found perforated in many places, causing the bark to burst open and expose the dead cambium. Each stalk showed signs of attack about one foot along the stalk and before death, had a warty and gnarled appearance. Sometimes the terminal shoot has been sapped by the insect, causing it to wither. If the tree survived, no fruit appeared to mature. Dwarfish pods are formed and decomposed in a short time.[21]

The extent of damage and spread of the Capsid menace led Gerald C. Dudgeon, the Inspector of Agriculture in British West Africa to visit Bompata, Ashanti in January 1910. Dudgeon reported that though the "bark-sapper," Sahlbergella Distantiella Theobroma, did not seem so plentiful, an allied species (Sahlbergella Singularis) was present upon almost every tree in badly infested plantations."[22]

During Dudgeon's farm itinerary in the Eastern Province, he found and classified the Helopeltis insect among the Capsid insect variety. After touring Peki-Blengo in the Anum-District, Dudgeon reported:

> I found it puncturing the cocoa pods, killing small cacao...even if a pod reached maturity, the pulp surrounding the seeds are often attacked by fungoid growths, which had penetrated the decomposed area around the puncture. Puncturing is done with the proboscis, to feed upon the juices of the plant. Krobo plantations had slightly distorted shapes.[23]

Dudgeon, the Inspector General of Agriculture cautioned that,

> Though damage is not great, yet care should be taken to prevent the spread of this pest, because it is extremely difficult to combat owing to its great activity...the insect should be looked for on unpunctured pods and killed whenever found, as upon multiplication it might become a most formidable enemy to the cacao plants.[24]

By 1912, Capsids caused the loss of 25 percent of all possible cacao output in Ghana.[25] In 1913, the Departmental report stated:

> It is widely distributed throughout the cacao growing districts and it is responsible for an enormous amount of damage. Numerous young plantations are annually ruined through the ravages of this pest, and where the trees are not actually killed, some time must elapse before the affected trees will give any appreciable crops.[26]

The Helopeltis Capsid insect species confined its attack to the cacao pod or fruit. Its feeding capacity, according to Dudgeon, was "prodigious," because "one female made eighty-four punctures on a pod in fourteen hours." The Helopeltis would attack the fruit with the proboscis to suck its sugary sap. In the process, it deposited toxins into the pod which triggered off a chemical reaction that destroyed the pod's internal tissues. Round black spots, two or three millimeters in diameter, would then appear on the fruits. The damaged tissues would then blacken, dry out, harden, and die, assuming the appearance of cancers.[27]

Young cacao pods, technically denoted as cherelles, would similarly wither and fall off when punctured. Immature fruits turned grayish when the insect fed on them. It was

common to find about fifty spots perforated on the fruit, but a lesser number of punctures on the branches. The larvae of the Helopeltis was more aggressive than the adults in puncturing the pod, which usually wilted along with the cacao leaves.[28] For pods which failed to fall, the insect's attacks enabled the entry of harmful fungal spores which often resulted in the complete loss of the fruit.[29]

Two other Capsids (or Miridae) insects also ravaged the cacao tree. The two species, Sahlbergella Singularis Haglund and Sahlbergella Distantiella were more formidable in their destructive capacity than the Helopeltis.[30] The Sahlbergella Singularis was a brown Capsid of about half an inch long. The Sahlbergella Distantiella, also of the same size, was black. Both species fed on cacao pods and young plant shoots. The Distantiella preferred young seedlings. The Singularis type usually sought mature trees. Like the Helopeltis, the Sahlbergellae perforated the tissue of the plants, which became infected with the fungus Calonectria Rigidiuscula.[31]

The Origins and Sources of Plant Diseases in Ghana

Precisely when cacao diseases originated in Ghana cannot be established with accuracy. But none of the country's cacao diseases were exogenous. Capsids were indigenous to the West African rain forest. The Black Pod and the majority of fungal diseases have wreaked havoc world-wide among several plants to

which Ghana is not exempt.[32] This was also true of the Swollen Shoot plant virus which struck in the 1930's. These facts underscored the perception that the cacao crop was transferred from its gene-center in the Western Hemisphere to meet these pathogens in Ghana during the 1880's. A farm journal in the British West Indies observed in 1903 that:

> The introduction of a new crop not infrequently occasions the finding of new pests. The cultivation of any plant on a large[r] scale than usual or the sudden introduction of any considerable area to a new plant is practically certain to result in insect attack.

The same farm journal explained that:

> When insect pests are found on a new crop, it does not necessarily follow that the pest has been introduced with the seeds of those crops but that the insects of that locality, finding a new plant growing in some abundance, will when possible, live on that plant and the fact of there being a large supply of this plant on the spot tends to aid the increase of the insect.[33]

Briefly stated, insect pests and diseases of agricultural crops are inevitable. This biological assessment has proven true over time. Henri Alibert, working independently in Cote D'Ivoire on cacao diseases, stated the same observation about cacao:

> Le cacaoyer est une plante introduite; la plupart des parasites etudies sont donc vraisemblablement des parasites indigenes qui se sont acclimates sur cette plante...d'autres sont uniquement infeodes sur le cacaoyer[34] (Cacao is an introduced plant. The majority of the known pests associated with it are actually indigenous, and which have adapted themselves to the plant. Other [pests] are uniquely predatory upon the cacao tree.)

Cacao Disease Control Strategies

Cacao pathogens in Ghana by 1910, was definitely serious. When Capsid and fungoid attacks became critical, Ghana's Department of Agriculture appointed its first entomologist in 1910. His duty was to investigate insect pests that were most destructive of economic crops in the country, and to devise means for their control.[35] The Department took on pest control as an incidental responsibility because no private research organizations with the research expertise and capital existed in Ghana for such work.[36]

To be sure, the Department's strategies to cope with cacao pathogens had earlier occurred under the governorships of John P. Rodger, 1904-1910, and James Thornburn, 1910-1911. However, these initiatives appeared mainly in the form of administrative directives. For example, a despatch from Governor Rodger to the Secretary of State for the colonies in 1910 indicated the advisory role of the colonial Department of Agriculture in disease control in Ghana. Rodger's letter contained information which the Director of Agriculture, William Steele Dykes Tudhope had prepared that year for cacao growers. Tudhope's notice, warned farmers that:

> An insect pest has been discovered to be doing great damage to cacao trees and if allowed to spread it may destroy the whole industry. Every chief or farmer must do his utmost to prevent the spread of

> this pest and so save the crops from the danger which threatens them.[38]

To help farmers identify the insect pest, Tudhope's circular explicitly described the pest:

> The insect when young resembled a tick or spider and it is reddish in colour: when old it is brown or black, and though it generally has wings, it cannot fly more than short distances. The insect, young or old, had a trunk which when nor feeding is folded back along its underside.[39]

To pre-empt the insect's attack, the chief executive of the Agricultural Department advised farmers to space the cacao trees 12' x 15' apart "to keep them strong and healthy." To contain fungal diseases, he counselled farmers to keep the plantations free of weeds and dead wood. The farmers had to prune the trees to avoid too much shade, and to bury the cacao pods when empty.[40]

In situations where cacao trees appeared moribund from attack, the farmer should "cut them eighteen inches from the ground, tar the stumps, and burn all the branches and the decaying wood about the plantation and turn the soil completely over."[41] The Departmental head also recommended to farmers to spray the trees with Kerosene emulsion. The directives needed to prepare the emulsion were also given:

> Take 1 pound of soap and 4 gallons of kerosene. Cut the soap and boil it in two gallons of water, when the soap has dissolved remove from the fire and add four gallons of Kerosene and mix thoroughly. To one bottle of this mixture add nine bottles of water before spraying.[42]

To this end, the Department in May 1909, ordered sprayers and syringes from England. In that year, it printed a circular on cacao diseases in English and Twi (the local vernacular spoken in the cacao belt) for dissemination among those connected with cacao.[43]

The Department actually sent copies to the Chief Commissioners of the Central and Eastern Provinces of the Colony and the Ashanti Region, where the insects were prevalent, for distribution to farmers and chiefs. The various European import-export firms which purchased cacao for shipment overseas, also received copies. These commercial agents included F. A. Swanzy, Messrs. Millers; J. J. Fisher, the African Association, and the Basel Mission Factory. Since the staffs of these commercial firms were in constant contact with cultivators, they were expected to "educate [farmers] about the dangers wrought by the insects."[44] The Agricultural Department despatched the circular to the Director of Education for use in every school where agriculture was part of the curriculum. The school pupils were expected to apprise their illiterate guardians who cultivated cacao about the Capsid menace.[45]

The Department directed farmers to teach children to handpick the offending insects at dawn when they are most vulnerable to capture. The idea of natural control also came up. By this, the entomologist contemplated the introduction

of parasites into the colony to combat the insect pests.[46] In 1911, the Acting Governor, H. Bryan, in a letter to the Secretary of State for the colonies, dealt with plant quarantine legislation:

> On the subject of disinfection of seeds on delivery to the colony, [it is intended] to provide for the fumigation of all imported seeds and plants; to train selected [local] subordinates of the Agricultural Department to implement legislation to provide fumigation chambers at such parts at Accra and Sekondi.[47]

In the bid to cope with plant pests, the technical staff of the department systematically searched for, identified and then studied the bionomics of a variety of destructive insects to determine the best means for their control. By World War 1, the Entomology section of the Agricultural Department had mapped out various Capsid insects and other pests of the cacao tree in the colony. These pests were classified into eight categories according to their seriousness.[48] By this date, the Agricultural Department still depicted Capsid insects as, "The most serious pest in the colony severely crippling thousands of acres."[49] In his report for the year 1914, the Government Entomologist also affirmed that the Capsid, Sankonuabe was "the most alarming pest and that many thousands of acres planted to cacao have been rendered worthless through the activities of this insect."[50]

The Agricultural Department identified the Big Bug, scientifically noted as Homoeocerus, among those insects that

ravaged the cacao tree. The Big Bug usually fed on young pods but also attacked larger ones. Its feeding habits often killed young growing pods leaving older ones severely distorted. The Big Bug was capable of causing an estimated 50-70 percent of crop loss on each tree.[51] Among the variety of cacao pests stated in this report, the Grey Moth deserve mention. Also known as a pod borer, the Gray Moth was a caterpillar. It generally bored through the wall of the cacao pod inviting fungal decay.[52]

The Slate Grey Leaf Beetle or the Coleoptera, and another bark borer, the Coleoptera Cerambycidae also proved destructive. The former generally attacked young leaves in a fashion that left only the veins and the leaf edges. The latter, on the other hand, was described as, "[c]apable of destroying an area of bark 5" x 5", and if as many as ten is found in one tree, may girdle the stem."[53] Termites tunnelled the ground to consume the roots of the cacao tree. Squirrels and rats also gnawed holes into the pods to extract the beans. Other listed diseases were generally fungal debilities, such as canker, horse-hair blight and leaf curl.[54]

The impact of Cacao Disease Control by World War I

Until the outbreak of World War I, travelling instructors demonstrated to farmers how to prepare kerosene emulsion as a capsidicide. The agricultural instructors either sold, lent

or presented syringes and sprayers to farmers for use against Capsids. These initiatives had no effect. In 1914, the Department reported after a year's work with cacao growers that, "it is extremely rare to find a farmer using the remedy and up to the present this means of control must be considered a failure."[55]

Cacao plantations generally averaged about an acre in size. On this account, most farmers received paltry incomes for their overall produce. For most cacao growers, the cost of insecticidal equipment was prohibitive. Second, farmers, unaccustomed to the equipment, applied them ineffectually. Often, the plantations suffered severe insect damage before the farm owner considered spraying. In response, the Agricultural Department suggested cooperative work among cacao farmers because, "the insects leave badly damaged farms to attack neighboring ones. It is folly for isolated individuals to spray farms as these are quickly invaded from surrounding untreated trees."[56] Such cooperatives, as will be seen later, emerged only in the 1930s, and were actually ineffectual against Capsid pests until the late 1950s.

Other methods of cacao pest control proved unsuccessful. For example, in 1914, the Agricultural Department identified the silk cotton tree, (Eriodonodron anfractuosum) as the original host tree of the Capsid. This explained the widespread nature of the pest. The Department recommended the

destruction of all silk cotton trees in proximity to cacao farms to reduce the Capsid populations. The idea was impracticable because cacao trees had become important host plants themselves. Considering too that the Sahlbergella was polyphagous, further underscored the ineffectiveness of this line of defense.[57]

The idea to handpick or spray insect pests with kerosene emulsion failed. The recourse to insect parasites as a remedy hardly took off the ground. Before World War I, the Department had considered using lizards and spiders, and breeding the red tree ants (Oecophylla) to prey on Capsids.[58] But as the Department later acknowledged, the cultivation of these natural parasites, "under prevailing conditions does not appear possible."[59] Moreover, the available travelling instructors could not disseminate the disease control strategies widely and effectively because of transportation difficulties.

The response of the farming communities to cacao disease control was lukewarm. In specific locales, cacao farmers and local chiefs warmly welcomed and attended the instructor's lectures and demonstrations on how to combat insect and fungoid pests. However, they generally ignored the instructor's ideas because such work entailed extra labor, "which appears to the farmer to be of no practical value."[60]

Following Dudgeon's suggestions in 1910, the Department

had recommended the spraying of Bordeaux Mixture against cacao fungus diseases. Alternately, farmers were encouraged to excise the diseased parts of the tree and to burn or bury fungus-infected material with quick lime. The advise also cautioned them to heat knives applied in removing diseased material before using them to prune healthy trees. The Department's field agents also advised cacao farmers to tar wounds on the tree to prevent the entry of the Diplodia Cacaoicola fungus.[61] The Government mycologist, R. H. Bunting, who initiated these controls, assumed that the susceptibility of cultivated plants to fungoid attacks arose from unprotected tree wounds, lack of farm drainage and the neglect and abandonment of diseased farms.[62] But the cacao growers did not heed any of his prescribed remedies until the first global war broke out in 1914.

World War I certainly aggravated the incidence of Capsid, Black Pod and other fungoid diseases among cacao trees. When war broke out in 1914, farmers felt apprehensive that cacao would not be purchased. This fact predisposed farmers to neglect their farms.[63] These developments reflected a portent of events to unfold. The commencement of hostilities actually restricted overseas markets for cacao. Markets in Germany and her allies disappeared completely.

Transportation barriers in wartime also posed formidable difficulties. In 1915, the colonial office initially reported

that cacao shipments from Ghana, "under the sure shield of the Navy had suffered little from the hands of the enemy."[64] But that was only in the short term. In the long-run, merchant marine shortage impeded cacao shipment to the available overseas markets. The colonial reports affirmed that, "during 1916 the [German] submarine menance (sic) was growing in seriousness."[65] The Legislative Council in Ghana on 9 February 1915 passed the Trade With Enemy ordinance, and in February 1917 all licenses for the export of cacao to whatever destination ceased.

The need for strategic raw materials became urgent. Corn, copra, palm oil and palm nuts were in demand for their oil, while rubber, required for tire manufacture became paramount in Britain's wartime priorities. The emphasis on strategic raw materials favored the coastal districts of Ghana such as Keta and Ada where such plants grew plentifully. Cacao under war exigencies became a luxury crop.[66]

When German submarine attacks intensified in 1917 and British mercantile losses mounted, the colonial government in Ghana only freighted palm kernels, peanuts, and other vegetable oils to war-related industries in Britain.[67] The restricted international markets and lack of shipping space reduced Ghanaian cacao prices considerably. In districts remote from cacao buying centers, farmers could not market their produce. Planters abandoned their cacao farms alto-

gether, and no new farms were built during the war.[68] The general neglect of cacao plantations, as the war progressed, led to disaster. Cultivators left ripe pods unharvested and the farms became saturated with diseases.[69] To quote one source:

> The almost invincible apathy of cacao farmers during the war could not be overcome, and the bulk of the cacao in, Kwahu, Birrim and upper portions of the Akwapim districts was not realized and plants around those districts were neglected and presented on all sites a melancholy aspect.[70]

This description was true of the Eastern, the Western and Central Provinces as well as Ashanti. In some areas, the Sahlbergella, and Helopeltis Capsids and the Marasmus fungus wreaked such destruction that in 1919, the colonial report on Ashanti noted that, "There are still numerous patches of cacao trees in a diseased, neglected and overgrown condition."[71] This then, was the state of cacao farms in Ghana until the war ended in 1918.

In the immediate post-war period, cacao prices shot-up from seven shillings and six pence in 1917 to £2 and ten shillings per load of 60 pounds. In the Eastern Province, "moribund farms and local associations were galvanized into life. Roads were soon thronged with planters and carriers."[72] Cacao diseases, however, still persisted, a situation that appeared sharply pronounced in the Ashanti cacao belt. The colonial report on that region for 1919 stated,

> [T]he year had been exceptionally dry and the trees have suffered considerably. The insect pest had been very severe and in numerous cases the young growth had been ruined by Sahlbergella and Helopeltis and the leaves destroyed by Thrips.[73]

Of the four cacao varieties, namely Amelonado, Cundeamor, Ocumare and Criollo, Capsids preferred the Amelonado, which formed 90 percent of the cacao grown in Ghana.[74]

The years between 1920 and 1924 were no different regarding the cacao situation. Writing of Ghana cacao in 1923 one source observed that, "whereas by 1910, one heard little of diseases in the Gold Coast, [now] those that are troublesome are a long one."[75] The 1923-24 colonial report on Ashanti affirmed that, "Diseases and Pests are all too common in Ashanti and the difficulty is to find economic means of control which the farmers can and will apply systematically."[76] Indeed, the variety of cacao fungal diseases had multiplied. By 1924, Collar Crack, a new fungus disease first discovered in Togo, was widespread in the Eastern Province. Other fungal disease types included the horsehair blight, leaf-curl, Phytophthora thread blight, Marasmus Cadens, Diplodia Cacaiocola and the Loranthus mistletoe.[77]

The crippling impact of insect enemies of the cacao tree was evident. Capsid pests (Sahlbergella Singularis and Sahlbergella Theobroma Distantiella) known for their destructive effects, were rampant. The Cacao Mosquito (Helopeltis Bergrothi), and various borers, namely the Glenea borer

beetles, the Armastoterma baquetiana and characoma stictigrapta were prevalent. The Thrips insect and moths, (Megalopygid and Eulophonotus myrmelion) also wreaked havoc. As one author wrote, "The list is formidable, but one knows that everything that can be done in an advisory capacity is being done by the energetic Department of Agriculture and its provincial staff."[78]

The post-war disease menace did not escape the attention of the Agricultural Department. In 1920, it stressed the urgency, "to start propaganda work on the cacao belt without delay to promote sanitary measures to preserve the cacao crop upon which so much of the wealth of the colony depends."[79] But the rhetoric remained only a statement of intent. The Department could not commence work immediately because of war-time dislocations among its top administrative personnel who determined policy. Before the war, William Steele Dykes Tudhope was the Director of Agriculture. Robert H. Bunting, a Fellow of the Linnean Society, served as Assistant Director of Agriculture and Government Mycologist, while W. H. Patterson remained as the substantive Government Entomologist. During the War, Tudhope went on leave to England. R. H. Bunting, the Government Mycologist also left the country on 26 June 1916. On that account, W. H. Patterson, the Government Entomologist became Acting Assistant Director of Agriculture and Acting Government Mycologist up to 1923.[80]

The administrative re-adjustments and wartime priorities, derailed the treatment of cacao diseases, and rendered continuity in the post-war era difficult. In 1919, the Department acknowledged that, "since the appointment of an entomologist and a mycologist very little opportunity for continuous research has been possible, much of those officials having been occupied by other duties than those of their substantive offices."[81] The situation remained the same in 1920. The Department's technical staff, now comprised of two mycologists, two entomologists and two chemists who had to cope not only with cacao, but with the entire crop system in Ghana.

Again, in that year, the Director was absent in England until October on "special missions... so that the remaining staff especially the administrative branch had its energies taxed to the utmost."[82] The departure of the Government Entomologist, W. H. Patterson from May to July 1920 to attend a conference of Entomologists in London did not alleviate matters, and, "Under such circumstances, no research work could be undertaken, a matter of great regret, as an officer thus loses opportunities of making progress in which he may be interested."[83] Even, the appointment of Godfrey Sturge Cotterell that year as Assistant Entomologist, stationed in the Eastern Province, could not register any improvements in the cacao pest situation.[84]

Such then were realities of Ghana's plant health position in 1920. The Department's only remedial initiative in this period was the introduction of plant quarantine regulations in Ghana. Two enactments, "Proclamation #26 of 29 October 1921" and "Proclamation Number 10 of 14 November 1924," empowered the Department's Agricultural Inspectors to enter any farm between the hours of 6 a.m. and 6 p.m. to enforce laws on farm sanitation.[85] Such inspectors could order any farm owner to treat diseased plants on his farm. The farmer, after inspection, had to maintain his plantation in a prescribed manner. If a farm was prevalent with injurious pests, the Agricultural Inspector, with the approval of the provincial Superintendent of Agriculture, could order the destruction of pathogenic plants on the plantation.[86]

The statutes enjoined farm inspectors to keep a register showing the identity and location of each farm inspected, the name(s) of the occupier(s) of such farm(s), the injurious pest(s) found on them, the treatment(s) administered, and the date of inspection. The Plants' Ordinance forbad the removal and transfer of any diseased plants, apart from purposes of destruction, from any farm. Penalties were enforceable against farmers who obstructed the Department's field staff from implementing the legal provisions. Such offenders became liable to a fine of £25.00 or a three month spell in jail.[87]

Ghana's plant pests' ordinances went into immediate

effect, especially in Ashanti, which suffered the worst forms of insect pests and fungoid diseases.[88] The Department also trained a special staff to deal with various plant diseases in the country.[89] But here again, the impact of the plant disease laws were marginal. The effective enforcement of these plant quarantine laws was difficult, especially when farmers could inadvertently move pathogenic plants easily from neighboring farms in the vast forest belt. Indeed, as of 1924, only 1,225 acres of cacao land had complied with the Injurious Pests enactment in Ashanti.[90] In the Eastern Province, like the rest of the cacao belt, the plant sanitation order proved difficult to practice. The measures required labor and expense, but owing to under-population, hired labor was both expensive and hard to come by.[91] These then, were the initial attempts to confront the menace of the Capsid and Black Pod cacao pathogens in Ghana from 1910 to 1925. The next chapter discusses what improvements and changes occurred in the fight against these biological hazards to the cacao crop up to the end of World War II.

Endnotes

[1]Hill, Migrant Cocoa Farmers (1963), chapters 1-4.

[2]Rudolf von Albertini, Decolonization: The Administration and Future of the Colonies, 1919-1960 (New York: Africana Publishing Company, New York, 1982), 100.

A comparative perspective on the British principle of financial self-sufficiency in the colonies, and how it guided bureaucratic policies and procedures in East Africa is available in D.M.P. McCarthy, Colonial Bureaucracy and Creating Underdevelopment: Tanganyika, 1919-1940 (The Iowa State University Press, Ames, 1982), 11.

[3]G. B. Masefield, A History of the Colonial Agricultural Service (Oxford: N.P. England, 1972), 53.

[4]In Ghana, savannah soils occupy almost two-thirds of the total land mass. These occur mainly around the extreme southeastern areas and northern half of the country. See, H. B. Obeng, " A Keynote Paper: Soils of the Savanna Zones of Ghana. Their Physico-Chemical Characteristics, Classification and Management," in Proceedings of the Joint Commission of the Society of Soil Science Conference on Savanna Soils of the Sub-Humid and Semi-Arid Regions of Africa and their Management Tema, Ghana, November 24-26, 1975, ed. H. B. Obeng (Kumasi, Ghana: Soil Science Society of Ghana, Council for Scientific and Industrial Research, 1975), 11-23.

The forest belt is concentrated in the southern third of the country. As one author described it, "This forest region is the economic heart of the Gold Coast. It has the mineral deposits. Of extraordinary fertility, it contains the chief farming districts; above all, it is the center of the cocoa industry." See, Martin Wright, The Gold Coast Legislative Council (London: Faber and Faber Limited, 1946), 14.

The same author noted that, "On the basis primarily of the cocoa industry, the Gold Coast became the most materially successful of all British African colonies. Its predominant class, numerically and economically, was native small farmers; their production of nearly 50 percent of total world cocoa exports brought the Gold Coast a higher standard of living than was enjoyed by other African territories..." Ibid., 28.

[5]Masefield, Colonial Agricultural Service (1972), 54-57.

[6]Sir Hugh Clifford to Lewis Harcourt, "Legislative

Council Debates, 1916-1917," in G. E. Metcalfe, Great Britain and Ghana: Documents of Ghana History, 1807-1957 (Accra, The University of Ghana: Thomas Nelson and Sons Limited, 1964), 539

[7]Masefield, Colonial Agricultural Service (1972), 54; and Government of the Gold Coast: Report of the Department of Agriculture for the Year 1914 (Accra, Gold Coast: Government Printing Office, Gold Coast, 1915), ii. (Hereafter cited as Gold Coast. Agricultural Department Report) See also Gold Coast. Agricultural Department Report for 1926), 49; and La Anyane, Ghana Agriculture (1963), 17-25.

[8]Masefield, Colonial Agricultural Service (1972), 55; and Gold Coast. Department of Agriculture Report for 1931-2, 22.

[9]Anonymous, "The Agricultural Department of the Gold Coast, 1890-1909: The Ministry of Agriculture and How it Began," The Ghana Farmer, 10 no.1 (1966): 29-43, and 48. (Hereafter cited as T. G. F.) See also, Anonymous, "The Department of Agriculture, Ghana," T. G. F. 1 no.5 (1957): 167-169.

[10]Gold Coast. Agricultural Department Report for 1919, 1; and Gold Coast. Agricultural Department Report for 1925-1926, 15.

[11]T. G. F. 10 no.1 (1966): 39.

[12]Ibid.

[13]Ibid.

Polly Hill's work on migrant cacao farmers in southern Ghana, cited earlier on, is to date, the major study of the introduction and dissemination of the cacao plant in the Akwapim and Akim Abuakwa districts.

[14]Gold Coast. Agricultural Department Report for 1913, 11.

[15]Ibid., 30; and Gold Coast. Agricultural Department Report for 1915, 14; A. N. 9 no.225 (December 10, 1910): 389; and La Anyane, Ghana Agriculture (1963), 42.

[16]R. H. Whymper, Cacao and Chocolate : Their Chemistry and Manufacture (London: J. A. Churchill, 1912), 31.

[17]See for example, Hinchley Hart, Cacao-A Manual on the Cultivation and Curing of Cacao (Duckworth and Company,

London, 1911).

[18]Gold Coast. Agricultural Department Report for 1914, 18.

[19]G. C. Dudgeon, "Notes on Two West African Hemiptera Injurious to Cacao," Bulletin of Entomological Research (Hereafter cited as B. E. R.) 1-2 no.1 (April 1910-January 1912): 59.

[20]Dudgeon, B. E. R. (1910-1912): 60.

[21]Ibid.

[22]Gerald C. Dudgeon. Inspector of Agriculture for British West Africa. Enclosure no.36, Colonial Office Report on the Gold Coast (London 23 June, 1910), 65.

[23]_____ B. E. R. (1910-1912): 59.

[25]Ibid., 60.

[25]La Anyane, Ghana Agriculture (1963), 41-42.

[26]Gold Coast. Agricultural Department Report for 1913, 29.

[27]G. C. Dudgeon, "West African Hemiptera Injurious to Cocoa," B. E. R. 1 no.3 (October, 1910): 177.

[28]Anonymous, "Cocoa Production in the British Empire," Bulletin of the Imperial Institute (Hereafter B. I. I): 17 (1919): 53.

[29]Ibid.

[30]Gold Coast. Agricultural Department Report for 1914, 17.

[31]F. R. Irvine, Cocoa in West African Crops Vol II (London: Oxford University Press, 1969), 16.

[32]H. A. Dade, Bulletin no.6 Department of Agriculture, Gold Coast: Economic Significance of Cacao Pod Diseases and Factors Determining their Incidence and Control (Government Printing Office, Accra, Gold Coast, 1927), 7.

[33]Anonymous, "New Crops, New Pests," A. N. (1943): 1.

[34]Alibert, Les Insectes Vivant (1951), 14-15.

[35]T. G. F. (1966): 37.

[36] Hayami and Ruttan, Agricultural Development: (1985), 78ff.

[37]John Rodger, Governor, to the Secretary of State. Enclosure no. 25. Despatch no. 175, Received 1 April, 1910., 47; Colonial Office, Public Record Office. 879/105. (Available at the main library, African Department, Africana microfilm collections, University of Wisconsin, Madison).

[38]Ibid., 48.

[39]Ibid.

[40]Ibid.

[41]Ibid.

[42]Dudgeon, B. E. R. (1910-12): 177; and Gold Coast. Agricultural Department Report for 1914, 21.

[43]P.R.O./C.O. 879/105 Despatch no.175, 1 April 1910. 47; and Irvine, Cocoa Vol II (1969), 16.

[44]Gold Coast. Agricultural Department Report for 1913, 20.

[45]Ibid.

[46]Acting Governor to the Secretary of State for the Colonies. Enclosure no.38. P.R.O.\C.O. 879\105 Despatch no.175. Received 1 April 191, 47.

[47]H. Brian, The Acting Governor to the Secretary of State, London. 27 March 1911. P.R.O.\C.O. 879\105 Despatch no.51, 150.

[48] Gold Coast. Agricultural Department Report for 1914, 21.

[49]Ibid.

[50]Ibid.

[51]Ibid., 19.

[52]Ibid.

[53]Ibid. and Gold Coast. Agricultural Department Report for 1913, 30.

[54]La Anyane, Ghana Agriculture (1963), 27-30, and 42. See also K. B. Dickson, Historical Geography of Ghana (Cambridge: Cambridge University Press, 1969), 170.

[55]Gold Coast. Agricultural Department Report for 1914, 21.

[56]Ibid.

[57]Ibid., 18.

[58]Gold Coast. Agricultural Department Report for 1913, 24.

[59]Ibid.

[60]Ibid., 28. also Gold Coast. Agricultural Department Report for 1914, 27; and Gold Coast. Agricultural Department Report for 1929-30, 22-23.

[61]Gold Coast. Agricultural Department Report for 1914, 21.

[62]Ibid., 18.

[63]Ibid., 26.

[64]Colonial Office: Annual Report on the Gold Coast, (Her Majesty's Stationery Stores, London, 1916), 7.

[65]Colonial Office. Annual Report on the Gold Coast for 1919, 25.

[66]Francis Agbodeka, Ghana in the Twentieth Century (Accra: Ghana Universities Press, 1972), 94.

[67]Colonial Office. Annual Report on the Gold Coast for 1919, 31.

[68]La Anyane, Ghana Agriculture (1963), 43; Agbodeka, Ghana (1972), 94.

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[70]Government of the Gold Coast: Report on the Eastern Province 1918 (Accra, Gold Coast: Printed at the Government Printing Office, 1919), (Hereafter cited as G.C.R.E.P.)

[71]Colonial Reports: Annual. Ashanti: Report for 1916 (London: H.M.S.O., 1918), 8-9. (Hereafter cited as C.R.A.A.) See also, C.R.A.A. Report for 1918, 7.

[72]G.C.R.E.P. Report for 1918, 4.

[73]C.R.A.A. Report for 1919, 7.

[74]Gold Coast. Agricultural Department Report 1915, 8.

[75]Arthur W. Knapp, The Cocoa and Chocolate Industry (London: Isaac Pittman and Sons Limited, 1923), 80.

[76]C.R.A.A. Report for 1923-4, 9.

[77]Knapp, Chocolate Industry (1923), 80; G.C.R.E.P. Report for 1919, 4; and La Anyane, Ghana Agriculture (1963), 43.

[78]Anonymous, "Cocoa Production in the British Empire," B.I.I. 17 (1919): 53.

[79]Gold Coast. Agricultural Department Report for 1920, 17.

[80]Annual Report of the Gold Coast and British Togoland. The Gold Coast Civil Service Staff List, 1917 (Accra, Gold Coast: Government Printing Office, 1917), 183-184. (Hereafter cited as C. S. S. L) See also, C.S.S.L. for 1921, 212-215; C.S.S.L. for 1925, 187-189, and Gold Coast. Agricultural Department Report for 1920, 18.

[81]Gold Coast. Agricultural Department Report for 1919, 6.

[82]Gold Coast. Agricultural Department Report for 1920, 1.

[83]Ibid. See, "Report on Mycological Work," in Appendix A. Aburi no.1 December, 1920, 17.

[84]Anonymous, "Cocoa: World Production and Trade," Empire Marketing Board no.27 (London: H.M.S.O., May, 1930), 11. (Hereafter cited as E. M. B.)

[85]Digest of Plant Quarantine Regulations. Supplement no.1 Food and Agriculture Organization of the United Nations F.A.O./UN/54/5/2536 (Rome, Italy: May 1954), 39-40.

[86]The Laws of the Gold Coast Colony Vol II (Accra, Ghana: Government Printing Department, January, 1928), 1307-1310.

[87]Ibid.

[88]Gold Coast. Agricultural Department Report for 1925-1926, 31; C.R.A.A 1920, 7-8.

[89]C.R.A.A. 1925-1926, 11.

[90]Ibid.

[91]G.C.R.E.P. for 1935-1926, 19.

III PRELIMINARY RESEARCH INTO THE BIONOMICS AND CONTROL OF THE CAPSID, BLACK POD AND SWOLLEN SHOOT CACAO DISEASES, 1926-1943

Introduction

In the early 1920S, two agricultural scientists joined the Agricultural Department. The first to do so in 1920, was Godfrey Sturge Cotterell, who became Assistant Government Entomologist. The other was Harry Arthur Dade, who served as Assistant Mycologist in 1921. These two farm scientists initiated research into the Capsid and Black Pod cacao diseases from 1926 to 1930. But their research findings were not implemented in the field partly because of financial stringencies emanating out of the depression of the 1930s and the onset of Word War II.

In 1936, a new plant disease, named the Swollen Shoot virus reared itself in the cacao belt. Its impact debilitated cacao plantations. Despite the creation of a Central Cacao Research Station in the rain forest, and notwithstanding promising scientific research into the plant virus, wartime exigencies pre-empted large scale disease control. The period under review, 1926-1943, may be characterized as the era of "science without practice."

Discussion

The seriousness of Capsid attacks after World War I was paramount. In 1926, year, W. G. A. Ormsby-Gore, Parliamentary Under Secretary of State for the colonies, during a visit to Ghana, observed of the Eastern Province that, "There are signs of a falling off in the production per acre due in part to a development of disease among the older trees."[1] The need for immediate action was never in doubt. Actually, some effort was already underway to deal with the Capsid menace. Earlier in the decade, Cotterell visited the United States on a Carnegie Research program from August to December 1922 to upgrade his expertise on plant entomology. W. H. Patterson, the chief Government Entomologist, proceeded to the Portuguese West African island of Sao Thome on 6 January 1923 on a similar mission.[2] But it was not until 1926, that any research on the Capsid menace commenced.

Capsid Research

The Assistant Government Entomologist, Cotterell, spent the first half of the year 1926 in the Department's sub-station at Asamankese in the Akim-Abuakwa district of the Eastern Province. Here, he studied the life histories and habits of the Sahlbergella Singularis and the Sahlbergella Theobroma Distantiella. Cotterell also included the insects Helopeltis Bergrothi, Heliothrips Rubroncincta, and the Earis biplaga in

his work. He also tested the efficiency of various liquid sprays and dusts capable of eradicating such pests. He determined that Nicotine Sulphate, though expensive, effectively destroyed the Sahlbergella species.[3]

In 1927, Cotterell made more progress in Capsid research. Based on proposals at the first West African Agricultural Conference held at Lagos, Nigeria in 1927, he headed a mission to Fernando Po, Sao Tome and Belgian Congo to investigate Capsid parasites.[4] From April 1928 to March 1929, after his return, Cotterell researched the bionomics of the Braconid Euphorus Sal which parasitized the Sahlbergella. If workable, the Entomology Division of the Agricultural Department would breed insect predators on a large-scale to minimize Capsid populations. [5]

In 1929, the Agricultural Department established a second entomological center at Kwahu, also in the Eastern Province, to obtain more information on the Sankonuabe, then "the most serious of crop diseases" in the district. But up to July 1931 the only positive development in the Department's pest control program was its experiment work with the Dasyscapus parvipenis parasite to kill insects destructive of cacao in Ghana.[6]

Black Pod Fungus Research and Control

Despite these difficulties, the Government Mycologist, Henry Arthur Dade conducted a series of studies Black Pod fungus disease. Because they seriously affected plants of economic importance in both temperate and tropical regions, plant fungus studies already existed before World War I.[7] But no fungus research under Ghanaian ecological conditions was available.

In 1926, Henry Arthur Dade, the Assistant Mycologist, selected the Anyinam district in the Eastern Province for his Black Pod studies. As he put it, "it was well known as an area in which loss from pod disease had been estimated as being very great."[8] The Anyinam district was situated in the Birrim river valley. Numerous streams intersected its extensive but uniformly flat plains. The Birrim plains were also heavily forested. These environmental factors easily promoted fungal diseases in the area which the Government mycologist selected for his work.

In his work, Dade kept close contact with the Imperial Bureau of Mycology in England, drawing upon their expertise and data collections and reference libraries. This was feasible because Kew Botanical Gardens maintained and compared collections of plant pests from all British colonies. The results of this work became invaluable in correlating the work of plant pathologists throughout Britain's overseas

territories. Furthermore, literature on plant disease control, published in all parts of the world, were obtainable on loan from the Bureau, which Dade found useful for his work on cacao fungoid diseases.[9]

In his report, Dade later maintained that air currents were negligible in transmitting fungoid pathogens, because surrounding brush and trees obstructed wind movement in cacao farms. By implication air currents did not easily dislodge viable sporangia which tend to cling strongly to the pods. On the other hand, man spreads fungus disease. Dade explained that a higher proportion of trees that bordered narrow, frequented tracks showed greater rates of infections than the others. This was so because the clothing of passers-by usually brushed off sporangia from fungus-infected cacao and transmitted them to healthy pods.[10]

Insects were however mainly responsible for transmitting the Black Pod fungus. Insects of many varieties which frequented the cacao trees, walked over the pods, and thereby carried the spores from one tree to the other.[11] Within the same tree, insects disseminated the disease among cacao pods in the same fashion. "Contact" and "Drip" also accounted for a large proportion of infections. Cacao pods grow in clusters, and always in contact with one another. In this situation, if one pod is diseased, drops of water containing zoospore from the diseased pods often dripped onto healthy

pods and caused infection.[12] Dade also established that when the pods suffer from machete wounds or insect punctures, the openings enable the parasite Phytophthora Faberi to penetrate and destroy the internal tissues of the pod, which nurture the beans. Deprived of nutritive material, the cacao fruit loses its vigor and ceases further growth.[13]

Apart from the Phytophthora Faberi, Dade in September 1927 examined the (Armillaria Mellea) cacao fungus. The Armillaria Mellea, or Collar Crack, emerged in the post-war period as a destructive fungal disease. It was widespread in the forest belt of Ghana and British mandated Togoland. Its major characteristic were the longitudinal and radial cracks it produced in the collar of the tree. A virulent parasite, Armillaria Mellea did not depend on previous wounds or infections to penetrate the host. Collar Crack infections began in the lateral roots and extended to the main axis where they produced fissures. Excessive humidity correlated with the severity of attack. According to Dade, Collar Crack was controllable if humidity could be reduced and if the material it infected were destroyed. To ensure that farmers complied with these measures, the colonial administration instituted ordinances in Ghana to ensure effective control.[14] But here again, as in Capsid control, farmers did not respond.

The Means To Resist the Black Pod Fungus

H. A. Dade also considered artificial controls for pod rot. In his view, "dusting," or the spraying of fungicidal chemicals, would best stem Black Pod growth on cacao trees. Hence, under the auspices of the Agricultural Department, two American firms, the California Sprayer Company of Los Angeles and the Niagara Sprayer Company of Middleport, New York, along with a British concern, W. H. Brown and Company of London, tested various dusts among cacao plants in Ghana.

Laboratory experiments indicated that dusts prepared from copper sulphate lime and copper carbonate lime were, "effective preventives of infection by Phytophthora Faberi and its spore production." Dade added that calcium arsenate, an insect stomach poison, may be an important additive in dust preparation to prevent insect damage.[15] But these chemical solutions did not prove beneficial. The dusts had to be applied in the morning when the pods were wet with dew to enable the chemicals to set successfully. However, chemical adhesion to the pod was poor, and could be washed off easily during rainfall. Wrote Dade, "This defect alone renders the method unworkable."[16] When between 1925 and 1930, the Agricultural Department's personnel toured cacao districts, often for months advising farmers on cacao disease management, the effort made no impact for reasons noted earlier in this

study.[17]

Plant Quarantine Laws

In 1936, the government demonstrated its resolve to stave off the threat of plant diseases from the outside world. In two acts, "The Importation of Plants Regulation Ordinance of 28 March 1936" and the "Importation of Plants Regulations of 6 May 1936," the colonial state aimed to forestall the inadvertent introduction of plant pests from outside sources. The Witchbroom fungus disease was striking disaster among cacao estates in the western hemisphere.[18] The two ordinances specifically prohibited the importation of plants from Central America and South America as well as Trinidad, where the Witchbroom cacao disease was most active. The law restricted inter alia cacao plants, and seeds, along with those of cassava, cotton, oil palms, citrus fruits, and sugarcane. The Department of Agriculture could however import exotic plants for scientific purposes.

Plant importation from neighboring West African countries came under the regulation of the Plant Interchange Schedule. The Interchange Schedule referred to West African countries which had reached agreements with Ghana on plant and seed exchange.[19] Under the law, exchanges should be allowed only under permit, set out in prescribed form, bearing the signature of the Director of Agriculture.[20] Persons requiring to

import plants had to apply for permission in writing to the Director of Agriculture, stating the name(s) and address(es) of the applicant(s) and of the person(s) from whom the plants would be obtained. The importer(s) must state the botanical, popular and varietal name(s) of the plant(s), the number of each variety to be imported and the locality in which the plants would be grown. A plant Health Certificate should be obtained from agricultural authorities to accompany plant imports. Finally, the law restricted the importation of plants and seeds (except by postage) to the ports of Accra, Winneba, Cape Coast, Saltpond, and Takoradi. At these ports, a Customs Officer administered screening tests, and could order such plants to be disinfected, fumigated or destroyed. Plants imported illegally could be confiscated outright and burnt.[21] Plant quarantine legislation formed part of the defenses the government employed to safeguard cacao from pathogenic attacks. But apart form the ports of entry, their enforcement nation-wide, as earlier stated, was arduous.

A New Plant Disease: The Cacao Swollen Shoot Virus

The Department's most historic, path-breaking cacao disease studies started in 1936 when the technical staff in the Agricultural Department initiated research into the Cacao Swollen Shoot virus (C.S.S.V.) Hitherto, Capsid and fungal pests along with slaty, weevily and defective beans in the

nation's warehouses had preoccupied the Agricultural Department from its inception in 1904 until 1935.[22]

In 1936, a farmer from Effiduase, in the New Juaben district of the Eastern Province, took cacao branches showing peculiar swellings to the district's Division of Agriculture for examination. W. F. Steven, a mycologist and plant pathologist, was the first to investigate the disease. He isolated no pathogens. But his field investigations led him to conclude in November 1936 that the branch swellings evinced the presence of an infectious disease which he termed the Cacao Swollen Shoot Virus. (C.S.S.V)[23]

Testimonies from local farmers in the Eastern Province suggested that the onset of the disease was by no means sudden. Preliminary surveys revealed that C.S.S.V was already established in the oldest cacao-growing districts of the Eastern Province. Here, such farms extended over several hundreds of square miles especially in the Nankese district. In this area, where cacao farms had started in 1907, patches of dying cacao trees typifying a Swollen Shoot epidemic were present before 1922.

C.S.S.V. posed unique difficulties. While Capsid pests and Black Pod diseases were costly to farmers and the state, those diseases had not destroyed whole trees. Swollen Shoot by comparison killed the trees outright and could obliterate whole cacao plantations altogether. This plant

virus, as one source explained, became, "a major concern of cacao in Ghana [and] Farmers... recognized a definite time limit to the economic life of their farms..."[24] Under those conditions, it became imperative for the Department of Agriculture to implement remedial steps against the virus.

The Department immediately started a cutting out campaign, destroying over 81,000 virus-infected trees in three hundred farms. Also, Dr. A. F. Posnette, a plant pathologist, started a cacao progeny selection program in 1937, to attain greater bean size and prolific plant yields to maintain output levels since old farms were either dying out or diseases were rendering replanting difficult.[25]

The Central Cacao Research Station

However, a major obstacle confronted the Department. Although the crop represented 98 percent of Ghana's export agriculture, up to 1936, no agricultural research station and farm scientists existed to treat plant virus diseases. Frank A. Stockdale, Agricultural Adviser to the Secretary of State for the colonies who visited Ghana in 1936, accordingly, advocated a cacao research station for Ghana.[26]

The colonial government voted £30,000 to establish a cacao research station in 1937 with a maintenance grant of £1,200 for the first year. The policy makers later examined sites at Old and New Tafo, Bunso and Moseaso in the Eastern

Province. Finally in 1938, the government established a Central Cacao Research Institute at New Tafo, where some of Ghana's first cacao farms were built in the 1890s. The government charged this research station to investigate and determine solutions to cacao pathogens, especially the C.S.S-.V, Black Pod and Capsid diseases. Plant breeding and hybridization, agronomy and nutritional problems of the cacao crop were also important in the Institute's research programs.[27] Swollen Shoot investigations later became by far the most prominent in the Department's cacao research agenda at Tafo.

In 1939, the Department suspended its earlier attempts to rogue out virus-infected cacao trees because it was apparent that the Swollen Shoot virus was too widespread for such measures. Besides, cutting out diseased cacao was costly. Further investigations were urgently needed either to confirm the existing control strategy or to determine a more efficient approach. Surveys conducted from 1940 to 1942 in two sample areas in the main region of infection, showed that cacao crops had died in nearly sixty percent of the farms examined. More significantly, an estimated ninety percent of the standing mature trees were infected.[28]

The Puzzle of the Swollen Shoot Virus

H. A. Dade, the Government Mycologist, who had worked in Ghana since 1920, after viewing the death of cacao trees over

extensive areas in the Eastern Province, opined that the C.S.S.V. "phenomena are new to science. They appear to indicate a systemic affection, the etiology of which is not yet clear [but] the evidence points to a physiological, and not a parasitic diagnosis."[29] Dade attributed the virus disease to environmental conditions particularly drought, exposure to dry harmattan winds, and the absence of shade trees because of deforestation. Dade's list of causes included, "lessening soil moisture," "lessening atmospheric humidity," "direct solar effects on the trees" and "the ingress of insects."[30]

To support his analysis, Dade cited the dry areas of the Eastern Province, namely Bisa, Asuoya, Suhum and Nsawam which recorded less than 55 inches of rain annually. In such districts, massive cacao infections have occurred. By comparison, the Ashanti Region and Western Province had no C.S.S.V because of better soil moisture, the absence of drought, and rainfall levels of less than 55 inches.[31]

In Dade's view then, the dying cacao tree arose from worsening environmental conditions over the years, and that, "Swollen Shoot is a secondary infection of minor, if indeed of any significance."[32] In essence, "[S]wollen Shoot, whilst it presents a novel problem whose early solution is highly desirable, is only an incident in the general problem of cacao die-back."[33] As a solution, the mycologist advocated the extensive

planting of Samanea Saman trees throughout the cacao belt areas to provide shade.[34]

Based on Dade's recommendations, the Department of Agriculture terminated the cutting-out of cacao trees and diverted resources into reducing the "drought-dieback" through the expedient of planting shade trees.[35] The effort to plant trees to provide shelter in all cacao farms did not stem the disease which continued to kill off more trees. The problem of ascertaining the etiology of the Swollen Shoot disease still persisted.

M. Greenwood, a soil chemist, had earlier investigated soils in the Nankese area in 1934. His analysis revealed no significant difference in the nutrient status of soil that supported flourishing cacao farms and those which the C.S.S.V. To determine the etiology of C.S.S.V, Greenwood in 1940, repeated the same soil tests, which confirmed his earlier findings. These experiments signified that no toxic effect or soil deficiency occasioned the Swollen Shoot disease.[36]

In a collaborative effort, A. F. Posnette of the Department of Agriculture and E. F. S. Shepherd a plant pathologist, began field observations on C.S.S.V. in 1938. The effort affirmed that the C.S.S.V disease spreads irrespective of environmental conditions. Shepherd also determined that the Swollen Shoot was not due to a bacteria. After numerous inoculation experiments when he utilized a strain of bacteria,

cultured from swollen tissues, he was unable to transmit the disease. Other experiments, using phenyl-propionic and Indolyl-propionic acids that promoted bacterial growth in soils gave negative results.[37]

Identifying the Virus Nature of the Swollen Shoot Disease

However plants budded with virus-infected trees in uncaged and caged environments revealed the virus nature of the C.S.S.V plant disease. When the tests were repeated in uncaged areas, all budded-plants developed Swollen Shoot. Plants not similarly treated remained healthy. To confirm these laboratory findings, the plant pathologists repeated the tests under field conditions at Aburi, ten miles from the nearest known case of the Swollen Shoot disease. In this example, ninety plants, budded with C.S.S.V infected trees, all revealed typical symptoms, and eighteen developed swellings. This scientific breakthrough that traced the Swollen Shoot to a virus obtained the support of two other farm scientists, who had earlier supported Dade's environmental theories of cause and effect.[38]

In 1941, Posnette searched for possible vectors of the virus and established a criteria to determine the symptomatology of the disease and methods for its control. These problems preoccupied him and his colleagues from 1940 to 1943. In the effort, Posnette established that beans or seeds obtained from normal pods on infected trees were not vectors.

Also, all available cacao-sucking Hemiptera were collected, fed on infected plants, then caged on healthy seedlings. Several insect species, including Capsidae, Coreidae, Membracidae, Cercopidae, Fulgoridae, Dictyophoridae and Ricaniidae were tested as virus vectors. The scientists also anticipated that the cacao Psyllid (Mesohomotoma Tessmanii) the Aphis (Toxoptera Aurantii) and the Thrips (Heliothrips rubrocinctus) which fed aggressively on cacao might be carriers of the Swollen Shoot virus.

In 1943, Cotterell, the assistant government entomologist obtained transmissions under experimental conditions with certain mealy bugs (Coccidae), a Psyllid (Mesohotoma tessmanii Aulm) and an Aphid (Taxoptera Aurantii Boye). These insects were common and widespread on Ghanaian cacao.[39] The tesmanii attacked unshaded cacao the most and therefore most capable of transmiting the virus from the original infected tree.

Establishing the Symptomatology of the Virus

The symptomatology of the virus disease was established between 1941 and 1943 after careful, painstaking field observations. This information was needed to help the Department's field staff to identify the disease in the course of treating infected farms. A virus infected tree showed several leaf symptoms. A distinctive yellowish or white chlorosis appeared

in the leaves. The veins remain outlined in normal green color, but seemed thickened underneath. Afterwards the areas between the main veins would bulge upwards, imparting a wavy edge to the leaf. In severe cases, "the whole leaf is puckered like a cloth in which the stitching but not the fabric has shrunk, the stitches representing the veins."[40]

The areas between the veins may turn brown and drop out of the leaf. At this stage, the tree cannot produce healthy leaves again. What is worse, steady defoliation would set in, the rate of leaf production is reduced, and the foliage would appear as small tufts at the ends of bare branches.[41] The cacao pods, which bear the beans, became dwarfed and rounded. The tree's stems suffer from swellings, usually at the end of a shoot whose growing points have been killed. A slow down of growth occurs and the tree reveals short internodes. While healthy cacao trees have a regular rhythm of flushes, infected trees tend to be tardy in generating new leaves. Swellings also occurred on cacao roots. But as of 1944, no abnormalities had been found in the flowers of infected trees.[42]

How the Virus Epidemic Spreads

Close observations from 1940 to 1943 enabled the Agricultural Department to determine that the C.S.S.V epidemic extended itself in two different ways. First, an outbreak

would gradually infect adjacent trees. This form of spread was characteristically, "slow, steady and relentless, seldom leaving any healthy trees inside the diseased area; more healthy trees on the perimeter become infected thereby accelerating the epidemic."[43]

The second type of dispersal occurs with the appearance of new scattered outbreaks some distance from the first or main outbreak. These eruptions tend to enlarge like the first. The rate of spread would then increase until the cacao farm is extinct. These subsidiary outbreaks originated from the first through agency of vectors, or resulted from fresh infections from an alternative host plant of the virus. Subsidiary outbreaks usually became fewer as the distance from the main outbreak widened.[44]

Methods of Controlling the Virus

In 1940-1, the strategy used to stem the disease was cutting out and stumping all trees showing the characteristic swellings. This procedure, however, proved difficult to implement. The field staff of the Agriculture Department could not identify twig swellings on mature cacao trees during the early stages of infection since these were often concealed by foliage. Another difficulty was that swellings large enough to be detected at a distance were not usually visible until the virus had infected the tree for twelve months.[45]

Without the transmission experiments which revealed leaf mosaic as a reliable symptom, diagnosis for future treatments would have been perplexing. Even after mosaic became a recognized symptom, it was clear that the removal of obviously diseased trees alone could not check the virus. The appearance of symptoms on adjacent trees shortly after cutting out of infected trees indicated that apparently symptomless trees in contact with those showing mosaic were potential carriers of the virus.

The Agricultural Department reverted to the policy of cutting-out all diseased trees after these scientific findings. The Department aimed to confine the disease within the existing limits of the main outbreak and to eradicate the isolated outbreaks whenever discovered. From February 1941, the Agricultural Department drastically removed rings of healthy-looking trees from infected farms. The field staff followed this policy consistently because this approach effectively reduced the radial spread of infection. After May 1941, the search for new outbreaks became more systematic. Infected plots were inspected on a monthly basis, unlike previous years when outbreaks were uncovered more or less accidentally.[46]

To control the known vectors, the Department adopted two methods on an experimental basis. One technique was the spraying of nicotine solution to kill off the virus before and

during the felling of infected trees, and scorching all leaves and greenwood immediately after hewing down the tree. The agricultural scientists inspected the farms monthly and promptly removed all newly infected trees. It must be stressed that the Department organized all of these schemes on an experimental basis on a seventy acre cacao farm near the cacao Research Station.[47]

The gravity of the cacao plant epidemic can be gauged from the fact by May 1942, the disease had engulfed over 250 square miles of cacao belt under potentially ideal conditions for its continuous spread. Within the heart of the cacao belt C.S.S.V disease had destroyed about 66 percent of the cacao trees. In one village, an agricultural scientist stated, "[In] the villages of Akodum (sic) stacks of cacao trunks are now seen to be for sale as firewood. This is when we thought the cacao had died as the result of repented attacks by Capsid bugs." [48]

The Department of Agriculture surveyed cacao producing areas in the colony and uncovered thirteen isolated cacao virus outbreaks far distant from the first struck in the Eastern Province. Wiawso in the Western Province, and Peki across the Volta river in the erstwhile German colony of Togo, provided notable examples. By 1943, C.S.S.V was a threat to cacao output in Ghana, then the world's major producer and whose national income derived largely from cacao exports. By this

date, the Department's strategies to eradicate this deadly plant pathogen were largely exploratory in character owing to lack of personnel and finance.

An Evaluation of Agricultural Science Administration in Ghana, 1909-1943

From the foregone analysis, it is clear that though formal British rule emerged in 1874, and despite the introduction of cacao into Ghana in 1879, no over-arching institution to direct the colony's agricultural operations existed until 1904, a time lapse of twenty-five years. But the country's agricultural potential was evident to the British administrators who noted in 1892 that not more than 5 percent of the soil had ever been cultivated in any one year.[49] The aim to promote export agriculture explains why colonial administration, especially Governor Brandford Griffiths, vigorously encouraged cacao farming in the 1890's without the benefit of an agricultural department. The absence of this institution automatically voided any cohesive program to identify and map out policy-decisions concerned with plant health.

It was not until the governorship of John Pickergill Rodger in 1904 that the colonial administration conferred the post of director of agriculture on the senior officer of the Aburi Agricultural Experiment station. The drive to promote export agriculture explains why the administration established

agricultural stations in various climatic regions of the colony.[50] These experiment stations only aimed to ascertain which crops would produce the most prolific yields under Ghanaian conditions for international commerce. Disease considerations, for any of the numerous crops it promoted, did nor figure in the agenda of the Agricultural Department. As indicated earlier, the Department's attention to plant pathogens arose only as an incidental adjunct to the Department's primary goal of promoting export agriculture.

Barely equipped to cope with plant diseases, the Department suffered interminably from shortage of agricultural experts. The Department was unable to recruit skilled manpower from abroad. Recruitment in Ghana for agricultural duties also failed. The available staff suffered from resignations and long leaves of absence. Two world wars, and depression in the 1930's led to further staff cuts. Some personnel were invalided out of service. These problems truncated work in progress and precluded the initiation of new lines of research.

The supporting evidence for this analysis is considerable. For example in 1913, I. D. Koranteng, a Ghanaian travelling instructor resigned. The Department's first entomologist, W. H. Armstrong died in 1911, a year after his appointment. His replacement went on a extended leave of absence from 1 July to 17 December 1913. A travelling

instructor, recruited from the West Indies, was also absent from duty for five and half months. R. H. Bunting, the government mycologist, similarly spent 158 days on leave of absence in 1913. Under such conditions, the Department's ability to safeguard plant health became especially difficult.[51] The situation with the department's top-ranking personnel was not different. By 1914, and throughout the era of colonial rule only two mycologists, R. H. Bunting and H. A. Dade, were available to the Department. Ghana with 91,843 square miles of territory, had a technical staff of twelve Europeans and thirty-eight indigenes. In reality, some of these positions remained vacant due to recruitment difficulties.[52]

The staffing problem was not peculiar to Ghana. From the outset, the number of qualified agricultural scientists the British appointed to its colonial agricultural service never exceeded a thousand, a number altogether inadequate for their immense task.[53] In 1925, the entire British colonial agricultural service comprised of 150 officers. The number broke down into 80 specialists and seventy other appointments to serve the colonies which covered nearly 2,000,000 squares miles, with a population of 51,000,000.[54]

Recruitment and training of suitable staff to fill professional positions in the colonial agricultural service presented problems. In the 1890s, British universities

provided no training in agricultural science, a trend which continued until 1910. The newly created colonial departments of agriculture recruited the available manpower. The shortage of skilled personnel became especially critical in 1913. In that year, the number of agricultural officers the British recruited for the colonies totaled only eleven. This included one entomologist, W. H. Patterson, for Ghana, but no mycologists. The First World War depleted the available staff and recruitment ceased for several years. When after the war colonial governments wanted to expand the agricultural departments, hardly any graduates were available.[55]

Meanwhile, British officials in 1923, insisted upon using trained scientific personnel because second rate officers were "worse than useless," and may lead the respective colonies to disaster, "when scientific aid is in question".[56] The manpower problem, however, still persisted. Even manpower training services in tropical agriculture at the Imperial College of Tropical Agriculture (I.C.T.A), at Trinidad, British West Indies, did not alleviate matters. Though the demand for agricultural scientists had increased threefold, the Institute could only make sixteen appointments per year from 1919 to 1924.[57]

In Ghana, because of personnel shortage, the Department accommodated itself to an advisory role in disease control. Shortage of qualified staff also meant agricultural

instructors were usually unavailable to implement policies on plant disease control in farm districts.[58] Attempts to recruit staff from among indigenous Ghanaians failed. Applicants who wished to train as instructors lacked the requisite academic credentials. Those with the required qualifications pursued professions in medicine.[59] Lack of recruitment for farm supervision posed several difficulties. The few available travelling instructors were over worked. Some averaged between 258 and 290 days of trekking each year.[60] The itinerant instructors covered an enormous stretch of territory which was taxing. For an officer to visit the same district more than once a year was rare.[61]

Ghana by 1925, carried over 180,000,000 cacao trees on 900,000 acres.[62] The Head Office of the Agricultural Department at Accra found the administrative capacity for this scale of operations taxing. The Department acknowledged that, "The task of directing the numerous lines of work, many of them of a highly specialized nature which are required of the Department, and of making and keeping the Department an organic whole is not an easy one."[63]

Over the years the Department of Agriculture acknowledged its apparent lack of progress in disease control. In 1914, the Agricultural Department expressed frustration over its "microscopic" efforts to control Capsid pests: "As the efforts to control these pests have been on such a minute

scale, it may be stated the pests have had an almost undisputed field of operations since the work was first brought into prominent notice in 1909."[64] This situation never improved in the period under review.

The Department from 1910 to the mid-1930s emphasized farm instruction without much local research. To quote one source, "It is difficult to see how any agricultural officer of the Department could be expected to offer correct advise on cultural or other treatment as he had no opportunity to acquire knowledge under local conditions."[65] Even with an adequate staff, it was doubtful whether the Agricultural Department could have controlled plant diseases any better. Labor shortage, made the cost of hired farm workers expensive for most cacao farmers.[66] For example, the instruction to farmers to handpick insects from cacao trees failed. In 1914 the Department reported "no progress in destroying insects because the collection of insects though congenial in India and Java is not congenial for the (Ghanaian farmer)."[67] Moreover, this advice was impracticable because it economized on land which was plentiful, but not on labor which was scarce.[68]

Another problem was that most farmers had no knowledge of English. Under these circumstances, they could not benefit from English language instructions. The use of ex tempore translations did not get the message across. Where such translators were available, farmers preferred instructions

from the few older staff, a cultural trait of deferring to the elderly, and scarcely to the younger ones.[69]

The absence of research facilities and skilled manpower to check cacao diseases worsened during the depression of the 1930s. In 1931, the administration, for economic reasons, reduced the senior and junior staff in the Agricultural Department. In that year, the Director of Agriculture abolished the post of chemist and entomologist. When two vacancies occurred in the technical division due to retirement, the Director refused to fill them. Despite the manpower redundancy exercises, Graham Auchinleck, then Director of Agriculture, felt compelled in 1932 to counter public perception that the headquarters of the Department was over-staffed. To use his own words:

> I wish to correct the impression current among some sections of the community that [the] Head office is over-staffed relatively (sic) to other branches of the Department or to other Departments of Government. Three officers above the long-scale are not only not excessive but are inadequate, and in this respect the Department does not compare particularly with other branches of Government Service.[70]

Funding for the Department, also underwent severe cutbacks. The working conditions of the technical staff accordingly suffered. By 1932, there were only two laboratories for the Department's four technical divisions at Aburi. None of them was commodious. The Entomological Division operated in one small room in the chemical laboratory

which severely limited available space for the chemist. The Botanical Division had no accommodation whatsoever. Auchinleck, the Director of Agriculture, observed that, "while it is unlikely that Government cannot face special expenditures of this kind just now, I wish to press for consideration of these needs, and to ask that they be filled as soon as possible."[71] Not only did the government leave these needs unfulfilled, but also denied funds to replace the electric light batteries at the Aburi Agricultural laboratories and staff bungalows. Auchinleck wrote:

> It is hardly necessary to stress the inconvenience they will cause to the officers there. Much of the apparatus is now dependent upon electricity as a source of light, heat or power, and unless the dynamo and battery can be repaired I shall be obliged to find funds for converting the laboratories and apparatus for using oil lamps. The officers themselves will be put to inconvenience and expense in having to change the lighting system of their bungalows.[72]

The director went on to demand that the Department of Agriculture, and not the government, should run the batteries. This though, failed to materialize.

Meanwhile, the laboratory's water-supplies became, "hopelessly insufficient."[73] Experiments closed down for long periods each year because water was always in short supply for ordinary laboratory operations.[74] As one political scientist has observed, "Looking back over the early years of the story of cacao's development one cannot but regret that it was not

properly organized from its very beginning."[75] He could not have been more apt. With a dearth of skilled personnel, poorly equipped and under-funded, technical research on entomological and mycological hazards to the cacao crop suffered severe constraints.

Comparisons With the Outside World

Most of these limitations were not peculiar to Ghana. G. B. Masefield, a well placed official, who served in the British Colonial Agricultural Services, has acknowledged that appointees to the colonial Agricultural Departments were always, "handicapped by scientific isolation, trying climate and frequent ill-health and money was short."[76] Parsimonious British colonial spending largely accounted for inadequate cacao disease control programs. Under colonial rule, Ghana's Department of Agriculture ran a tiny annual budget of £18,000.[77] Most of these went into salaries and sundry administrative expenditures. In 1929, when the Colonial Office in London organized the Imperial College of Tropical Agriculture in Trinidad to research plant diseases, the financial resources to operate the college did not come from the British treasury. The cacao producing colonies in the West Indies and West Africa, and some cacao manufacturing interests in the United Kingdom provided the funding.[78] Like Ghana, the Imperial College of Tropical Agriculture worked with a limited

staff of five scientific officers. In addition to cacao problems, the officers dealt with general problems related to agriculture in the British West Indies.[79]

If under colonial rule agricultural research and extension services in Ghana to control cacao diseases were poor, the same was true of other cacao-growing countries. Cacao research had expanded in Brazil, Dutch-Guiana, Belgian Congo, Columbia, Ecuador, Guatemala, Mexico and Haiti. But before World War II, the cacao research institutes of any importance were the Imperial College of Tropical Agriculture in Trinidad, and the Central Cacao Research Station at Tafo, Ghana. The Turrialba Cacao Research Institute in Costa Rica emerged only in 1947, to improve cacao production in the Western hemisphere. It is interesting that Turrialba was charged to resolve short-term research projects and to leave problems of longer range to the older and larger cacao research center of Trinidad and Ghana's Cacao Research Institute.[80]

Most of the problems entailed in cacao disease controls lay beyond the resources of Ghana's Agricultural Department. Indeed, the nature of tropical plant pathology, particularly viruses, was largely unknown elsewhere in the world before the mid-1930's. The British agricultural research centers including Rothshampstead Experiment Station at Harpenden, Herts, knew "very little" about virus diseases generally. British

agricultural scientists have actually characterized the period before the 1930s as the "Middle or Dark Ages" of plant virus research, and that, the more scientific attack upon the plant virus problem occurred during the 1930s.[81] By implication, work on the Swollen Shoot virus conducted between 1936 and 1943 at the Central Cacao Research Station in Ghana, placed the country among those which pioneered plant virus diseases before World War II.

It is doubtful, whether Ghana's Department of Agriculture without its difficulties, could have accomplished more than it did on cacao disease controls under colonial rule. In England, the Imperial Bureau of Entomology had since 1890 produced the Review of Applied Entomology, which dealt with insects injurious to plants, man and beasts. These were abstracted from about 1,200 Swedish, Japanese, Danish and Norwegian articles. The Bureau identified insects it received from entomologists and veterinary officers from British colonies. However, only a staff of three and one part-time worker prepared these research findings and journal abstracts for publication in the Imperial Bureau of Entomology Quarterly. Since these publications dealt with the technical and taxonomic aspects of the subject, they proved unsuitable for use in the various Departments of Agriculture in Ghana and other British colonies.[82]

Conclusions

For its limited impact on controlling cacao diseases in Ghana, the colonial Agricultural Department has attracted criticisms from African nationalist politicians and several social scientists. In the light of the available evidence, these perceptions demand serious modification. The colonial Department of Agriculture fulfilled its primary objective to introduce, experiment with, and instruct farmers to propagate exotic plants for international commerce. Using agricultural experiment stations, the Department disseminated seeds either gratis or in exchange for a nominal fee. The effort undoubtedly helped farmers to transform Ghana's rain forest into the world's most prolific cacao producing country from 1911 to 1978. Declining output in the Western hemisphere, due to the Witchbroom fungus disease, rendered the Department's role in promoting cacao growing in Ghana, a landmark in world agricultural history.

It must be reiterated that the control of cacao diseases was however incidental to the Department's original agenda. The Department offered advise on disease and pest control strategies without any scientific support from a viable research station. However, as will be seen later, the Department's lines of research in entomology, fungoid and virus diseases, along with recommended control measures remained a valuable knowledge base for the West African Cacao

Research Institute which emerged in 1944. From this perspective, the Department's long term impact on cacao diseases represented a significant historical legacy.

The Department of Agriculture undoubtedly exhibited major weaknesses. Such flaws, however, must be attributed to the dynamics of British colonial rule. British administration, and its parsimonious spending failed to envision a research station to protect colonial economic plants from disease. Few qualified plant pathologists served the Agricultural Department. Poorly equipped as they were, this technical staff dealt with difficult plant diseases, over an extensive geographical area, under hard conditions.

Laboratory facilities, when available were mediocre. When war exigencies and financial depression occurred, the Department of Agriculture suffered cut-backs in personnel. This fact, among other factors voided continuity of research and precluded the initiation of new ones. From 1910 to 1943, these constraints were the decisive elements upon which the progress of the Department depended. The Department's initial accomplishments in cacao in virus research and controls broke new ground, but the administration of agricultural science experienced severe limitations. Such constraints, however, were not peculiar to the Ghana but to all British colonies.

Endnotes

[1]Report by the Honourable W. G. A. Ormsby-Gore (Parliamentary Under Secretary of State for the Colonies) on His Visit to West Africa During the Year 1926 (Accra, Gold Coast: Government Printing Office, 1926.), 614.

[2]G.C.C.S.S.L. 1925, 188-189.

[3]Gold Coast. Agricultural Department Report for 1925-1926, 39.

[4]Gold Coast. Agricultural Department Report for 1928-1929, 13; and La Anyane, Ghana Agriculture (1963), 100.

[5]E. M. B., no.42 (July 1931), 122; and Gold Coast. Agricultural Department Report for 1928-1929, 13; see also, Gold Coast. Agricultural Department Report for 1929-1930, 13.

[6]Ibid.

[7]See for example, Hinchley Hart, Cacao - A Manual on the Cultivation and Curing of Cacao (London: Duckworth and Company, 1911).

[8]H. A. Dade, Bulletin no.6. Department of Agriculture. Gold Coast. Economic Significance of Cacao Pod Disease and Factors Determining their Incidence and Control (Accra, Gold Coast: Government Printing Office, 1927), 7.

[9]Gold Coast. Agricultural Department Report for 1925-1926, 36.

[10]Ibid., 24.

[11]Ibid., 23.

[12]Ibid., 122.

[13]Ibid., 29 and 45. See also H. A. Dade, Paper no.14, "The Determination of the Incidence of Black Pod Disease of Cacao," Yearbook of the Gold Coast Department of Agriculture, 1929-1930, (Accra, Gold Coast: Government Printing Office, 1931), 7, 10-14, & 122-123.

[14]H. A. Dade, "Collar Crack of Cacao (Armillaria Mellea), T. A. 4 no.9 (September 1927): 175.

[15]Bulletin no.6 Economic Significance of Cacao Pod Diseases, (September, 1927) See section V "Artificial Controls." unpaged.

[16]Ibid.

[17]E. M. B., no.42 (July 1931), 16.

[18]Plant Quarantine Regulations. Supplement no.1 (F.A.O./UN/54/5/2536 (1954), 39-40.

[19]Ibid.

[20]Ibid.

[21]Ibid. See also, The Laws of the Gold Coast Colony Vol II (1928), 1305-1307.

Plant fumigating centers already existed at Accra and Sekondi. See, Gold Coast: Agricultural Department Report for 1913, 27.

Most of these legal provisions conformed to the resolutions of the 1914 phytopathological conference in Rome, Italy, to which Britain, the colonial power in Ghana, was a signatory. See, Anonymous, "International Phytopathological Conference," A. N. 13 no.314 (May 9 1914): 153.

For comparative plant ordinances in Germany, the state of California, U.S.A., and Trinidad in the Caribbean, see A. M. Adamson, "The Geographical Distribution of Insect Pests," T. A. 18 no.3 (1941-1942): 43-47.

[22]The problem of insect pests in the cacao warehouses deserves its own study in agricultural history. It has attracted considerable documentation over time. Such insect pests have persisted in both producing and importing countries over an extended time frame. See, for example, A. W. Knapp, "Insect Pests of the Cacao Store," B. I. I. 19 (1921): 189-200; J. W. Munro and W. S. Thompson, "Report on Insect Infestation of Stored Cacao," E. M. B. no.24 (London: H.M.S.O., December, 1929): 7-37; Winnefred M. Noyes," Moth Pests in Cocoa and Confectionery," B. E. R. 21 no.1 (1930): 77-121; O. W. Richards and G. B. Hereford, "Insects Found Associated with Cacao, Spices and Dried Fruits in London Warehouses," A. A. B. 17 no.2 (1930): 367-394.

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IV WARTIME CACAO DISEASE EPIDEMIC AND THE EMERGENCE OF THE WEST AFRICAN CACAO RESEARCH INSTITUTE, 1939-1945

Cacao diseases multiplied intensively during World War II to the extent of threatening a national catastrophe in Ghana. The farm crisis compelled the British colonial administration to intervene directly to curb the epidemic. Such was the ruinous impact of cacao diseases by 1944 that the Secretary of State for the colonies re-organized Ghana's Central Cacao Research Station to the status of an inter-territorial cacao research institute embracing the four British West African colonies, of Ghana, Nigeria, Sierra Leone and Gambia. This posture marked a major departure from the restrained involvement policy which Ghana's Agricultural Department had pursued until then.

Though officially recognized in 1936, D. H. Urquhart, the director of Agriculture in post-war Ghana, opined in 1956 that the earliest outbreak of this plant virus disease occurred between 1910 and 1935, soon after the first farms were established.[1] A tree-killing disease, the cacao virus had defied solution until the outbreak of the second global war. Before World War II, approximately 3,000 acres of cacao farms in the zone lying between Tafo, Koforidua, Mangoase and Amanase in the central portion of the Eastern Province suffered from Swollen Shoot. In 1939, the disease was present

at Bisa in the Manya Krobo district. By 1940, Swollen Shoot had destroyed many cacao farms in an area of 200 square miles as a result of progressive devastation when war began. In 1942, the Swollen Shoot epidemic had extended to the Atewa range, north-east of Peki in the Volta region, Awenade, Wiawso and Kobriso. The plant virus was also prevalent in the Ashanti Region, Central and Western Provinces up to the border with Cote D'Ivoire, having taken over thirty years to establish itself throughout the extent of Ghana's cacao belt.[2] The worst hit area, was the Eastern Province where the first cacao plantations were built.

Wartime Priorities Supersede Cacao Farming

The gloomy pre-war outlook on cacao worsened during the war when the crop lost its markets in Europe. The German military occupation of continental Europe restricted cacao exports only to the United Kingdom, Canada and the United States. It is true that Ghana was then the world's leading producer of the crop. But cacao from this source competed with those from the rest of Africa, Central and South America, Asia and the Caribbean for the few available wartime markets.

As a British colony, the war diverted resources in Ghana to war-related economic pursuits. Output subsequently declined during the war. The 1939-1940 cacao season, yielded 242,000 tons of cacao compared to 300,000 in 1937. In 1941,

Ghana produced 222,000, tons of the produce. The corresponding production figures for 1942, 1943 and 1944, were 126,000, 190,000 and 193,000 tons in that order. By 1946-7, the country's cacao output had slumped to 192,000 tons.[3] The neglect of the cacao economy contributed significantly to the incidence of plant diseases, especially the Swollen Shoot virus in the wartime period.

When the war broke out, the British government demanded strategic raw materials and food. These priorities took precedence over cacao which was always in surplus supply. With the outbreak of the Pacific War in 1941, Japan occupied Southeast Asia and interdicted the outflow of primary resources to Europe. African primary commodities, notably oil-seeds, palm oil and the Hevea Funtumia rubber variety assumed a strategic significance.[4] In fact, from 1941, copra, palm kernels and mineral products topped the priority list over cacao in British commodity shipments.[5] Timber became highly prized. The demand for it led to intensive timber-felling in Ghana throughout the war. The mining of bauxite, manganese ore and industrial diamonds also became pronounced.[6]

Ghana's capital, Accra, became a U.S. strategic outpost for military operations in North Africa and the Mediterranean. The army needed supplies of edibles from Ghanaian farms. In 1942, the colonial administration appointed a full-time Director of Supplies to emphasize local food production and

procurement.[7] Food farming subsequently assumed a major significance to meet the wartime military demand for foodstuffs. The Department of Agriculture diverted efforts from the control of cacao diseases to establish pig farms while encouraging the production of tobacco, honey, jam, marmalade, fruit and juices for local use. The Department also created cooperatives to produce and market yams at Atebubu in northern Ashanti under contract to the army.[8] The Department fixed prices for government procurement agencies to secure supplies for the military. Farmers accordingly cultivated food crops especially rice, corn, millet groundnut, shallots, palm oil, fresh vegetables and livestock. In some cases, planters uprooted dying cacao trees to make room for food crops because cacao prices had since the 1930s been meager.[9] These developments had serious implications for the subsequent neglect of cacao plantations and the spread of diseases that followed.

Moreover, merchant firms which had hitherto purchased and marketed cacao overseas could not operate because war conditions rendered European markets virtually inaccessible. Cacao could not be shipped abroad because shipping space was restricted to strategic resources. Meanwhile, German U-Boats lurked in African surf ports and preyed on British cargo ships anchored off-shore.[10] Admittedly, the British colonial government did not altogether abandon cacao. The

administration, unlike pre-war years, created the West African Produce Control Board (W.A.P.C.B.) to centralize cacao marketing in lieu of the free marketing system of the pre-war years.[11] Even under war conditions, the crop was the mainstay of thousands of peasant farmers and the country's source of hard currency earnings. Ghana's budget position also depended upon the prosperity of cacao exports. Above all else, cacao was a valuable dollar earner to the colonial power, Great Britain, which usually re-exported the commodity to the United States and continental Europe.[12]

Even then, the British faced problems. Under war conditions, vehicles and spare parts were unobtainable in the colony to cart cacao from rural settings to Ghanaian harbors. The complications of shipping cacao overseas compelled the British in 1942, to order the destruction of surplus cacao up-country after purchase.[13] Throughout the war, the W.A.P.C.B could only ship 48 percent of its cacao stocks. Given, these realities, cacao deliveries at the beginning of 1943, slackened in Ghana. Part of the problem was manpower shortage. Cacao harvesting was dependent upon wage labor. The strong demand for manpower for war-related activities inevitably reduced the labor available to harvest cacao.[14]

What was worse, the government pursued a low price policy for cacao to avert inflation. The Agricultural Department never paid more than £3 per ton for cacao compared to £2 for a

load of 60 pounds in peace-time. Higher prices, it was claimed, when imported commodities were not forthcoming, would have placed excess income into farmers' hands, thereby fueling inflation.[15] Surplus cacao was either burnt in heaps or used to produce cacao butter, cooking fat, lighting oil, soap and candles to make up for commodity shortages.[16]

Staff from the Agricultural Department who could have handled cacao diseases were for the most part engaged in other pursuits. When war struck in 1939, some of the staff performed military duties overseas. Those available in Ghana assumed responsibility for government procurement.[17] On 13 July 1943, the Agricultural Adviser to the Colonial Office observed that, "Research had to go by the board to a large extent... we may find ourself rather bankrupt of research results which are a necessary prelude to secure planning for the future."[18] This perception was hardly open to dispute. In sum, labor shortage, poor cacao prices, lack of shipping space, demand for strategic resources and food for the army, as well as better-paying alternative labor opportunities voided wartime cacao disease control. The relative disinterest in cacao farming advanced the spread of cacao pathogens in Ghana's rain forest. Destructive Capsids and fungi, hitherto dispersed, became concentrated in the cacao plantations. Combined with the debilitating effects of Swollen Shoot, the phenomenon "threatened a national

catastrophe" in the country.[19]

Given the nature of the Swollen Shoot virus, the relative wartime disinterest in cacao plantations proved particularly dangerous. The virus devastated plantations in two ways. The virus epidemic usually began sporadically among a few trees. By a process of tree to tree spread, these isolated outbreaks gradually extended beyond their immediate locales to engulf the farm.[20] The two types of spread varied from farm to farm and from district to district. But they both accelerated as the virus built up and gathered momentum each year. The number of trees infected in a single outbreak usually increased about three-fold in three years, eleven times in five years, and eighty-eight times in seven.[21] By the end of the war, 90 percent of virus-infected cacao was concentrated in an area of 600 square miles in the Eastern Province, called the "Special Area." Most cacao in this "Special Area" was planted before 1920. But due to the virus and wartime neglect, production slumped to below 50 percent of their pre-war average.[22]

The statistics cannot convey adequately how the Swollen Shoot virus devastated hundreds of square miles of established cacao during and after the war, leaving villages derelict and hamlets abandoned.[23] Two villages in the Eastern Province, Koransang and Akotuakrom may perhaps illustrate the Swollen Shoot menace in post-war Ghana. The Department of Agriculture

had surveyed Koransang cacao farms in 1936 when the virus was first discovered, and again in 1939 when the war broke out, and finally in 1944. The Department designed the surveys to monitor the effects of the virus on the typical cacao farm. Built in 1904, the Koransang farm was over thirty years old before the first survey. A casual re-inspection in 1942, revealed that Swollen Shoot had killed 20 percent of the trees and infected about 45 percent of the farm.[24] In 1944 when it was re-surveyed, the Swollen Shoot disease had crippled about 74 percent of the trees in the oldest fields planted between 1904 and 1914. The virus had also killed 43 percent of the medium-aged fields planted between 1915 and 1922. The farm's 1926 production tonnage dropped from 30 tons to 6 tons in 1944 solely because of the disease.[25]

The cacao farms of Akotuakrom in the Akim district of the Eastern Province, provided another example of a post-war devastated area. In 1944, farmers resorted to "Appeal Farms." This meant they replanted their derelict plantations in hopes of re-vitalizing them. This attempt however failed to remedy the jeopardy.[26] Generally, output in the Eastern Province that had previously averaged 325 pounds per acre, dwindled to 200 pounds after the disease surfaced. To quote one agricultural scientist, "The analogy between the spread of Swollen Shoot and fire is close. The sooner both are attacked the easier the control, but left for long both become out of control."[27]

Shifting Cacao Farming from Ghana to the Southern Pacific

Such was the gravity of the Swollen Shoot threat in the immediate post-war years that British manufacturing interests considered building cacao plantations in the South and Western Pacific. D. H. Urquhart, one of Ghana's post-war directors of agriculture, toured the Western Pacific on behalf of the Cadbury cacao manufacturing company and the South Pacific Commission to consider the feasibility of developing cacao estates in Papua New Guinea, the Netherlands New Guinea, New Hebrides, Western and American Samoa, Cook Islands, Fiji and the Solomon Isles.

Considered as a unit, these territories comprised of some 560,000 square miles, adequate to satisfy overseas' demand for cacao. In a similar venture, another emissary, Dr. E. E. Cheeseman, visited Malaya and Borneo in Southeast Asia, and some East African territories including Zanzibar where an estimated 3,000,000 acres of land were deemed suitable to cacao planting. In fact, in Western Sri Lanka, for example, about 1,300 hectares of dying rubber trees were promptly converted to cacao planting in the post-World War II situation.[28] These developments might perhaps illustrate the catastrophic nature of the cacao crop epidemic in Ghana.

The cacao Swollen Shoot menace in West Africa was reminiscent of South and Central America and the Caribbean where the Monilia Pod Rot and Witchbroom diseases destroyed

cacao estates in the 1930s. It is pertinent to reiterate that in 1895 Latin America had furnished 86 percent of world cacao output compared to only 1 percent from Africa. However, because of disease pathogens, cacao in the Western hemisphere declined to 28 percent between 1935 and 1938 with much of the rest coming from Africa. It was ironic then, that by 1944, the Swollen Shoot virus threatened the extinction of African cacao as had earlier occurred in the neotropics. The seriousness of Ghana's cacao situation prompted the official realization that, "The rehabilitation of the [cacao] industry to its former level of production must be a matter of prime importance after the war."[29]

The West African Cacao Research Institute

The creation of the West African Cacao Research Institute therefore arose in response to cacao diseases which spread like wild-fire in the region during the Second World War. Ghana's situation was probably the most acute. These concerns compelled the Agricultural Adviser to the Colonial Office, Dr. H. A. Tempany, to tour Ghana and Nigeria's cacao growing districts as early as October 1943 to obtain a first hand appraisal of the farm crisis. Dr. Tempany came away convinced of the need to employ agricultural scientists to control these virulent cacao pathogens.[30]

Under these considerations, an agricultural institution

to resolve the cacao problem emerged in the form of the West African Cacao Research Institute (WACRI). The British Colonial Office selected the pre-war Central Cacao Research Station at Tafo, Ghana, as the headquarters of the Institute. The major consideration was that the research station stood in close proximity to the center of the cacao farm belt where the Swollen Shoot disease was paramount. Also, the Central Cacao Research Station which had since 1938 investigated the Swollen Shoot virus bequeathed its research findings to the newly-created West African cacao research body.[31] WACRI came under a team of agricultural scientists composed of entomologists, chemists and agronomists working under a director of research. In the interim, the Secretary of State for the Colonies established in London, a body of scientists to direct research policy.[32]

WACRI emerged formally on 1 April, 1944, superseding the Central Cacao Research Station of 1938. The West African Cacao Research Institute, however, was an international body designed to eliminate cacao pathogens from West Africa generally. Funding for the Institute came from the profits of the West African Produce Board which had accumulated some £3,676,253 in wartime trading. From these profits the British endowed one and a quarter million pounds sterling to the Institute to finance the survey of cacao farms in Ghana and Nigeria in July 1944.[33] Three years later, the newly created

cacao marketing boards in Ghana and Nigeria allocated a further £1,000,000 in financial support to WACRI.[34] Furthermore, the British government invested £800,000 of this funding in home government securities to accrue an interest rate of £70,000 in six years.[35] Evidently, quite unlike the depression years, funding for cacao research after the war, started on a sound financial footing.

Funding aside, the research institute inherited the agricultural science personnel and laboratory facilities of Ghana's pre-war Central Cacao Research Station. More importantly, the Station's staff of five research officers, made up of a botanist, a plant pathologist, an entomologist, a chemist and agronomist had already made considerable progress on the bionomics of the Swollen Shoot virus between 1938 and 1943. To this experienced body of scientists, the Cacao Advisory Board in London later recruited a corps of qualified and reputable agricultural science personnel for the institute.

In addition to securing skilled manpower, the Secretary of State for the colonies at the behest of its Agricultural Adviser, widened the scope of the research institute to meet the threat of Capsid and Black Pod pathogens as well. WACRI aimed to concentrate research into pests and diseases which posed immediate threats to West African cacao. The overall policy-objective required a rigorous investigation into the

bionomics of cacao Capsids and the Black Pod fungus disease. Second, the program required a thorough examination of cacao virus problems, their vectors and the alternative host plants in order to determine practical measures of control.[36] Finally, the institute also had to fully address the problem of cacao fungoid pests.

Although investigations into the Capsid, Black Pod and Swollen Shoot topped its agenda, WACRI's other lines of research included plant-breeding, fertilizer trials and fermentation techniques to improve cacao growing methods.[37] In sum, the West African Cacao Research Institute from its inception was geared to investigate all matters affecting the crop from the cultivation stage to the preparation of the crop for international commerce. The WACRI report for 1946 noted, "It was one of those rare occasions in which the urgent need for a research to maintain the production of a crop has been recognized".[38] This development also marked a rapid departure from past when funding cuts took priority over agricultural research.

The Structure and Functions of WACRI

To effectively implement its research programs, the Institute, like the Central Cacao Research Station it inherited, had four divisions: entomology, botany/pathology, chemistry/soil science and agronomy.

[a] The entomology division determined the bionomics of Capsid bugs, the toxic action of these insects, their parasites and predators. This unit also tested the relative effectiveness of insecticides and spraying techniques against insect vectors of cacao viruses in collaboration with the botany and pathology division.

[b] The botany and pathology division dealt with virus research, the fungal diseases of cacao and specialized in theobroma introductions, plant breeding and progeny trials.

[c] The chemistry and soil section investigated mineral deficiencies of cacao and conducted soil surveys in the West African cacao belt. This division also emphasized cacao root development, according to soil conditions and examined the possible correlations between soil types and the incidence of Swollen Shoot diseases and Capsid attacks.

[d] The agronomy section on the other hand undertook experimental replanting of cacao in areas devastated by virus disease and to rejuvenate cacao trees close to centers of the Swollen Shoot outbreaks. This division also observed clinical symptoms and the relative importance of pests and diseases in the field before cutting out began.[39]

The Institute enjoined the agronomy section to observe methods designed by local farmers to control the plant virus and Capsid attacks and to assess the scientific value of each. The agronomy division, formerly a part of the Department of

Agriculture, was designed to fill the gap between research and practice. Each division has a head responsible to the director of the institute. However, no research unit operated independently. The Institute's work required inter-divisional cooperation. Therefore each research officer had to be familiar with work in all research units. The Institute also has a principal research officer who guided details of research in all divisions and acted in the director's absence.[40]

WACRI had a much wider international dimension outside West Africa. The Colonial Office established in London, a Cacao Advisory Committee to advise on cacao research. This body, actually a branch of the post-war Colonial Agricultural Research Advisory Board fostered links between the West African Cacao Research Institute and leading scientific bodies in Britain.[41]

The first director of the Institute, O. J. Voelcker, arrived at Tafo, Ghana on 20 March, 1944 from Britain to implement WACRI's research agenda. On 25 April, 1944, he met the local cacao advisory board in Ghana to discuss the future of the Institute. The session, which local Ghanaian cacao producers attended, unanimously resolved to place WACRI on a permanent status, a position the London Cacao Advisory Committee also endorsed.[42]

The organization of the institute assumed a definite form

in 1946 when an international management committee replaced the London cacao advisory committee.[43] In 1947 a legislative instrument, titled the Gold Coast (Ghana) Ordinance #1 provided the statutory basis for this international committee to run the Institute. The committee comprised of equal Ghanaian and Nigerian representation. A nominee of the Secretary of State for the colonies chaired the committee. In the management of the research institute, the Secretary of State for the colonies reserved over-riding powers. WACRI is autonomous, but for disciplinary purposes, its staff conformed to Ghana's general orders.[44]

The relationship between the cacao research body and the various Departments of Agriculture in Ghana and elsewhere in British West Africa was clearly outlined. WACRI was a fact-finding body. The Institute has no responsibility for executive action. Using specialized equipment, WACRI's technical staff performed laboratory work on cacao diseases. The Institute then subjected the results of these experiments to controlled field tests to either confirm or discount observations and deductions made in the laboratory.

After this came the tertiary stage when the Institute repeated the field experiments in selected cacao farms under local agricultural conditions. Such field tests were designed to confirm the results of the first two stages of the Institute's work. The trials also gauged the economic and

psychological effect of the project on the farmers.[45] It is only at this stage that executive action could be taken to implement the results in confidence. The final responsibility to implement the institute's findings rested with the Agricultural Departments in British West Africa.

WACRI's Initial Difficulties and Advantages

The Institute did not enjoy a roaring start. Staffing problems, which had long confronted the Departments of Agriculture, also faced WACRI. European agricultural scientists were unobtainable in the post-war years. To resolve this bottleneck, the colonial administrations in British West Africa agreed to second their agricultural scientists to the Institute. In Ghana, the Central Cacao Research Station at Tafo, and the Department of Agriculture each released four of their technical staff to work for WACRI. By the end of 1945, the total number of agricultural scientists at the service of the institute stood at fifteen. However, many of the expatriate staff knew little about the cacao crop before their arrival in Ghana. As a starting point, such personnel were encouraged to visit diseased farm districts to obtain a first-hand appraisal of the cacao problem.[46]

The expanse of territory in Ghana also demanded much time during farm inspection tours. This geographical barrier

proved particularly difficult because the Institute, after the war, could not readily secure light trucks for extensive travel. Such vehicles, whenever available, were expensive to hire, a by-product of general post-war shortages. Again, field inspection trips took staff away from the laboratories for extended periods. Above all else, some of the staff divided their attention between the Institute and the Agricultural Department. One example was the senior chemist of the Institute who worked part-time for the cacao research body and the Department of Agriculture.[47]

Furthermore, the recruitment of supporting staff of laboratory technicians and research assistants also posed difficulties. Candidates available for such work were poorly trained in biology and chemistry, the requisite disciplines for research into plant pathology, entomology, soil science, plant-breeding and agronomy. Here again, the best students from the colleges had already set their sights on more prestigious vocations, particularly medicine. To surmount this problem, the institute decided to train its own supporting technical staff and to improve their job prospects in order to retain their services.[48]

There was also the lingering post-war difficulty of obtaining technical scientific literature and equipment from overseas. For example, efforts to secure dissecting microscopes ran into severe difficulties which handicapped

initial entomological research. The problems did not end there. The few available personnel from the institute experienced sicknesses. Amoebic dysentery, sand-fly fever and malaria were the commonest ailments. Water shortages also surfaced to hamper WACRI's programs.

This cacao research unit, however, enjoyed specific advantages. As indicated earlier, WACRI inherited previous research information on the Capsid, Swollen Shoot and Black Pod diseases from the erstwhile Central Cacao Research Station. Again, the earlier trial efforts of Ghana's Agricultural Department in cutting out virus-infected cacao had yielded considerable information on the value of this method of control. The difficulty, however, was that the cutting-out policy lapsed during the war because of staff shortages and wartime priorities. On a positive note, this line of plant virus control was nonetheless available to the Institute for future use.

Between 1936 and 1943, the Central Cacao Research Station had worked assiduously and extensively on the Swollen Shoot virus. Moreover, the Ghanaian staff it seconded to WACRI had previous experience in cacao virus research. These individuals continued the lines of work on which they were previously engaged and formed a valuable nucleus for the Institute's later research into cacao plant pathogens. The need to train Ghanaian staff to diagnose the virus disease was

not acute because most of them were familiar with Swollen Shoot symptoms.[49]

WACRI's Sub-Stations

Preparatory to its research work, the West African Cacao Research Institute acquired sub-stations for field experiments. One of these was the Koransang cacao farm. Built in 1904, the farm by 1944 was infected with the Swollen Shoot virus on account of its location in a disease-devastated area. Other cacao farms which served as sub-stations for the institute were located at Akwadum in the Akim district, namely, Kukua (30 acres), Nankese (18 acres) and Adunkwanta (26 acres). These diseased farms located 16 miles from the Institute were rented from local farmers to provide pilot studies on plant pathogens. By 1946, the institute had acquired over 910 acres of land for field research purposes.[50] The Royal Air Force obtained aerial photographic surveys of these plots thereby providing the research body with detailed topographical, geological soil and forest surveys.[51] This information, along with funding, an excellent research personnel and laboratory equipment facilitated the WACRI's onslaught on cacao diseases after World War II.

The planning that went into the organization, staffing, funding, structure, policies and operations of the Institute, represented a major transition from the restrained involvement

programs that characterized the control of cacao pathogens before World War II. Until the mid-1940s, agricultural scientists in Ghana's Department of Agriculture acted mainly in an advisory capacity. For the most part, they did so without the benefit and support of scientific research and experiments. The creation of WACRI to determine how best to fight cacao diseases represented a significant departure from the well-meant albeit largely ineffectual policies of the colonial Agricultural Department.

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[9]Commodity Reports: Food and Agricultural Report of the United Nations F.A.O./52/74568 26 June 1950, 4. See also F.A.O. Commodity Series Bulletin no.27 (1955), 34.

[10]Great Britain. Colonial Office. Report on Cocoa Control in West Africa, 1939-1943 and Statement on Future Policy Presented by the Secretary of State for the Colonies to Parliament by Command of His Majesty, September 1944 (London: H.M.S.O., 1944), 1-4; and Anonymous, "Agricultural Development in West Africa," W. C. (February, 1952): 45.

[11]The wartime cacao marketing arrangements derived from the pre-war recommendations of the Nowell Commission which enquired into the cacao hold-up and protest movement in Ghana during depression times for better prices. See, Report of the Commission on the Marketing of West African Cocoa, (London: H.M.S.O., 1938), 1-7.

[12]The Sterling Area: An American Analysis (Prepared by the staff of the Economic Commission for Africa. U.S. Government Printing Office, Washington, 1951.), 199; David Apter, "Some Economic Factors in the Political Development of the Gold Coast," Journal of Economic History (Hereafter J. E. H.): (1954): 411 & 419-410. Also F.A.O. Bulletin no.27 (1955), 41.

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[17]Masefield, Colonial Agricultural Service (1972), 59.

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[23]Urquhart, Cocoa (1958), 147.

[24]W. H. Beckett, Koransang Cocoa Farm, 1904-1970 Technical Publication Series no.31 Institute of Statistical Social and Economic Research (University of Ghana, Legon, 1972), 1-2. Available at the Land Tenure Center, University of Wisconsin at Madison.

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[28]Anonymous, "Prospects for Cocoa in the South Pacific," W. C (October, 1953): 393-398; H. A. Tempany, "The Threatened Future of Cocoa," W. C. (September, 1949): 13. F.A.O. Commodity Reports 26 (June, 1950), 7.

[29]Waters, E. J. E. A. (1944): 101.

[30]West African Cacao Research Institute Annual Report: 1 April 1944 - 31 March 1945, Tafo Gold Coast, (London: Crown Agents for the Colonies, 1951), 6. (Hereafter WACRI: Annual Report)

[31]Ibid, 5.

[32]Tempany, W. C. (September, 1949): 13.

[33]Ibid., 6-7.

[34]WACRI Conference 1953, 2.

[35] WACRI: Annual Report, 1946-1947, 5-7; O. J. Voelcker, the first director of the Cacao Research Institute actually remarked, "That such a sum of this magnitude should be devoted to research on one specific crop is a matter of considerable interest and importance in the history of agricultural research in the history of the British colonial empire." O. J. Voelcker, "The West African Cacao Research Institute" Nature, 61 no.4082 (January 24, 1948): 118. This policy reflected a major departure from the advisory role of Ghana's Agricultural Department in the past half century.

[36]WACRI: Annual Report for 1944-1945, 7.

[37]WACRI Conference, 1953, 2.

[38]Ibid.9; and WACRI: Annual Report, 1946-1947, 5ff.

[39]Ibid.

[40]Ibid., 8-10; and also Ayo Abidegun, "Cocoa Research in Nigeria: An Ex-Post Investment Analysis," The Nigerian Journal of Economic and Social Studies (Hereafter cited as N.J.E.S.S.) 20 no.1 (March 1978): 22.

[41]WACRI: Annual Report 1946-1947, 5 ff.

[42]WACRI: Annual Report for 1944, 7.

[43]Ibid.

[44] WACRI: Annual Report 1948-1949, 3.
and WACRI: Annual Report, 1954-1955, 6; see also, Colonial Office. Gold Coast Annual Report: 1947, 69.

[45]WACRI: Annual Report for 194-1945, 6-8.

[46]Ibid., 11.

47Ibid.

[48]Ibid.

[49]Ibid.

[50]Beckett, Koransang Cocoa Farm (Legon, 1972), 1 ff; R. J.

Benstead, "Swollen Shoot Diseases- W.A.C.R.I.," Paper no.18 WACRI Conference, 1953, 26; Colonial Office. Annual Report on the Gold Coast for 1951, 70; WACRI: Annual Report, 1945-1946, 20, and Voelcker, Nature, (1948): 118.

[51]WACRI: Annual Report 1946-1947, 11.

V IMMEDIATE POST-WAR PROGRAMS TO ERADICATE THE SWOLLEN SHOOT EPIDEMIC, 1945-1947

The widespread nature of the Swollen Shoot epidemic after World War II, compelled the administration to initiate emergency measures to eradicate the Swollen Shoot epidemic. To await WACRI's research findings before contemplating action was dangerous because the disease could destroy Ghana's entire cacao economy in short order. At any rate, the government in 1945 could not realistically expect WACRI recommendations before initiating action. Moreover, for the first two years of its existence, the Institute itself was engrossed in the available studies on the Swollen Shoot and building upon it.

In the interim, the administration based its decision to cut out diseased cacao on the existing information acquired in the wartime period. A study of an isolated outbreak at Apedwa, eleven miles southwest of Tafo, had amply demonstrated the destructive powers of the disease when allowed to progress unchecked. F. C. Deighton, the Government Plant Pathologist, surveyed the Apedwa outbreak for observation purposes in 1937. The diseased area was originally confined to about 1,000 square miles. By 1943, the Swollen Shoot virus had extended across an approximated 20,000 square miles of cacao farms. This figure included a number of scattered outbreaks which started from it.[1]

To control the Swollen Shoot disease the government surveyed all cacao growing areas with WACRI's assistance. Started in 1944, the survey defined the major cacao growing areas and the severity of the of Capsid and Swollen Shoot attacks in these regions.[2] The survey revealed that the original focus of the disease, west of Koforidua in the Eastern Province had extended to the boundary of the Central Province. In the Volta region, the area of infection centered around Peki. A series of small isolated outbreaks also ran northwards on both sides of the Volta river. The most northerly outbreaks in this series, encompassed northwest of Kpandu. In Ashanti, a chain of outbreaks criss-crossed the territory, running from Agogo, Konongo and Nyabo, right up to the Lake Bosumtwi districts. Cacao producing districts similarly affected in the region included Bekwai, Sikamang and Dunkwa. In addition, two small isolated outbreaks existed in the Pamu district.[3]

However, over 90 per cent of the diseased existed in one area in the Eastern Province. Only scattered outbreaks could be found elsewhere in the country. The virus epidemic was most grave in the older cacao producing areas in the Eastern Province. In the 1945-46 crop season, the province had produced 70,000 tons compared to a production tonnage of 116,000 eight years earlier.[4] By 1945, cacao production was declining mainly because of the disease, and partly because

many farmers shifted to food farming which in wartime, was more profitable. The 1945-46 major crop season had amounted to 204,000 tons compared to 285,000, ten years earlier.

In the Western Province, the disease had extended its original focus around Wiawso, eastward to the Ankobra river, downwards to the Tano river valley, and further westward to the border with Cote D'Ivoire. Another could be found about twenty miles south of Wenchi, and approximately ten miles south of Wiawso. The geographical dimensions of the Swollen Shoot epidemic were definitely extensive. The question of control received urgent consideration after a series of conferences held for agricultural officers in 1945. Representatives of the West African Cacao Research Institute were present at all the important meetings. Formulated in August 1945, the country's disease control program aimed to alert farmers and the general public to the depredations of Swollen Shoot and the need to effect emergency control measures. The Department of Agriculture also aimed to prevent the disease from spreading northwards and southward from the main area of infection in the Eastern Province. Finally, the Department planned to re-survey the area of infection in Ashanti and to eradicate the disease in that region.

In field trials conducted in 1941, agricultural scientists from the Central Cacao Research Station removed all infected cacao trees along with the surrounding ring of

symptomless trees. The method reduced tree to tree contact and checked further infections. In essence, the removal of contact trees was crucial in controlling the epidemic.[5]

The Department of Agriculture in 1945, initiated a policy of cutting out all Swollen Shoot infected trees. The chopping down of infected trees was then the only method known to science capable of checking the plant virus. The procedure had in fact received the endorsement of the Cacao Research Institute. Not only was there no other known cure for the virus, but progenies resistant to the disease were then unknown.[6] The scientific bases for chopping down infected trees were clear. A diseased tree could not recover. It died within 16 to 24 months. Experiments and experience had also indicated that symptomless trees in contact with diseased ones usually became infected within a time lag of three months.[7]

The location and extent of the Swollen Shoot outbreaks and the propaganda to persuade farmers to cut out infected trees commenced in March 1946.[8] Because it lacked sufficient staff and financial resources to undertake a comprehensive nation-wide cacao treatment programs, the administration expected farmers to implement the cut-out policy on a voluntary basis. However, government agricultural personnel were always on hand to provide guidance and assistance.[9]

The Department of Agriculture drew up plans on the modalities of the voluntary cut out policy. To this end, it

demonstrated how mealybugs transmitted the virus from tree to tree. Personnel from WACRI and the Agricultural Department toured the devastated districts to explain the control strategies to local chiefs and farmers. A pamphlet explaining the Swollen Shoot disease and how to eradicate it appeared in both English and Twi, the local vernacular in the cacao belt. A series of broadcast talks, based on this pamphlet were regularly transmitted on the national wireless news.

The Agricultural Department ordered portable, battery operated film projectors to portray visual propaganda to cacao villages. One departmental film that dealt with the Swollen Shoot was titled, "Cut to Cure." This motion picture that dealt with the timely and precise treatment of infected farms was shown throughout the cacao areas. A WACRI pamphlet, captioned, "SWOLLEN SHOOT DISEASE OF CACAO - HOW TO RECOGNIZE AND CONTROL," was distributed to schools and interested individuals. F. C. Bawden, a British authority on plant pathology gave a radio talk on virus disease at Accra. Whenever possible, agricultural officers persuaded farmers to visit and apprise themselves of disease control techniques at WACRI.[10] Government policy at this stage, required the Department of Agriculture to chop down infected trees only for demonstration purposes.[11]

After the Department of Agriculture and the West African Cacao Research Institute had demonstrated the effectiveness of

the Swollen Shoot program, the government adopted a campaign to treat the disease. In the effort, the agricultural field staff approached farmers through traditional rulers.[12] The agricultural field staff also organized demonstrations on how to deal with infected farms.

The Farmers' Response to Cutting Out

Farmers' response to the voluntary cacao rehabilitation campaign was not favorable. In areas of land scarcity, and consequent demand for foodstuffs, farmers replaced devastated cacao fields with food crops.[13] Food farming actually increased with intensity along the southern fringes of the forest belt and were particularly prominent in areas within convenient reach of large consuming centers.

Cacao farmers remained suspicious and continually expressed open hostility to the recommended measures of disease control. Under the circumstances, the Agricultural Department only registered a marginal impact. Only farmers whose plantations suffered severely from the virus responded positively to the cutting out program. In the Eastern Province, only 101 square miles of cacao plantations were surveyed and 516 outbreaks of the disease were recorded. Of these, 223 were treated in the period under review. In Ashanti, where the disease had affected about 800 acres, only about 10 percent of these received treatment. In the Western

Province, where a mild form of the virus was present, no cutting out came into effect. In the Central Province and Northern Trans Volta Togoland, no outbreaks were reported but propaganda in these areas were nonetheless insisted upon.[14]

The Compulsory Cut Out Ordinance of 1946

Throughout 1946, the Department carefully monitored the progress of the cacao disease campaign. It became apparent that the voluntary efforts of the farmers alone would not suffice to stem the Swollen Shoot plant virus. With this realization, agricultural policy makers decided to resort to more direct and vigorous methods of control. With this end in view, the government passed the Swollen Shoot Disease of Cacao Order of December 18, 1946.[15] This farm ordinance went into effect as of 31 December 1946. The ordinance made it obligatory for owners and occupiers of cacao farms to remove all virus infected trees. A government-appointed farm inspector could enter any cacao plantations to enforce the removal of diseased cacao.[16]

In January of 1947, the Department of Agriculture implemented the compulsory cutting out policy. The program followed set procedures. The regional and district officers of the Department of Agriculture engaged African staff for the job. Some of this staff were trained to identify infected cacao trees. The rest operated in gangs for felling and

stacking the diseased trees.[17] The efficacy of rogueing out diseased cacao and its ring of surrounding trees was never in doubt since the virus could not survive for more than 48 hours after the tree's death.[18]

By 1947, some 46,000,000 of Ghana's 400,000,000 cacao trees were infected and doomed to die within the year. Of these, 45,000,000 were situated in the Eastern Province. The decided policy therefore was to cut them out before they spread to healthy trees. In January 1947, the Cacao Rehabilitation Department commenced the cutting out project. At the end of 1947, it had removed over 2,500,000 diseased trees.[19] Meanwhile, the disease was expanding at the rate of 15,000,000 trees per annum.[20] In response, the Department of Agriculture made detailed plans early in 1948 to concentrate on the area of mass infection in the Eastern Province where 45,000,000 of the trees existed. It also planned to rehabilitate stricken cacao farms in areas best-suited for the permanent cultivation of cacao.[21]

The urgency behind the Swollen Shoot campaign was clear. Cacao prices had risen in 1946 from £28 to £51 a ton, and settled at £75 a ton in 1947. Ghana's national income as always, depended heavily on cacao exports. Moreover, Ghanaian cacao was an important dollar earner for Britain, which required financial resources in the post-war world for national rehabilitation. Because of wartime neglect and the

Swollen Shoot disease, cacao had experienced a substantial fall in exports. Cacao production stood at 221,000 tons in 1946, but dropped to 162,000 in 1947, compared to the 250,000 ton average in pre-war years. The successful rehabilitation of cacao plantations would assure Ghana of its major source of livelihood.[22]

Nonetheless, from April to December 1947, the voluntary cut out policy severely hampered progress towards satisfactory treatment of diseased farms. Agricultural field staff could treat farms only with the farmer's consent. What was worse, farms already treated for the Swollen Shoot continued to sustain re-infections from adjacent farms whose owners had rejected treatment.[23]

The Beeton Committee

Farmers opposed the cutting out crews of the Agricultural Department in several areas. The disease control policy came to a standstill. The Swollen Shoot situation deteriorated as cacao districts that had received treatment became rapidly reinfected. On September 18, 1947, the Legislative Council adopted a motion to review the Plant Pests and Diseases Ordinance of 1937. The government accordingly set up a committee to review the existing legislation on cacao diseases and how best to administer them. Working on the available evidence, the committee in particular, should consider the

requisite compensation for cacao trees.[24] W. H. Beeton headed the Plants Ordinance review committee. This investigative body held its first meeting on 20 September 1947. Nineteen witnesses, which included members of the Legislative Council, the Joint Provincial Council and the Ashanti Confederacy gave testimonies. Other witnesses, drawn from among paramount chiefs, chief farmers, personnel from the Department of Agriculture, the West African Cacao Research Institute and the government received due consideration.

A member of the Ashanti Farmers Union and president of Ghana Farmers' Co-operative Union, also submitted proposals on how best to cope with the Swollen Shoot epidemic. These suggestions ranged from pruning the obviously diseased parts of the tree and then tarring the resultant stumps. Others suggested chemical application against the mealybug vectors of the Swollen Shoot virus. To still some others, the destruction of the alternative wild host plants of the virus was the solution. Others wanted the creation of a <u>cordon sanitaire</u> around the outbreaks even if this warranted the felling of healthy cacao trees for the purpose.[25] The evidence that came before the committee from rural Ghanaians revealed the unpopular nature of the cutting out program.

The Beeton Committee considered each proposal carefully. Obviously bent upon the destruction of diseased trees, the committee predictably ruled that though alternative host trees

were pregnant with the virus, their destruction with chemicals was not feasible. The committee also ruled that cordon sanitaire would not provide the control required. The commission, in compliance with government policy, accepted the recommendations of a WACRI representative that cutting out was the most efficient method to destroy the Swollen Shoot virus. This investigative body concluded that on the basis of the available scientific knowledge, the most appropriate treatment was to remove all infected cacao trees.[26]

On January 28, 1948, the Beeton Committee recommended grant payment to farmers who lost their cacao trees to the cut out policy. The monetary grants derived from a draft scheme the Government had prepared in July 1947, titled "The Payment of Rehabilitation Grants to Cacao Farmers Injuriously affected by the Effects of the Swollen Shoot Disease." The compensation payment was based on the "Tree Basis" scheme. Each farmer would receive seven pence for each diseased tree removed, with the proviso that he replanted his field to offset the loss of the tree.[27] Compensation was payable in two installments. The initial grant would be paid out on the basis of the number of cacao trees removed. The farmer would receive a total of £12 for every acre lost to the disease.[28] In effect, the farmer would receive £5 for each acre lost to the disease and £7 for every acre he replanted.[29]

The committee recommended how best to administer the

scheme. The disease control project according to the report, should go under the Cacao Rehabilitation Division under the Department of Agriculture.[30] The Cacao Rehabilitation Department could execute these measures without the farmer's consent.[31] The committee considered that prior notification to farmers would not be necessary before government laborers treated diseased farms because "The circumstances were too serious..."[32] The Beeton Committee maintained that, it would not be practicable to advise individual farmers of the cut out and re-treatment procedures. Rather, the gong, the traditional public address system in rural Ghana, should be sounded two days before the agricultural field staff entered the diseased farms to effect treatment.[33]

In its final report to the Legislative Council on 23 March 1948, the committee endorsed the legislation which regulated the Swollen Shoot control policy. The report advised further that treated farms should be inspected bi-monthly to remove reinfected trees whenever discovered.[34] Upon the advice of the Executive Council, the Governor of Ghana adopted the recommendations of the Beeton Committee whose report was published in 1948.[35] Beeton's "Tree Basis" scheme remained in effect from 1 October 1948 to 31 August 1951 until the New Deal of Cacao Policy replaced it.[36]

Farmers, however, opposed the Beeton scheme. They contended that the recommendations failed to make any

compensations for any diseased trees removed from the farms during the bi-monthly re-inspections and re-treatment by agricultural officers.[37] This grievance, as shall be seen later, was a major contributory factor to the general rural unrest in the cacao belt in the months of February and March of 1948.

In conclusion, the cutting out program between 1945 and 1947 attracted a lukewarm response at best. Agricultural officers who implemented the ordinance encountered opposition from farmers. Progress was slow in view of the large area involved. The Agricultural Department required a considerable increase in staff to cope with the outbreaks successfully. It was only in the areas of mass infection in the New Juaben district of the Eastern Province where farmers requested assistance from the agricultural field staff.[38] In the early months of 1948, violent political disturbances interrupted the Swollen Shoot eradication campaign. The subsequent chapter evaluates the dynamics of rural unrest and the politicization of the cutting out order because of the emergent tide of nationalism in Ghana after World War II.

Endnotes

[1]Posnette, T. A. (1943):116-117.

[2]Gold Coast. Agricultural Department Report for 1946-1947, 6; and Gold Coast. Agricultural Department for the Year 1947-1948, 8.

[3]Gold Coast. Agricultural Department Report for 1945-1946, 3-4.

[4]Colonial Office. Annual Report on the Gold Coast for 1950, 20.

[5]Posnette, T. A. (1943): 118.

[6]Colonial Office. Report on Disturbances in the Gold Coast: 1948, 48.

[7]Posnette, T. A. (1943): 118-119.

[8]Colonial Office. Annual Report on the Gold Coast for 1947, 48.

[9]WACRI Conference 1953, 29; and Gold Coast. Agricultural Department Report for 1945-1946, 4-5.

[10]Gold Coast. Agricultural Department Report for 1946-1947, 7.

[11]Gold Coast. Agricultural Department Report for 1945-1946, 4.

[12]Ibid., 10.

[13]Ibid., 5.

[14]Gold Coast. Agricultural Report for 1945-1946, 4-5.

[15]Colonial Office. Annual Report on the Gold Coast for 1948, 36-37.

[16]Ministry of Agriculture. Cocoa Industry Division, 1960-1961, 2-5.

[17]Gailey, W. C. (1950): 191.

[18]Colonial Office. Report on Disturbances in the Gold Coast: 1948, 48-49.

[19]Colonial Office. Annual Report on the Gold Coast for 1947, 14-16; and Colonial Office. Annual Report on the Gold Coast for 1948, 152.

[20]Colonial Office. Annual Report on the Gold Coast for 1948, 152.

[21]Colonial Office. Annual Report on the Gold Coast for 1947, 49.

[22]Ibid., 17.

[23]Gold Coast. Agricultural Department Report for 1949-1950, 8.

[24]Ministry of Agriculture. Cocoa Industry Division. 1960-1961, Annex I, 1.

[25]Ibid., 2.

[26]Ibid., 11.

[27]Ibid., 42-43.

[28]Ibid.; see also, Gold Coast. Agricultural Department Report for 1946-1947, 8-9.

[29]Colonial Office. Annual Report on the Gold Coast for 1950, 20.

[30]WACRI Conference 1953, 28-29.

[31]Ministry of Agriculture. Cocoa Industry Division. (1960-1961), 4.

[32]Ibid., 5.

[33]Ibid.

[34]Ibid.

[35]Ibid., 42.

[36]Ibid., 9-10; and Colonial Office. Annual Report on the Gold Coast for 1948, 37-38.

[37]Colonial Office. Annual Report on the Gold Coast for 1948, 37.

[38]Ministry of Agriculture. Cocoa Industry Division. 1960-1961, 9.

VI THE POLITICIZATION OF THE SWOLLEN SHOOT CONTROL PROGRAM

Preliminary Observations

The imprint of rural movements on Ghana's decolonization process after World War II, is under-represented in the available historiography. Nationalist agitation in Ghana, as presented in the existing literature, exhibits an elitist bias. Historians have ascribed Ghana's march to self rule to various social forces notably, "European racial arrogance" the role of "education," "urbanization," "newspaper attacks," and "radical nationalist agitation." But leaving aside the issue of cacao diseases, all of the social forces which contributed to decolonization after World War II were also present after the first global war. From this perspective therefore, there is the need to explicate why independence occurred in Ghana after World War II but not the first.

Apparently, the educated African nationalists have received sole credit for Ghana's achievement of political autonomy. Accordingly, "education" is highlighted because the nationalist leaders were its major beneficiaries. "Newspaper agitation" is emphasized because the elite used the print media as a weapon against colonial policies. "Urbanization" is stressed because the educated African leadership were urban residents. The marches, boycotts and verbal confrontations

and rhetoric organized against colonial administrators occurred in the urban centers. These factors are indisputable. But they have contributed to the persuasive, albeit narrow perception that the decolonization movement in Ghana was uniquely urban in character.[1] Cacao diseases which fanned rural unrest, making for a mass movement against British rule, is hardly emphasized. As will be seen later, Ghanaian nationalists politicized rural discontent in Ghana which in turn contributed to the British decision to grant partial to Ghana in 1951 and full independence status in 1957.

The Bases of Rural Discontent

The reaction of the cacao farmer's to the cutting out policy facilitated Ghana's advance to self-rule.[2] The supporting evidence for this assertion is considerable. In 1946, colonial government ordinances required the obligatory destruction of infected trees. Nationalist politicians immediately politicized the government's coercive measures when these ordinances provoked discontent in rural Ghana.

Farmers expressed open hostility to the government's cut out policy on economic grounds. Cacao farming in Ghana is a long term business investment. It took at least seven years of uninterrupted toil for each cacao tree to bear fruit. Each fruit, in turn took several weeks to mature.[3] Farmers usually

re-invested cacao incomes into new lands. Such investments were risky. The uncertainties ranged from destructive plant diseases, drought, excessive rainfall, the dangers of snake bites to unstable produce prices. Cacao farming also revolved around credit facilities. Prospective farmers often incurred loans to acquire lands, seeds, tools and to pay for labor. Once built, the farms provided a collateral for credits. Such loans usually underwrote the cost of funerals, marriages and children's educational expenditure. An Ashanti ditty, as quoted below, accurately summarized the cacao farmer's economic aspiration:

> If you want to send your child to school,
> it is cacao;
> If you want to marry,
> it is cacao;
> If you want to buy cloth,
> it is cacao;
> Whatever you want to do in this world,
> it is with cacao money that you do it. [4]

Since the cacao plantations supported their livelihood, farmers have traditionally opposed any threats to these investments. In 1921, 1931-2 and again in 1937-8, cacao farmers collectively confronted exporters in Ghana for allegedly manipulating cacao produce prices. The 1946 compulsory destruction of infected trees was more sinister. Since cacao farming usually took several years of back-breaking toil and the endurance of heat and dust to achieve results, the cut out policy in their view, attested to the

insensitivity of an alien government to the economic aspirations of rural dwellers.

The farmers' opposition also derived in part from a significant jump in post-war produce prices. Cacao incomes, during the depression years was paltry and even worsened progressively in the wartime period. In 1946, the value of the crop for Ghana, amounted to £9,500,000. In the 1947-8 crop season, cacao fetched £41,000,000. The price per head-load of 60 pounds went up from fifteen shillings in 1945 to £1. 7s 6d in 1946, and then to £2 in 1947, and settled at £3. 15s in 1948.[5] The removal of cacao trees in a period of rising prices merely signified the destruction of valuable capital. This perception predisposed the farmers to resist.

Moreover, the 1946 cut out order undermined the entrepreneurial spirit of the farmers' pioneering ancestors who first built the farms between the 1890s and the first decades of the twentieth century. Farmers remembered with nostalgia, how they and their forebears had built the cacao plantations as a family resource to last from generation to generation. Migrant farmers from the Akwapim, Krobo and Ga districts had since the 1890s relocated into northeastern and south-central Ghana. As pioneering farmers, the migrants brought stubborn tracts of forest land under cacao planting. To most planters therefore, the destruction of cacao trees was sacrilegious to the memory of their entrepreneurial ancestors.

These family assets must be not destroyed, in their view, but retained as a heirloom.[6]

By 1947, cacao farmers in the southeastern areas of the Colony and Ashanti expressed open hostility to the administration's cutting out measures. The farmers' anxiety was profound. Year by year, the removal of trees continually diminished cacao output and profits. To most farmers, the prescribed cure for infected farms was worse than the disease. Pathogenic trees could still bear healthy pods for at least two more crop seasons. To hack them down meant immediate total loss, which in their view, was unconscionable.[7] When the farmers refused to comply, the Agricultural Department employed labor gangs to destroy infected trees without consulting the farmers.[8]

The size of most farms hardly exceeded three acres. This meant the trees targeted for removal represented all the mature cacao plants of the average farmer. It is true that the 1947 Beeton Committee had recommended a grant of £12 per acre to the farmer for each treated acreage. Most planters found it unsatisfactory compared to the potential profits of the farm even with infected trees over the same period.[9]

The Character of Rural Opposition to the Cutting Out Policy

Dating back to the depression of the 1930s, cacao farmers had protested against the import-export firms for

paying low prices for cacao. The cut out order was yet another threat to the cacao plantation system which might destroy their livelihood. Cacao growers displayed their discontent through verbal and physical opposition to the government's cut out ordinance. They counter-argued that, "the disease was nothing new and would disappear if left alone for a few years." Others opined that to control the infection, "it was only necessary to cut out the infected parts and not the whole tree, for how could a diseased tree bear good fruit.?" An oft-repeated contention was, "What was the point of cutting out the cacao trees if the forest trees were left to harbor the mealybugs which was said to carry the virus?"[10]

The farmers took particular exception to the gang of government laborers who entered their farms and indiscriminately slaughtered their trees. Clashes occurred between individual farmers and the cutting out gangs of the Agricultural Department.[11] In the farmers' perception, the government was "wicked" because laborers sent into the farms chopped down both healthy and diseased trees unless bribed not to: "Was there in fact, a secret motive behind government action? Did it intend the deliberate destruction of the cacao [plantations] and the acquisition of the land for some hidden end?"[12]

Ashanti, a major cacao producing region provided an

example of rural discontent which the compulsory cut out order generated. The Swollen Shoot disease was first recognized in Ashanti south of Konongo in 1943. A cutting out campaign started in October 1945, and by June 1946, 100,000 trees were eliminated. The program was intensified with the passage of the Beeton Committee Act on cacao disease control in June 1947. Thereafter, farmers vehemently opposed the cutting out strategy. In early 1948, the Ashanti Confederacy Council, made up of the region's divisional rulers, convened in an emergency session to discuss the Beeton Committee's report on the Swollen Shoot legislation. The debate in council, reflected a growing alarm to the compulsory destruction of infected trees.[13] The traditional rulers, later converged on WACRI's experimental farms in Tafo. Here, they endeavored to confront the Institute's director, Dr. O. J. Voelcker, on the relevance of the Swollen Shoot control measures.

Some of the Ashanti chiefs questioned Dr. Voelcker intensely and with considerable suspicion. Reflecting the notion that the British colonial government aimed to destroy cacao plantations in Ghana for some hidden agenda, the Ashanti divisional chief for Agogo asked Dr. Voelcker bluntly: "Has the opinion of any other scientist, apart from those in Britain, been consulted? " Answer: "This is the biggest (Cacao) research institute in the world, and it is being watched keenly. Let us move to another farm."[14] This evasive

and rather obfuscating response hardly satisfied the chiefs. To some of these traditional rulers, the destruction of infected trees only spread the disease within the farm. To this end, the chief of Berekum asked the director, "How do you prevent the mealybugs from falling on healthy trees when the unhealthy ones are being cut?" Answer: "One healthy and strong man pulls the tree during cutting and it is made to fall away from healthy trees." The chief of Berekum asked further: "Don't you see that these mealybugs drop from the leaves at every stroke of the axe and the chances are that they fall on healthy trees?" Answer: "Yes. I agree with you." Chief of Berekum: "Do you realize that the wind can blow the mealybugs to healthy trees? " Answer: "Yes it is possible." Chief of Berekum: "What is the use of cutting out then?" In his response Dr. Voelcker contended that cutting out was the only method of containing the plant virus epidemic.[15]

The suspicions of the traditional rulers about the relevance of the cutting out policy, was active throughout the meeting with Dr. Voelcker. For example, the chief of Asamang demanded: "Has any of these trees ever been infected?" Dr. Voelcker: "One tree was infected but was cut out five years ago." Chief of Asamang: (Coming along with a pod). "Aren't these mealybugs I see on the pod?" Dr. Voelcker: "Yes. Definitely they are." Chief of Asamang: "And you say this

farm is not infected?" Dr. Voelcker: "Take it from me that this farm is not infected."[16] These exchanges mirrored the distrust and discontent felt among the Ashanti leadership against the cutting out policy. These traditional notables were themselves either cacao farmers or landowners with a vested interest in the fate of their investments.

The organizational structure for the farmers to resist the government's Swollen Shoot policy was already in place. This structure had emerged from a long tradition of opposition to low cacao prices in 1908, 1919, 1931-2, and again in the 1937-8 crop seasons. For example, when produce prices plummeted in 1937-8, cacao farmers in the Colony organized the Sika Mpoano Akuafo Fekuw, (The Gold Coast Farmers' Association) under the leadership of John Ayew and Ashie Nikoi to secure favorable prices. In the Ashanti region, farmers also created the Ashanti Farmers Union with identical goals in mind.[17]

The ability of the farmers organization to succeed as an anti-colonial mass movement was never in doubt. The basic unit of the organization was an association of farmers in each Twi-speaking village under a chief farmer called Akuafohene. The organization was transitory in character, but came alive in times of perceived emergencies.[18] Above the village and town level the farmers' organizational structure involved the district, provincial and national levels. The chief farmer

and a few lieutenants represented their respective villages or towns at district level conferences. Here the chief farmers would elect one or more of their colleagues to represent the district at provincial conferences. This system of delegate conferences which had existed since 1913, helped to mobilize and coordinate the farmers' opinions at the grassroots. Resolutions adopted at the higher levels were transmitted back to the towns and villages for discussion. The farmers' organization, in short, aimed to confront perceived threats to cacao farmers.[19]

Many traditional rulers participated in the farmers' associations because apart from being landowners and farmers themselves, they depended upon cacao revenues to support their local political functions. The paramount chief of Akim Abuakwa in the Eastern Province, Sir Nana Ofori Atta I, was a major advocate of farmers' aspirations. The farmers' organization was actually the only mass movement in Ghana up to World War 11. Until then these associations only aimed to secure better prices for cacao. They never demanded political changes in order to achieve their objectives.[20] But the cut out problem was different.

The Alliance Between the Farm Protest Movements and the Urban-based Nationalist Politicians

Throughout 1947 and early 1948, farmers held protest meetings in the cacao districts. Most farmers were ready to

support the urban-based nationalist politicians to oppose the government's cut out policy. Ghana's first nationalist political party, the United Gold Coast Convention (U.G.C.C.), formed in August 1947, took up the farmers' anti-cutting out campaign. As a quid pro quo, the farmers association identified with the U.G.C.C. demand for self-rule.[21]

The western-educated professionals had long protested some aspects of British rule. In 1896, for example, Ghanaian lawyers organized The Aborigines' Rights Protection Society (A. R. P. S.) when the colonial government by law, placed all "unoccupied" lands in Ghana under the jurisdiction of the British crown. This law, as the A. R. P. S. interpreted it, would have served to transform indigenous Ghanaian into strangers in their own country. The A. R. P. S. protested the act and successfully restored the land to Ghana's traditional rulers.[22] In the 1920s, the urban-based professionals created the National Congress of British West Africa (N. C. B. W. A.) to seek participation in the British Legislative Council and the colonial bureaucracy. But throughout the period, the National Congress movement never demanded political freedom. It had no power base and no linkage with rural aspirations.[23]

The linkage between the rural farmers and the urban-based political agitators after World War 11 is significant. The nationalists, particularly, Dr. J. B. Danquah, Thomas-Hutton Mills Junior and Alf Ocansey had participated in the

farmers' movement as legal or commercial advisers. This connection had forged no linkage between the political and constitutional objectives of the urban politicians and the concerns of rural farmers. In fact until the U. G. C. C. emerged in 1947, the politician's ability to penetrate and influence rural discontent against colonial rule was difficult.[24]

The coastal based politicians could not influence rural movements in Ghana before 1945 because the British policy of indirect rule excluded them from active political participation. The British established a Joint Provincial Council (J. P. C.) as an arm of the colonial Legislative Council. The administration limited representation in the J. P. C. only to traditional rulers. By excluding the educated elite, indirect rule divided the urban politicians from the traditional leadership in rural areas. Indirect rule aligned the Ghanaian ethnic rulers with the British administrative staff which controlled the colonial bureaucracy, the army and police. The Ghanaian ethnic rulers who wielded power over the rural mass, actively collaborated with the colonial government because the system protected their authority from usurpation by "arrogant," "self-serving," "presumptuous" educated professionals who "represented nobody but themselves."[25] Until 1945, therefore, both rural and urban anti-colonial protest movements historically proceeded along two separate tracks.

But colonial policy, erected on divide and rule tactics, did not anticipate that kinship connections and economic tensions arising from cacao diseases would unify some traditional leaders with the country's urban based intelligentsia. Since the rural population steeped in tradition remained solidly behind their ethnic rulers, the linkage between the farmers associations and the political agenda of the urban politicians cemented a mass movement.[26] It was no accident that Dr. Joseph Boakye Danquah, a lawyer, became the doyen of Ghanaian politics. In 1928, Danquah had returned to Ghana from England as a lawyer.[27] Educated at London University, he was the scion of the paramount chief of Akim Abuakwa, Sir Nana Ofori Atta 1. Raised in the countryside himself, Danquah was deeply conscious of his rural roots. His doctoral dissertation, "The Moral End as Moral Excellence," and two of his major publications in the 1930s heavily illustrated rural values.[28]

Danquah's ability to forge a common front for both rural and urban issues was not unexpected. His direct family ties with the royal house of Akim Abuakwa, a cacao producing rural state, stood him in good stead among rural folk. His legal expertise aside, Danquah had acquired a unique experience in the dynamics of colonial politics. In 1942, the colonial government had accepted an amendment to elect non-chiefs to the Joint Provincial Council, which until then, was the

exclusive preserve of traditional Ghanaian chiefs. In July 1942, the chiefs co-opted two commoners, Christian Gomedo Baeta, a reverend minister, and Dr. Danquah into the J. P. C.

At the same time, Dr. Danquah had gained a first hand knowledge of rural discontent because of the 1946 cut out order. In 1947, he identified closely with the farmers associations in his ethnic state of Akim Abuakwa in the Eastern Province. As a lawyer, farmers who bore the brunt of the compulsory destruction of their cacao trees sought his advise. As Dr. Danquah has explained:

> Tetteh Kene, a Krobo man, a cacao farmer, whose farm is situated at Bosuso came to my office in a state of great trepidation. He was accompanied by an educated son who interpreted for him for he spoke in the Krobo language and I do not speak Adangbe. "Sir," he said, "they are destroying my plantation..." "Who are destroying your plantation?" I asked. "The Agriculture people," he said.[29]

The aggrieved cacao farmer added:

> One clerk lives at Bosuso and a European lives at Bunso and they entered my farm with a gang of laborers and they cut the trees--trees in full bearing. They cut them down, and when I protested, they said they would take me to court if I stood in their way. Please, master, save me, save my farm.[30]

The farmers were aggrieved because, the Agricultural officers simply entered the farmers' plantations without any notification. When Dr. Danquah asked Tetteh Kene whether the agricultural staff followed such procedures, the farmer replied:

> Nothing at all. The clerk and the white man came there

> many months ago, and marked certain of my cacao trees and told me to cut them down, on the grounds that they were diseased. The trees had pods on them, yellow pods and green pods, but they have come again and again, and this time they did not ask me to cut down any trees but they cut the trees themselves, every kind of tree, one long belt from one end to the other. Can you help me? [31]

This episode typified the frustration of the cacao farmers with the government's commitment to the mandatory destruction of infected trees. Moreover, the government's compensation payment of £12 per acre was irksome to the planters, most of whom farmed tiny acreages. Since it took a minimum of five years to bear fruit, the grant paid the average farmer five shillings a year until his replanted fields yielded revenue.

After World War II, the government's destruction of infected trees, though scientifically sound, was politically dangerous. The rising tide of nationalism and higher cacao produce prices drew farmers and nationalists resolutely together to oppose the cut out order. Wild anti-colonial propaganda spread from village to village, purporting that the administration only aimed to destroy the country's cacao plantations.[32] Under the circumstances, farmers physically resisted the government-paid labor gangs who entered farms and slaughtered cacao plants under legal fiat. In such situations, the affected farmers turned to the leaders for help. The nationalist politicians gratefully exploited such

mass rural discontent to their advantage.[33]

In this ferment of rural unrest, Dr. Danquah and other urban professionals, created Ghana's first nationalist party, the United Gold Coast Convention (U. G. C. C.) on 4 August, 1947 at Saltpond, a coastal urban enclave. The U. G. C. C. had for its agenda the decolonization of Ghana "Within the shortest possible time." The party looked for support from both urban and rural areas.[34] Because they were professionals, the leadership of the Convention could not have mobilized rural support that readily. The cut out policy served to foment and focus mass rural discontent against colonial rule.

By 1947, both urban and rural issues in Ghana played into the hands of the U. G. C. C. For cacao farmers, the compulsory destruction of their cacao trees had to stop. The cacao protest movements of the past had demonstrated the organizational potential of the cacao growers and their ability to threaten colonial interests. After World War II, they were convinced that the United Gold Coast Convention which involved educated professionals, would pursue their interests with vigor.

John Ayew and Ashie Nikoi, who spearheaded the farmers' organization, and the anti-colonial boycotts of 1937-8, joined the ranks of the U. G. C. C. The farmers' determination to resist the 1946 cut out order, contributed to the strength of the anti-colonial forces. The nationalists in return, threw

their weight behind the farmers' grievances. The major objective was to bring the farmers' associations under the U. G. C. C. for the purposes of anti-colonial propaganda.[35]

The farmers' linkage with the U. G. C. C. was bound to occur. For, apart from Danquah, other leaders in the U. G. C. C. working committee had been involved with the cacao farmers' associations in some districts. One example was William Ofori Atta. Like Danquah, Ofori Atta belonged to the royal house of Akim Abuakwa at Kibi in the Eastern Province. In the wake of the Swollen Shoot campaign, he became the Okuafohene (Head Farmer) of the Akim Abuakwa Farmers Union. The formation of the U. G. C. C. placed the nationalists in a position to politicize the farmers woes and to link them with a growing number of urban complaints.[36]

Meanwhile, a large section of southern Ghanaian rural and urban society chafed at two particular issues. In the cities of Accra, Sekondi-Takoradi, Kumasi and Saltpond, the livelihood of the urbanites had deteriorated because of rapid post-war commodity price increases. In 1947-8, money was plentifully available because of favorable cacao incomes. But since British and other European industries had not fully recovered from wartime ruin, imported consumer goods remained in short supply. Sugar, a staple commodity, fell short by 46 percent of its 1937 index; cotton piece goods dwindled to 25 percent, and kerosene, indispensable for lighting most rural

and urban homes, had slumped to 45 percent of the pre-war supplies.

Commodity shortages in turn induced inflationary pressures to bear on the economy. The high prices bore heavily on daily rated workers and salaried employees, whose incomes dropped from an index of 100 in 1939 to only 66 percent of its real value in the post-war situation. The colonial government did not control the country's import-export trade directly. This was centered in the hands of foreign businesses. But it was in the interest of nationalist feelings to equate the activities of European firms with the government's Swollen Shoot control policy.[37] In addition, the urban dwellers faulted the colonial administrators for neglecting industrialization, education and urban slum. Here again, the nationalists exploited both rural and urban grievances as evidence of colonial incompetence.[38]

In late 1948, while farmers resisted the Swollen Shoot disease, city residents were boycotting European imported goods. Meanwhile, demobilized servicemen, who had returned home after trudging in Burma, East Africa and European war theaters, had no gainful employment. Alleged British promises in wartime to rehabilitate the veterans at the end of the hostilities had remained unfulfilled. On February 28, 1948, the war veterans marched to the seat of government at Christianborg Castle, Accra to seek redress. Government

guards fired into the crowd. Two of the ex-servicemen fell dead. Several of the marchers lay wounded.[39] Violent riots soon followed. Rioters systematically and thoroughly looted several European stores. Between February and March, the Accra riots extended to Koforidua, Akuse and Nsawam which were actually rural towns in the Eastern regional cacao belt. In these rural locales, 29 people died and 237 suffered injuries.[40]

These urban and rural developments had serious repercussions on the course of Ghanaian politics. The leadership of the U.G.C.C. used the opportunity, "To take advantage of that day's tragic event and to use that advantage as a fulcrum or lever for the liberation of Ghana."[41] In this atmosphere of national tension, political propaganda encouraged farmers to conceive the notion that competing foreign interests were using the Swollen Shoot control methods as a pretext to obliterate Ghanaian cacao. The United Gold Coast Convention gained support. The population, which was pre-dominantly rural, widely acclaimed the U. G. C. C. leaders becausee they made every grievance their own.[42]

The 1948 Watson Commission of Inquiry

In 1948, the government suspended the cutting out operations in the wake of the riots. The British Colonial Office appointed a commission of Inquiry to investigate the

political riots of that year. Aitken Watson chaired the three-man commission. The Committee met on 8 April 1948. The virus disease meantime, gained ground.[43]

The Watson committee members visited markets, villages and country towns. They also toured parts of the cacao belt and later visited WACRI and its experimental farms at Tafo.[44] During its deliberations, the committee took in 187 memoranda and concluded its work on 9 May 1948. The investigators determined that the cutting out programs contributed to the 1948 political upheavals in Ghana. Dr. Danquah, the founder and leader of the U.G.C.C., submitted before the Watson Committee that the "government's policy for the eradication of the disease was scientifically sound but politically inexpedient."[45] As some farmers told the commission, rumors suggested that European firms in Ghana like the United Africa Company had embarked upon huge cacao plantations in the Far East and were anxious to curtail West African production to offset competition.[46] Propaganda such as this, helped to mobilize rural inhabitants into a state of hostility against the government. The alternative suggestions submitted before the committee were to "Let Nature take its Course," "Let the Land rest for a Year or Two," and "Let Science Find another Remedy." But, as the Watson Committee put it, "all these are counsels of despair which can only lead to disaster."[47]

In sum, Ghanaian nationalists politicized both rural

and urban issues to press for self determination. The widespread confusion among the population resulted from the misrepresentation of the government's cutting out policy. According to the Watson commission, the U.G.C.C. founded in 1947, "had endeavored to bring under their banner everyone who had a private or public grievance against the government and to seize upon every complaint, great or small to inflame a population avid for excitement."[48]

The committee nonetheless criticized the Agricultural Department's methods of dealing with Swollen Shoot. The Department had attached more urgency to containing a disease that threatened the country's economy, but completely ignored the farmers' sensibilities. Furthermore, the Department's propaganda to alert farmers on the nature of the disease and probable effect was inadequate.[49] The Commission maintained further that because laborers received payment according to the quantity of trees they destroyed, such individuals ruthlessly slaughtered both healthy and diseased trees. Again, farmers received no notification before the cutting out squads arrived. Sometimes the squads hewed down the farmer's trees without his knowledge. Because these issues galled the farm owners, the Watson committee pointed them out to the Agricultural Department for consideration and remedy.[50] The Watson Committee recommended that cutting out procedures should continue. But because of the politically sensitive

nature of the issue, the committee asked for a marking time. Secondly, the report indicated that a representative of the Department of Agriculture should notify the farmer before treating a diseased farm. Furthermore, trained agricultural officers should mark out the infected trees before they are destroyed. The committee proposed an increment from £12 to £24-£30 payable within a two-year period, for every acre treated.[51] Unlike the Beeton Scheme which offered a block grant of £12 per acre treated, the Tree Basis scheme was a more liberal system of rehabilitation payment calculated on the number of trees removed during treatment.[52]

U.N. Agricultural Scientists and the Swollen Shoot Disease

In view of the highly politicized nature of the Swollen Shoot disease, the Watson Committee noted that, "We recognize that present feelings make it unlikely that further British scientific advise will be accepted as impartial."[53] The committee therefore advised the government to invite scientists from countries not commercially concerned with cacao to investigate and report on a speedy means to eradicate the Swollen Shoot virus.[54]

The Food and Agricultural Organization of the United Nations, recommended three plant pathologists for this service. The three international scientists which the Food and Agricultural Organization of the United Nations recommended

for their expertise on plant virus diseases arrived at Accra, Ghana, on 24 October 1948. These agricultural experts were: Professor E. Van Slogteren from Holland, Walter Carter from Hawaii, U.S.A. and G. H. Berkeley from Canada.[55] The virologists, toured the cacao growing areas to meet farmers. The trip also created an opportunity for all those who had a problem to submit their ideas before the commission. The U. N. panel of farm scientists met local chiefs and farmers at Suhum, Kibi, Akropong, Koforidua, and Kukurantumi, in the Eastern Province. In Ashanti, the panel visited Kumasi, Konongo and Bekwai with similar goals in mind. Like the Watson Commission, the plant pathologists obtained and considered many suggestions. Finally, the U. N. agricultural scientists held meetings with members of the colonial administration and the staff of the Department of Agriculture.[56]

In its final report, the panel underscored the seriousness of the Swollen Shoot epidemic. The plant virus disease was no minor foray, "but a full scale invasion which has already left some of the choicest cacao producing lands devastated and derelict."[57] After examining the research and experiment facilities at WACRI, the U. N. panel of farm scientists justified the destruction of infected trees as the only scientific remedy to Swollen Shoot: "If enforced accurately, thoroughly, continuously and without delay."[58] The

destruction of infected trees along with a number of wild host trees would remove the sources of infection. Though cutting out may be unacceptable to those who do not understand the nature of the disease, the panel stated, "Unfortunately, in spite of many years of effort, there is no alternative known, and, and so far as can best be foreseen, there is no reasonable expectation of finding one."[59]

The U. N. body made several recommendations which later focused the cacao disease research and control projects in Ghana especially after 1952. There were indications, according to the virologists, that the virus existed in the wild forest trees and had to be felled with arboricides. The plant pathologists recommended the use of disease resistant and high yielding Amazonia cacao progenies to rehabilitate devastated farms in Ghana. The U. N. scientists encouraged research int the possibility of inoculating trees against the disease and the importation of predatory insects to kill off the mealybug vectors of the virus. The need to streamline the country's extension services to improve relations between the Agricultural Department and the farmers in the interest of rehabilitating Ghana's cacao economy were also highlighted in the committee's report.60

Notwithstanding these approaches to cacao diseases, the U.N. plant scientists nonetheless cautioned that Ghana had to, "learn to live with Swollen Shoot" because the ability to

uproot it completely was "an unattainable ideal." On the other hand, "unless much more vigorous measures were undertaken, the ultimate disappearance of the cacao industry in West Africa in its present form was only a matter of time."[61] The chapters that follow, will explore how these considerations figured in WACRI's research agenda, and how the Agricultural Department implemented them in the field.

Endnotes

[1]See for example, Crawford Young, Neal P. Sherman and Tim H. Rose, Cooperatives and Development of Agricultural Politics in Ghana and Uganda Madison: University of Wisconsin Press 1961), 165; Anthony Low, "The End of the British Empire," in Decolonization and African Independence, ed. Prosser Gifford and William Roger Louis, (New Haven: Yale University Press 1988), 33-39.

Both Anglo-phone and Franco-phone sources on decolonization have viewed the event from urban African and international perspectives, leaving local rural settings out of the account. See for example, Aguibou Y. Yansane, Decolonization in West African States with French Colonial Legacy (Cambridge Massachussetts: Schenkman Publishing Company, 1984), 17-36.

Other authors, typifying the trend in the field, only mentioned the Swollen Shoot episode in a couple of sentences when explicating the mass movement in Ghana. See for example, Ali Mazrui and Michael Tidy, Nationalism in the New States of Africa (London: Longman's Green and Company 1988), 10, 32, 70, 83, 114, & 119.

Standard texts for schools and colleges in Anglo-phone West Africa have left out rural politics in the period under review, when accounting for mass movements in colonial West Africa. See for example, Olajide Aluko, "Politics of Decolonization in British West Africa," in History of West Africa, ed. J. F. Ade Ajayi and Michael Crowder, (London: Longman and Company, 1987), 693-735.

[2]G. B. Masefield, with a long service record in the British colonial agricultural service, could be numbered among the few authors who have established correlations between the Swollen Shoot control act and nationalist politics in Ghana. This author observed that the compulsory destruction of infected trees led to:

> One of the most remarkable impingements of agriculture on politics in colonial history. Farmers resentful of the compulsory destruction of their trees which still had life in them, and which sometimes constituted their whole means of livelihood, had long harbored suspicions of the motives behind big business interests engaged in the cacao trade.

See, G. B. Masefield, A Short History of Agriculture in the

British Colonies (Oxford: Clarendon Press, 1950), 121-122.

[3]John Miles, "Rural Politics in the Gold Coast: The Cocoa Hold-Ups, 1908-1938," in The Imperial Impact: Studies in the Economic History of Africa and India, ed. Clive Dewey and A. G. Hopkins, (London: Athlone Press, 1978), 154.

[4]Young et al., Agricultural Politics in Ghana (1981), 162; and Piet Konings, The State and Rural Class Formation in Ghana: A Comparative Analysis (London: N.P., 1985), 25.

[5]Colonial Office. Annual Report on the Gold Coast for 1948, 5; and Dennis Austin, Politics in Ghana (London: Oxford University Press, 1964), 66.

[6]The best available studies on this subject are still those of Polly Hill: see her Migrant Cocoa Farmers in Southern Ghana (1963), especially the first four chapters. See also by the same author, "Adidiso: A Company of Cocoa Farmers," in The New Gold Coast/Ghana Farmer (Hereafter cited as T. N. G./G. F.) I (1956-1957):218; "Obomofo Densua: A Company of Cocoa Farmers," T. N. G./ G. F. I (1956-1957): 172.

The same topic has appeared several times in other publications. See for example, Polly Hill, "The History of Migration of Cocoa Farmers," Transactions of the Historical Society of Africa (Hereafter cited as T. H. S. G.) 4 (1959): 14-18; see also, "The Migrant Cocoa Farmers of Southern Ghana," Africa 31 no.3 (1961): 209-230.

Other authors have also contributed to this discussion. See, Celia McGlade, "Companies and Cocoa Growing in Akim Abuakwa," Universitas, 2 no.4 (1956): 109-111; and Anonymous, "History of Cocoa Cultivation in Ghana," T. G. F. 3 no.3 (August 1959): 88.

[7]Austin, Politics in Ghana (1964), 59-60.

[8]Colonial Office. Disturbances in the Gold Coast: 1948, 49; Masefield, Agriculture in the British Colonies (1950), 121-122.

[9]Austin, Politics in Ghana (1964), 59.

[10]Ibid., 60; and Young et al., Agricultural Politics in Ghana (1981), 169.

[11]Austin, Politics in Ghana (1964), 66.

[12]Ibid., 60; and Young et al., Agricultural Politics in Ghana (1981), 169.

[13]Austin, Politics in Ghana (1964), 61.

[14]Ibid., 63.

[15]Ibid.

[16]Ibid; and Dennis Austin, Ghana Observed (New York N.Y.: Africana Publishing Company, 1976), 14-15.

[17]Austin, Politics in Ghana (1964), 66.

[18]Miles, in Economic History of Africa and India, ed. Dewey and Hopkins, (1978), 164.

[19]The Farmers Associations first appeared in official colonial reports in 1914. See, Government of the Gold Coast. Report on the Eastern Province, 164-166.

[20]Ibid.

[21]Austin, Politics in Ghana (1964), 66.

[22]Sir Hugh Clifford, then Governor of Ghana, depicted the western educated Ghanaian professionals as:

> ...a self-selected and self-appointed congregation of educated gentlemen... whose eyes are fixed not upon African native history or tradition or policy, not upon their own tribal obligations and the duties to their natural rulers which immemorial custom imposed upon them, but upon political theories evolved by Europeans.

See, Thomas Hodgkin, African Political Parties (London: Penguin Books, 1961), 26. See also, A. Adu Boahen, African Perspectives on Colonialism (London: The John Hopkins University Press, 1983), 69-70.

[23]For further discussions on the Aborigines Rights Protection Society, see G. I. C. Eluwa, "Background to the Emergence of the National Congress of British West Africa," African Studies Review (Hereafter cited as A. S. R.) 14 no.2 (September 1971): 205-219.

[24]Miles, in Economic History of Africa and India, ed. Dewey and Hopkins, (1976), 169.

[25]The attitude of the colonial administration to the urban based Ghanaian nationalist politicians never changed. British administrative policy retained the traditional African administration over rural Ghana and buttressed European style of centralized government from the political nerve-center of Accra, complete with departmental branches at the regional levels.

Sir Lord Lugard was the first British colonial official to articulate the theoretical political formulation behind the policy of indirect rule in 1906-1912. This eventually appeared in print with the title, The Dual Mandate in Tropical Africa in 1921-1922. One historical source that has discussed this British colonial political framework is Bruce Fetter, Colonial Rule in Africa (Madison: University of Wisconsin Press, 1979), 96-98. See also, John E. Flint, "Frederick Lugard: The Making of an Autocrat: 1858-1943," in African Proconsuls: European Governors in Africa, ed. L. H. Gann and Peter Duignan, (New York N.Y.: The Free Press, 1978), 290-312.

For further discussions on the governance of Ghana under British rule, see Rudolf von Albertini, Decolonization: The Administration and Future of the Colonies, 1919-1960 (New York N.Y.: Africana Publishing Company, 1982), 124-133.

For the structure and dynamics of political administration in rural Ghana up to independence in 1957, see J. K. Nsarko, Local Government in Ghana (Accra: Ghana Universities Press, 1964), 4-17; for British West Africa as a whole, refer to Ronald Wraith, Local Administration in West Africa (New York, N. Y.: Africana Publishing Company, 1972), 166; and the author's Local Government in West Africa (New York, N. Y.: Alfred A. Praeger, 1976), 15-24 and 67-95.

[26]The term, "mass movement" is loosely defined and misused in the standard works on African politics. Urban populations in Britain's predominantly agricultural-oriented colonies were insignificant compared to the total aggregation of rural inhabitants. To summarily ascribe the term "mass movement" to urban settings while excluding rural inhabitants, obfuscates and invalidates the term altogether. There is an urgent need to revise the existing literature in order to place the role of rural political participation in the context of African decolonization process.

[27]Austin, Politics in Ghana (1964), 51.

[28]Dr. Joseph Boakye Kwame Kyeretwie Danquah was the John Stuart Mill scholar in the philosophy of mind and logic at the

University College of London and also a Panel Lecturer in Twi at the London School of Oriental and African Studies. He was also a Fellow of the Royal Society of Arts of the Inner Temple.

Dr. Danquah's numerous publications include, Gold Coast: Akan Laws and Customs and the Akim Abuakwa Constitution (London: George Routledge and Sons, 1928). This dealt with civil cases adjudicated in the royal house of Akim Abuakwa where he served as secretary to the Paramount Chief, Sir Nana Ofori Attah I, Dr. Danquah's half brother. This traditional chief decided cases according to African customary judicial processes under the dual mandate system of British colonial rule.

In 1944, Dr. Danquah came out with his, The Akan Doctrine of God - A Fragment of Gold Coast Ethics and Religion (London: Lutherworth Press, 1944). In the acknowledgment page, he wrote, "To the Founders of the University College, London, who facilitated the Endeavour of a Raw African to drink deep of the Pierian Spring."

Born on December 21, 1895, he died in detention without trial in February 1964 under his political opponent Kwame Nkrumah.

On 24 February, 1966, the military and the police ousted Nkrumah from the Presidency in a coup d'etat. The then ruling National Liberation Council accused the ex-president of corruption, subversion of sister African governments and the dissipation of Ghana's national wealth on unproductive prestigious projects. After his exit from power, Time magazine depicted Nkrumah as "the most pretentious, and noisiest" African politician who referred to himself with several titles such as "Redeemer" "His Messianic Dedication" et cetera. Nkrumah sought political asylum in Conakry the capital of the Franco-phone West African republic of Guinea. In April, 1972, he died of cancer in a hospital at Bucharest, Romania.

Meanwhile, the ruling military government rehabilitated Dr. Danquah's memory in a series of lectures organized at the University of Ghana under the rubric of "Danquah Memorial Lectures." In 1990, a bronze statue, of 350 centimeters, was erected to his memory under the military regime of Flight Lieutenant John Jerry Rawlings. See, Home Front: Ghanaian News and Views, 10 no.1 (January 1991): 20.

The author, Francis K. Danquah has no relationship with

Dr. J. B. Danquah.

[29]Ibid., 61.

[30]Ibid.

[31]Ibid.

[32]These rumors probably stemmed from British colonial moves to develop cacao plantations in the Far East after the Second World War when the Swollen Shoot virus had made considerable inroads into Ghana's cacao economy. Reports on these issues are available in Anonymous, "Prospects for Cocoa in the South Pacific," W. C. (October 1953): 393-398.

The problem of cacao under-production and supplies to European manufacturing concerns attracted top priority attention in a series of conferences held in London after World War II. See for example, Anonymous, "Disease Problem Overshadows Cocoa Industry Conference," W. C. (November 1949): 93-116; the same agricultural magazine ran an extensive editorial coverage on the issue, see "Editorial Comment," W. C. (November 1949): 93.

Further references to post-war cacao shortage in the same magazine appeared in subsequent issues as follows: Anonymous, "The 1951 Cocoa Conference," W. C. (November 1951): 419-424; Anonymous, "West African Cocoa," W. C. (November 1951): 415-416; Anonymous, "Cocoa - The Present Situation," W. C. (December 1950): 496-497; and Anonymous, "Cocoa Problems," W. C. (June 1954): 219.

For a secondary source that dealt with the same theme, see Jerker Carlson, The Limits to Structural Change: A Comparative Study of Foreign Direct Investments in Liberia and Ghana: 1950-1971 (Uppsala: Scandinavian Institute of African Studies, 1981), 199.

[33]Dr. Danquah stated later before the 1948 Watson Committee of Enquiry that the government's scheme to eradicate the virus was "scientifically sound" but "politically inexpedient." See, Ministry of Agriculture. Cocoa Industry Division: 1960-1961, 10.

[34]Austin, Politics in Ghana (1964), 50-55.

[35]Bjorn Beckman, Organizing the Farmers. Cocoa Politics and National Development in Ghana (New York, N.Y.: Africana Publishing Company, 1976), 51-52.

[36]Austin, Politics in Ghana (1964), 66; Miles, in Economic History of Africa and India ed. Dewey and Hopkins (1978), 169; Young et al., Agricultural Politics in Ghana (1981), 165-167.

[37]Austin, Politics in Ghana (1964), 67-68; and Colonial Office. Report on the Gold Coast for 1948, 129-130.

[38]The anti-colonial rhetoric of African nationalists during and after decolonization represented colonial rule as an organized system of plunder and vicious exploitation that left nothing to chance. To most nationalists, the only positive development in European style imperialism was when it ended.
This perception arose because notwithstanding the European claim of bringing "civilization" to Africa, modernization programs were largely absent on the eve of independence. When available, these were restricted to European colonial urban bureaucrats in the colonies and to mining concessionaires.

Indeed, a special report issued on colonial Ghana by British academic statisticians from Oxford in 1952, stated candidly that:

> If we were forced to sum up the Gold Coast economy in one word, the word we would choose would be "fragile." A major economic weakness is that foreign exchange depends on cocoa. The demand for cocoa depends on taste and fashion, which may be temporary, and since it is a luxury, its price in the world's market is highly sensitive to changes in the prosperity of a few highly industrialized countries, notably the U. S. and U. K. Secondary industry is negligible. Virtually all manufactures except beer and furniture are imported.

The report continued:

> The whole value of Gold Coast output which in turn determines peoples' living standards and the rate of development, depends very largely on one commodity...It is moreover a commodity whose long run prospects are doubtful.

See, Dudley Seers and C. R. Ross, Report on the Financial and Physical Problems in the Gold Coast., (Accra, Gold Coast: Office of the Government Statistician, July 1952), 1-5.

Ghanaian nationalist politicians, particularly Kwame Nkrumah, capitalized on these perceived weaknesses in British rule. In electioneering campaigns, Nkrumah's Convention

Peoples Party issued proclamations that promised water supplies, health services, other public utilities and general infrastructural development when voted to office. See, for example, Convention Peoples Party. Manifesto for the General Election 1954 (Accra: Gold Coast, 1954), 5-14.

[39]Colonial Office. Annual Report on the Gold Coast for 1948, 125.

[40]Masefield, Agriculture in the British Colonies (1950), 121-122.

[41]Austin, Politics in Ghana (1964), 75.

42Ibid., 73.

[43]Colonial Office. Annual Report on the Gold Coast for 1948, 1-4.

[44]Colonial Office. Report on Disturbances in the Gold Coast: 1948, 5-6.

[45]Ibid., 50.

[46]Ibid., 48-49.

[47]Colonial Office. Annual Report for 1949, 152.

[48]Colonial Office. Report on Disturbances in the Gold Coast: 1948, 18.

[49]Ibid., 49.

[50]Ibid.

[51]Colonial Office. Report on the Gold Coast for 1949, 153; and Colonial Office. Report on Disturbances in the Gold Coast: 1948, 50-51.

[52]Ministry of Agriculture. Cocoa Division. 1960-1961, 10.

[53]Colonial Office. Report on the Gold Coast for 1949, 152, & 53-56; and Appendix IIA "Report of the Commission of Enquiry into the Swollen Shoot Disease of Cocoa in the Gold Coast," 169-173.

[54]Ibid.

[55]Colonial Office. Annual Report on the Gold Coast for

1949, 4.

[56]Ibid., 171.

[57]Ibid.

[58]Ibid., 4.

[59]Ibid.,

[60]G. H. Berkeley, W. Carter, and E. van Slogteren, Report of the Commission of Enquiry into the Swollen Shoot Disease of Cacao in the Gold Coast Colony, no.236 (London: Her Majesty's Stationery Stores, 1948), 1-10.

[61]Ibid.,9-10.

VII THE NATIONALIST GOVERNMENT AND THE POLITICS OF THE CACAO SWOLLEN SHOOT CONTROL

A major political fall out of the 1948 anti-colonial riots, was the creation in 1949 of the Convention's Peoples Party (C.P.P.). The C.P.P. was a splinter party of the United Gold Coast Convention. Kwame Nkrumah, the leader of the new political group, received a liberal arts education at Lincoln University in Pennsylvania, U.S.A., and later at the London School of Economics in the United Kingdom.[1] Both the C.P.P. and U.G.C.C. sought Ghanaian political autonomy. However, the more conservative U.G.C.C. required political emancipation, "within the shortest possible time," while the radical C.P.P. demanded "self government now."[2] In response to the 1948 political riots and subsequent political agitation, the colonial administration, held general elections in 1950 to establish a quasi-African government in Ghana, as a preliminary step to self rule in 1957.

Meanwhile, based on the findings of the 1948 Watson Committee of enquiry and the U.N.-appointed Swollen Shoot Commission, the colonial Legislative Council re-enacted the Swollen Shoot Disease of Cacao Control Regulations on December 12, 1949.[3] The farmers' opposition to a legislative instrument that required the destruction of their stock of capital and livelihood remained unaltered. In rural areas, the C.P.P. gained support from the farmers organizations.

Ashie Nikoi, a national leader of the farmers association, split from the conservative U.G.C.C. party to join the central committee of the Convention Peoples' Party. In December 1949, he and John Ayew, a farm organization activist, created the Ghana Farmers' Congress as a wing of the C.P.P.

The Farmers Congress complained that government-paid laborers, lacking any scientific training, had ruthlessly destroyed healthy cacao trees. The C.P.P. took up these complaints and secured recruits from among the cacao farming communities. Once the farmers accepted the radical nationalist party as the political expression of their own grievances, the popularity of the C.P.P. spread throughout southern Ghana. While Nkrumah's Convention Peoples' Party, mobilized support from farmers, fishermen, petty traders and wage earners, the U.G.C.C., an elitist nationalist movement, was the party for paramount chiefs, lawyers and other western educated professionals. To quote one source, "the United Gold Coast Convention was led by elder statesmen ... who were unwilling to enter the rough and tumble of politics."[4] By December of 1950, cacao farmers had agreed to sponsor candidates through the commoners' party, the C.P.P.

In preparation for the 1951 elections, the C.P.P. manifesto stated explicitly that, "Special Attention Will Be Given To the Swollen Shoot Disease." The U.G.C.C. manifesto by contrast, omitted any references to this virulent plant

disease and cacao farmers in general.[5] In the contest to elect African representatives to the Legislative Assembly in 1951, the farmers' wing of the C.P.P. proved a valuable political asset. In Akim-Abuakwa, Dr. Danquah's home district and political constituency, Ashie Nikoi mustered support from among the area's cacao farming community for C.P.P. candidates.[6] The Swollen Shoot issue still rankled farmers who still resented the destruction of their trees.

Cacao growers supported the C.P.P. because this party championed their interest. For example, in October 1950, when the C.P.P. addressed the Ghana Farmers Congress at Nkawkaw, in the Eastern Province, cacao farmers strongly condemned the cutting out policy and resolved to sponsor candidates to the Legislative Assembly through the Convention Peoples' Party. This party in turn, felt strengthened with the support of the farmers' associations.[7] In rural districts, the C.P.P. chose local farmers in primary elections. The U.G.C.C. on the other hand, failed to field candidates in rural areas. In the elections that followed, the C.P.P. won decisively with 34 out of 38 seats.[8]

Under a new constitution drafted in December 1950, and which became effective on January 1, 1951, the colonial legislature increased from 31 to 84. This, for the first time, represented the entire country, unlike the past when the colonial government separately administered the Gold Coast

Colony, Ashanti, The Trans-Volta Togoland and the Northern Territories. In the quasi-African government of 1951, Nkrumah, the pacesetter of the C.P.P. became the Leader of Government Business. Dr. Danquah served as the opposition leader in the newly created Legislative Assembly.[9]

The C.P.P. Policy on Swollen Shoot

In fulfillment of its 1950 electioneering promise, the Convention Peoples' Party addressed the Swollen Shoot issue. This was crucial because many of the C.P.P. party members entered the country's newly created National Assembly with a mandate from the farmers' constituency to "safeguard" their cacao plantations from the Department of Agriculture.[10] Farmers' discontent against the disease was still active in many villages during the early months of 1951 in the devastated area of the Eastern Province such as Osiem, Osino, Bosuso and Suhien. At the start of January 1951, "the situation had reached ominous proportions and farmers began physically to interfere with personnel of the Department engaged in disease control operations in the field."[11] The farmers wanted the entire cutting out program terminated altogether. By April 1951, opposition to the Swollen Shoot disease control operations was violent.[12]

On 3 April 1951, Ghana's Minister of Agriculture and Natural Resources, Archie Casely-Hayford, stated before the

Legislative Assembly that the quasi-African government would review the cutting out program. The nationalist government, in the interim, suspended the cutting out operations in the cacao belt for a month to enable a commission of enquiry to re-examine the disease control policy.[13] It is interesting that once in power the nationalist government under Nkrumah resorted to the colonial expediency of committees of enquiry to prepare public opinion to accept hard political choices of national importance.

In mid-April, the Minister of Agriculture, Archie Casely Hayford, appointed a commission of enquiry to review the, "Existing Organization and Methods for the Control of the Swollen Shoot Disease by the Compulsory Cutting Out of Infected Cacao Trees."[14] Justice K. Arko Korsah, chaired the committee. Ashie Nikoi, the leader of the Ghana Farmers Congress, and J. O. Torto, educated at the U.C.L.A. in the United States and with much experience in cacao virus control, also served on the committee.

The committee conducted its investigations from 12 April 1951 to 17 May 1951. During its deliberations, the Korsah Commission held 14 public meetings at eleven urban and rural capitals. Some of these places were Accra, Koforidua, Nkawkaw, Kumasi, Bibiani, Sunyani, Bechem, Suhum, Adeiso, Swedru and Chito. The public sessions aimed to encourage interested persons to place their views and grievances before

the committee. The Korsah committee, an all Ghanaian investigative body, took evidence from the Ministry of Agriculture, the Cacao Rehabilitation Department and 153 members of the public. The majority of those who testified were either farmers or representatives of the farmers' organizations. The Korsah Committee also obtained evidence from Dr. J. B. Danquah at a private sitting in Accra because of his legal and political experience with farmers grievances over the issue of Swollen Shoot.[15]

Based on the evidence before it, the Korsah commission reported considerable opposition to the mandatory destruction of diseased trees and threats of violence against enforcement personnel from the Ministry of Agriculture. The committee submitted further that most farmers were not knowledgeable about the Swollen Shoot virus and were unwilling to accept any scientific explanations about how to control it. The farmers had indicated before the committee that alternative forest trees which harbored the virus should be removed but not the cacao.[16]

The committee affirmed also that farmers opposed the cutting out order because the agricultural staff were ruthless when enforcing the policy. The use of police officers to compel obedience to the destruction of diseased trees and the arrest and conviction of recalcitrant farmers had damaged relations between cultivators and the disease control staff.

The farmers complained that while the government used the native authorities to implement the Swollen Shoot ordinance, they never worked through the farmers' unions and chief farmers in various districts. Worst of all, the farmers lacked confidence in the agricultural survey officers because they were not qualified agriculturists.[17]

The Ministry of Agriculture came under fire for cutting out cacao that still carried pods. Most agricultural officers, according to the farmers, could barely recognize and identify virus-infected trees. This fact significantly contributed to the indiscriminate destruction of trees. Again, compensation payments for treated farms were unsatisfactory to most farmers. The majority of cacao growers demanded restitution at the rate of ten shillings per tree. Others completely rejected the cut out procedures and wanted no ex gratia payments.[18]

Farmers opposed the spending habits of the agencies which controlled the plant virus epidemic. First, the Cacao Rehabilitation Department controlled diseases in the Special Area because of the extensive devastation of trees there. The Department of Agriculture on the other hand, held jurisdiction over the General Area, which encompassed the rest of the cacao belt.[19] But instead of disease control, the Cacao Rehabilitation Division disbursed £120,000 on bungalows for their officers, £17,000 on road construction and £34,000 on

road-building machinery. As the Korsah Committee observed, "The farmers found it difficult to believe that the activities of these officers contributed to the farmers' benefit [and] who also operated under compulsory powers."[20] Essentially, farmers refused to co-operate with the Cacao Rehabilitation Department, partly for such reasons. On the other hand, without the cooperation of the cultivators, past and future strategies to curb the Swollen Shoot menace would be unworkable.

The committee criticized the colonial government's approach of forceful entry into farmers' lands to compel obedience to the disease control ordinance. Farmers who testified before the committee had threatened violence against anyone who might attempt to enforce the cut out order in their plantations. To defuse these grievances, the Korsah Committee recommended the abolition of the Cacao Rehabilitation Department and the placement of the Swollen Shoot control schemes under the Ministry of Agriculture.

Notwithstanding the recommendations of the Watson and U. N. Swollen Shoot Commissions, the Korsah committee counter-argued that in practice, "compulsory cutting out was so unpopular and so infuriating to the farmers that if the policy... were to be pursued further, there would be general unrest and possibly public disturbances in the country."[21] The committee added though, that while some farmers accepted

cutting out, "the preponderance of opinion was against cutting out in any form. Cutting out was a drastic method of control and under any circumstances, it would be unpopular among those who lost their trees." On that account, the Korsah committee counselled the revision of the existing methods of enforcing the Swollen Shoot ordinance to forestall more public disturbances in the country.[22] The method of forced removal of the affected trees should be re-structured to seek the farmers' co-operation.

The Korsah committee also recommended a central advisory board consisting of the Minister of Agriculture and Natural Resources, the director of WACRI and a representative of the cacao farmers to advise the government on how best to control the plant virus disease. Above all, the central advisory board would also give the farmers a voice in policy formulation on agriculture. The government on the other hand, should communicate information from this body through its regional branches to farmers association, the representative body of the farmers.[23]

Meanwhile, to maintain good relations with the farmers, agricultural officers should defer the cutting out exercise to the post-harvest season. The Korsah committee counselled that rapport between agricultural officers and cacao growers would be possible if the government selected agricultural liaison officers in consultation with the farmers. Moreover, the

Ministry of Agriculture should disburse ex gratia payments only after farmers had rehabilitated their treated cacao farms. In that respect, replanting should be spaced at 5 x 5 feet for Amelonado cacao, and 8 x 8 feet for the fast-yielding Amazonia variety. Canthium species and Cola Chlamydantha must be absent from rehabilitated fields since they might potentially harbor and disperse the Swollen Shoot virus. In a radio broadcast to the nation on 25 April 1951, Justice Korsah, the chairman of the committee stated that cacao was not a matter for political controversy and that all should help to overcome the difficulties.[24]

The New Deal for Cacao Policy

Based on the report of the Korsah committee, the quasi-African government abolished the Cacao Rehabilitation Department in 1951, and placed its operations under the Ministry of Agriculture. This ministry, became solely responsible for the control of cacao diseases and the payment of replanting grants to affected farmers.[25]

The C.P.P. administration also instituted the New Deal for Cacao policy. Kwame Nkrumah, then the Leader of Government Business, enunciated his New Cacao Deal policy in a radio broadcast to the nation on 28 June 1951.[26] The C.P.P. administration would pay ten, instead of two shillings for each cacao tree removed, with the proviso that the grant-

recipient farmer should rehabilitate his field. By implication, farmers' would receive two shillings per tree annually until their re-planted trees started to bear fruit.

The New Deal grants did not apply in the areas of mass infection or devastated areas in the Eastern Region. Areas deemed to lie beyond repair, were specified as the Akwapim hills, Nsawam, Krobo-Odumasi, Huhunya, western Tafo, Bosuso, Bunso, Amanfrom and Adeiso, but not Asamankese and Kibi.[27] The New Deal grant payments went into effect on 1 September 1951. Convinced that the cut out program was the only solution to the Swollen Shoot virus, the C.P.P. administration used local party functionaries and Community Development teams to persuade farmers to accept the compulsory destruction of their infected trees. The policy to cut out infected cacao was partly situational. During the temporary cessation of control, the plant virus epidemic gained ground.[28]

The problem of losing the main revenue base for the state if the virus was left unchecked was ever present. Historically, cacao had represented over 90 percent of Ghana's agricultural exports and 63 percent of domestic production.[29] After the war, the crop's value had shrank to two-thirds of its pre-war worth.[30] If the Swollen Shoot could be contained, Ghana's major source of export revenue would be assured. This was crucial especially when post-war demand for cacao was high. An increased world demand coupled with poor crop

prospects, had propelled prices to average £402 per ton from 1946 to 1954.[31]

For introducing the New Deal for Cacao policy, the C.P.P. drew criticism for condemning the cutting out policy initially, only to pursue the same measures when the party assumed power in 1951.[32] In his autobiography, Nkrumah, the leader of the Convention Peoples Party government, explained his predicament over the problem. As he put it:

> [a] matter that called for careful handling but for definite action was the Swollen Shoot disease that was attacking cacao trees in the country. The disease...was threatening the future of our cacao crop, the country's most valuable export.[33]

Referring to the findings and recommendations of the Korsah Committee of Enquiry, Nkrumah, the Leader of Government Business added:

> Investigations into the matter confirmed my former fears that the only solution was to cut down the affected trees. I knew the farmers would kick against this for they could not understand that although the cacao trees were said to be infected with Swollen Shoot, they still produced apparently healthy pods.
> It was difficult to convince them that in a few years time the whole of their crop would fail.[34]

The New Deal policy for cacao was urgently needed. Otherwise, it was conjectured, Ghana's cacao economy would eventually suffer a precipitous decline. Nkrumah's decision to remove diseased cacao trees, reflected considerations best recapitulated in this quote:

> This cacao problem is not a sectional nor merely a

> farmers' problem since the economic life of the Gold Coast is at stake. The Swollen Shoot issue is really the prime test of the ability of African leaders to shoulder political responsibility.[35]

The resolution of these political obstacles to the eradication of the cacao pathogens in the forest belt enabled the Ministry of Agriculture to fully implement the recommendations of the West African Cacao Research Institute in Ghana. After intensive scientific investigations into the causation and dynamics of the Capsid, Black Pod and Swollen Shoot cacao diseases, WACRI advocated the use of the chemical D. D. T. against Capsid insects.[36] Fungicidal trials against the Black Pod disease proved ineffectual because they were costly and demanded the confluence of several variable elements to achieve results.[37] The standard procedure on Swollen Shoot control was to cut out infected trees and those surrounding them.[38] The use of disease resistant seedlings, early bearing and high yielding cacao progenies also figured highly in WACRI's recommendations to Ghana's Cacao Division on how best to cope with cacao pathogens in Ghana.[39]

These then were the major determinants of the nationalist policies towards the vexed issue of containing the Swollen Shoot virus in Ghana's forest belt up to 1951. The anti-Capsid spraying schemes and the cutting out policies and their results from 1952 to 1966, are analyzed in the subsequent chapters.

Endnotes

[1]The New Africans, ed. Sidney Taylor, (New York: G.P. Putnam's Sons 1967), 178; J. Ayo Langley, Ideologies of Liberation in Black Africa: 1856-1970 (London: Rex Collins Limited, 1979), 592.

[2]David E. Apter, "Ghana," in Political Parties and National Integration in Tropical Africa, ed. James S. Coleman (Berkeley and Los Angeles: University of California, 1964), 271.

[3]On 12 December, 1949, the colonial legislative council passed the motion spelt out in the text that follows:

> That in view of the increasingly widespread appreciation throughout the country of the threat to its economy represented by the Swollen Shoot disease of cacao, in view of the rate at which the disease is spreading, and in view of the finding of the Commission of Scientists that the cutting out of infected trees is the only available remedy, this council welcomes the policy of Government that immediately after the collection of the current main crop, The Swollen Shoot of Disease (Control) Regulations, 1946, should be enforced in all areas. See, G.G.C.D.A: 1948., 10.

[4]Dennis Austin, Politics in Ghana: 1946-1960 (London: Oxford University Press, 1964), 144.

[5]Ibid., 130.

[6]Ibid., 145.

[7]Bjorn Beckman, Organizing the Farmers: Cocoa Politics and National Development in Ghana (New York, New York: Africana Publishing Company, A Division of Holmes and Meir Publishing Incorporated, 1976), 54.

[8]Austin, Politics in Ghana (1964), 140.

[9]Apter, in Political Parties, ed. Coleman (1964), 274.

[10]The December 1950 constitution went into effect on 1 January, 1951. The colonial Legislative Council changed to the Legislative Assembly. Its membership increased from 31 to 84 representing the Gold Coast Colony, the British Mandated

Trans-Volta Togoland and the Northern Territories for the first time in Ghanaian colonial history. The Department of Agriculture became the Ministry of Agriculture. See, Colonial Office, Annual Reports Gold Coast (London: H.M.S.O., 1950), 3.

[11]Austin, Politics in Ghana (1964), 159.

[12]Ghana Government: Ministry of Food and Agriculture. Cocoa Industries Division - Miscellaneous Information, 1960-1961 (Cyclostyled) (Hereafter cited as Ghana Government: Cocoa Industries Division.) Available at the Land Tenure Center, University of Wisconsin at Madison.) 20.

[13]Ibid.

[14]Ibid., 13.

[15]Government of the Gold Coast: Committee of Enquiry into the Existing Organization and Methods for the Control of Swollen Shoot Disease by the Compulsory of Infected Cocoa Trees Report, (Hereafter cited as Infected Cocoa Trees Report). (Gold Coast: Government Printer, 1951), 159.

[16]Ghana Government: Cocoa Industries Division, (1961), 14.

The farmers generally confused the Capsid menace with the effects of the Swollen Shoot virus. Scientifically, however, both plant disease types demanded different cures.

[17]Ibid., 15-18.

The use of legal and physical coercion appears typical throughout the rest of continental Africa under colonial rule. Dennis M. P. McCarthy, an academic, in a study of legal impositions under colonialism has shown that, "The European partition of much of Africa, worked out during the 1880s and 1890s, originated in force, took hold by force, and inaugurated a formal colonial period dominated by force."

The same author wrote, "...all colonial pronouncements rested on the continuous underwriting of physical force...In its core meaning legal imposition refers to situations in which people have to deal with rules that they themselves did not originate." See, Dennis M. P. McCarthy, "The Bureaucratic Manipulation of Indigenous Business: A Comparative Study in Legal Imposition from Colonial Africa," Business and Economic History 19 (1990): 123.

[18]Ibid., 14-15.

[19]Ibid.

[20]This attitude and approach towards the disbursement of government funds has persisted to the present. As one Ghanaian journalist reported in a London based African magazine, "...in an agricultural budget, adequate funds were made available for bungalows and vehicles for senior staff and feeder road construction but little was left behind for farm inputs." See, Cudjoe Kpor, "Need for Planning," West Africa (London: 18-24 March, 1991): 394-395.

[21]Ghana Government: Cocoa Industries Division (1961), 15.

[22]Austin, Politics in Ghana (1964), 16.

[23]Ghana Government: Cocoa Industries Division (1964), 16

[24]Ibid., 20-23.

[25]Gold Coast : Development Progress Report. 1 April 1952-31 March, 1953 (Hereafter cited as Gold Coast : Development Progress Report) (Accra, Gold Coast: Printed by the Government Printing Department, 1953), 2.

[26]Bourret, Ghana: 1919-1957 (1960), 206-207.

[27]Ghana Government: Cocoa Industries Division (1961), 19-20.

[28]Michael Dei Anang, Ghana Resurgent (Accra: Waterville Publishing House & the Camelot Press Limited, London, 1964), 149-150; and Jerker Carlson, The Limits to Structural Change: A Comparative Study of Foreign Direct Investments in Liberia and Ghana: 1950-1971 (Uppsala: Scandinavian Institute of African Studies, 1981), 199.

[29]Colonial Office: Report of the Commission of Enquiry into the Disturbances of the Gold Coast (Hereafter cited as Colonial Office: Report on the Disturbances). (London: H.M.S.O. 1948), 18-19.

[30]Gold Coast: Economic Survey, 1953 (Accra, Gold Coast: Issued by the Ministry of Finance, Government Printing Department, February 1954), 151.

[31]Ibid.

[32]Bankole Timothy, Kwame Nkrumah, His Rise to Power (Evanston, Illinois: Northwestern University Press, 1963),

153; David Rooney, Kwame Nkrumah: The Political Kingdom in the Third World (New York: St. Martin Press, 1988), 89; and Tawia Adamafio, By Nkrumah's Side: the Labour and the Wounds (Accra: West Coast Publishing Press and Rex Collins, London, 1982), 89.

[33]Kwame Nkrumah, Ghana: The Autobiography of Kwame Nkrumah (New York and Toronto: Thomas Nelson and Sons, 1957), 151.

[34]Ibid.

[35]Colonial Office: Report on the Disturbances (1948), 51.

[36]Insect depredations during and after World War II were global in scope. In 1943, President Roosevelt of the United States convened a conference of 43 nations and called for the increased use of science and technology to reduce the impact of plant diseases. See, A. Ramsay Tainh, "Gross National Waste," W. C. (June 1965): 52.; and A. A. Adamson, "The Geographical Distribution of Insects Pests," T. A. 18 no.3 (1941-1942): 43-47.

In Ghana, entomologists conducted several field surveys to map out the extent and location of Capsid bugs preparatory to treatment and control. See, for example, G. Williams, "Field Observations on the Cacao Mirids, Sahlbergella Singularis Hagl. and Distantiella Theobroma (Dist.) in the Gold Coast. Part I. Mirid Damage," B. E. R., 45 no.4 (December 1954): 723-743.

The Capsid menace was the subject of intensive and extensive laboratory and field experiments at WACRI. In 1950, the Institute noted that cacao was most susceptible to insect attacks when flushing and that Capsids were most destructive at this time. See, M. Greenwood and A. F. Posnette, "The Growth Flushes of Cacao," Journal of Horticultural Science (Hereafter cited as J. H. S.) 25 no.3 (April 1950): 164.

Capsid attacks usually tended to destroy the plant's foliage. To protect themselves, the plants responded to Capsid attacks by flushing. This natural reaction diverts vital nutrient materials away from the fruits, which when young, may generate considerable fruit wilt. The subject of cherelle wilt is more complex and controversial. Lack of soil nutrients and moisture destroy the budding fruits or pods. Capsid attacks under such circumstances tend to do irreparable damage to the tree. For studies on the subject, see, E. C. Humphries, "Wilt of Cacao Fruits (Theobroma Cacao) an Investigation into the Causes," Annals of Botany (hereafter

cited as A. B.) N.S. no.25 (January 1943):31-45 ; E. C. Humphries, "Wilt of Cacao Fruits, (Theobroma Cacao)" A. B. N.S. 7 no.25 (January 1943): 45-61; A. D. McKelvie, "Cherelle Wilt of Cacao," Journal of Experimental Botany (Hereafter cited as J. E. B.) 7 no.20 (June 1956): 252-263; R. Nichols, "Xylem Occlusions in the Fruit of Cacao (Theobroma Cacao) and their Relation to Cherelle Wilt," A. B. N.S. 29 no.114 (1965): 181-203; R. Nichols, Studies of Fruit Development in Relation to Cherelle Wilt," A. B. 28 no.112 (1964): 619-634.

When cherelles wilt, the husk of the cacao pod breaks down and the bean mass rots. See, Entwistle, "Insect Pests of Cocoa," in Cocoa, ed. Wood and Laas (1985), 168.

When soils are deficient in nutrients, they can delay the regeneration of the cacao tree after Capsid attacks. See WACRI Report for 1946-1947, 30.

The destruction of Capsid insects depended upon the factors that determined their peak populations. Since this information would indicate the best period in the year to suppress Capsids with chemicals, entomologists at WACRI systematically researched the problem between 1945 and 1947. The insect's life-cycle was one pertinent determinant of Capsid population growth. In 1946-1957, WACRI indicated that Capsid populations normally reached a peak period during November and January. Because the insects cannot withstand the rains, their population declined with the onset of the rainy season in April and August. See WACRI Report for 1944, 25. See also, D. G. Gibbs, A. D. Picket and Dennis Leston, "Seasonal Population Changes in Cocoa Capsids, (Hemiptera, Miridae) in Ghana," B. E. R. 58 no.2 (November 1968): 279-293; P. B. Cornwell, "An Investigation into the Effect of Cultural Conditions on Populations of the Vectors of Virus Diseases of Cacao in Ghana with an Evaluation of Seasonal Trends," B. E. R. 48 no.2 (June 1957): 375-396.

Capsid population increases also depended upon food supply, which are generally fresh leaves. A breach in canopy increased light intensity in the plantation. More light usually occasioned a corresponding increase in leaf flushes. This latter factor in turn accentuated Capsid build up because the bugs fed on the fresh shoots. See, for example, WACRI Report for 1955-1956, 38.

Capsid population studies have been valuable. The information have helped to assess the types and timing of insecticidal control to achieve maximum effect and economy. The recommended spraying practice is two double applications

of the chemical B.H.C. each year. The two sprays are administered in June and then again in November and December. In theory, the first spray destroys nymphs and adult Capsids. The second kills Capsids which have emerged from eggs that were present during the first spraying. The June and July applications are timed to coincide with the beginnings of population increases. Those of November and December cover the period of maximum population development. See WACRI Conference 1953, 88-89 & 61.

The chemical, D.D.T was the most successful insecticide under Ghanaian ecological conditions. For a discussion of its origins and use in Ghana, see, J. W. Munro, "D. D. T.": A New Insecticide," T. A. 21 no.3 (1944-1945): 19-20; Anonymous, "Two New Insecticides - D. D. T. and 666," T. A. no.6 (June 1945): 98-99; Anonymous, "The Chemical Control of Pests," 23-24 no.9 (1946-1947): 1-2; and WACRI Report for 1946-1947, 40. Over the years, however, Capsid pests have developed resistance to D. D. T. The impact of this chemical on the environment requires research.

One solution to the Capsid menace was biological control. Studies on insect predators of Capsid pests date back to the 1920s. See for example, D. S. Wilkinson, "On Two New Parasites from West Africa Bred from the Cacao Backsapper, (Sahlbergella)," B. E. R. 17 (July 1926-June 1927): 309-311; see also, Callan E. McC., "Natural Enemies of the Cacao Thrips," B. E. R. 33-34 (1943): 287. This approach proved unworkable in Ghana.

[37]The financial loss due to Black Pod disease averaged about 10 percent of world cacao output or half a million tons per annum. See J. A. Spence, "Black Pod Diseases of Cocoa," A. A. B., 49 (1961): 723.

A survey of WACRI's experimental cacao farms over a two year period revealed an approximated 19-20 percent average crop loss to the disease in Ghana during the 1954-1955 and 1955-1956 crop seasons. Further discussions on this subject can be found in A. L. Wharton, "Black Pod and Minor Diseases," in Agriculture and Land Use in Ghana ed. J. Brian Wills, (Oxford: Ghana Ministry of Agriculture, 1962), 335-336.

Total loss to Black Pod in Ghana varied from farm to farm and from year to year because the severity of the disease depended upon climate and the size of the crop exposed to infection. An author who has discussed this issue is E. J. A. Asomaning, "Black Pod Disease," in Cocoa Production ed. Simmonds (1976), 172. See also, J. T. Dakwa, "The

Relationship Between Black Pod Incidence and the Weather in Ghana," Ghana Journal of Agricultural Science, (Hereafter cited as G.J.A.S.) 6 (1973): 97.

[38]The problem of plant virus diseases is not unique to Ghana. The existence of plant viruses was first deduced from research into tobacco plants in 1892. Up to 1942, viruses were elusive entities. They were deemed to be parasitic pathogens too tiny for microscopes to resolve. One farm scientist wrote, "Thus when we speak of a virus disease, we usually mean an infectious disease with an invisible cause." See, F. C. Bawden, "Plant Viruses and Virus Diseases," T. A. 21-22 no.5 (1944-1945): 89.

In the main, viruses debilitate and dwarf the host plant. Instead of being uniformly dark green, the leaves may bear spots and rings or patches of yellow or white coloration. The outline of the leaf becomes crinkled owing to deformation. The veins stand out because they lose the greenish material in-between them. The flowers change color and the stems suffer tumors or swellings. Some infected plants become carriers but remain symptomless. In the symptomless case, the plant may appear normal, a fact that makes detection difficult. In some others, the symptoms persist and become increasingly severe to the point of killing the plant outright. Overall, a virus equals or exceeds other disease agents in the degree to which they damage plants. See, G. Frolich and W. Rodewald, Pests and Diseases of Tropical Crops and their Control (Oxford, London: Pergamon Press Limited, 1970), 269.

Viruses observed up to 1944, appeared in the same chemical form as nucleo-proteins which contain nucleic acid. By means of the electron microscope viruses are now known to consist of ultra-microscopic, ultra-filterable discrete particles which biochemists have proven in some cases to consist of a nucleo-protein. The smallest viruses are about the size of molecules: Bawden, T. A. (1944-1945): 90-91.

Ghana has three virus complexes. These were classified as the Cacao Swollen Shoot Virus (C.S.S.V.); the Cacao Mottle Leaf Virus (C.M.L.V.) and the Cacao Necrosis Virus (C.N.V.). Some examples of the Swollen Shoot Virus exist outside West Africa. These are the Ceylon Cacao Virus (C.C.V.) and the Cacao Trinidad Virus. (C.T.V.). See, Frolich and Rodewald, Diseases of Tropical Crops (1970), 271-272; Thorold, Diseases of Cocoa (1975), 71-72.

Scholarly publications in scientific journals have

discussed and clarified the dynamics of this cacao plant virus in West Africa. See for example, T. W. Tinsley, "Strains of the Cacao Swollen Shoot Virus," WACRI: Report for 1952-1953, 7; D. W. Goodall, "Virus Diseases of Cacao in West Africa," Annals of Applied Biology, 36 no.4 (December 1949): 440-447; A. F. Posnette and J. McA. Todd, "Virus Diseases of Cacao in West Africa," A. B., 43 no.3 (September 1955): 433-453; A much simplified depiction of the Swollen Shoot problem in Ghana is available in: Anonymous, "A Brief Introduction to the Virus Disease of Cacao," T. G. F. 3 no.2 (May 1959): 63-65.

In the 1960s, some further discussion on the C.S.S.V. appeared in, T. W. Tinsley, "The Ecological Approach to Pest and Disease Problems of Cacao in West Africa," Tropical Science, (Hereafter cited as T. S.) 6 no.1 (1964): 38-46; and A. A. Brunt, "Some Properties of Cocoa Swollen Shoot Virus," Journal of General Microbiology, (Hereafter cited as J. G. M.) (1964): 303-309.

For a terminology of plant viruses, see: Maurice F. Welsh, "Terminology of Plant Virus Diseases," Canadian Journal of Botany (Hereafter cited as C. J. B.) 39 no.7 (November 1961): 1773-1780.

By 1953, some seventy virus strains had been studied by nomenclature and locality. The strains were also referred to as "type," "form," "strain," or "isolate." In West Africa, the virus is present in Sierra Leone, Liberia, Cote D'Ivoire, Ghana, Togo and Western Nigeria. But it is remarkably absent from the Cameroon, Fernando Po, Sao Tome, Gabon, Zaire and the Congo Republic which form part of the African rain forest. In recent years, the virus is present in Malaysia. Cacao estates in Java, Sabah and Sumatra as well as Venezuela have all experienced the disease: Adomako, O.A. (1987): 87. T. W. Tinsley, "The Strains of Cacao Swollen Shoot Virus Occurring in West Africa," WACRI Conference 1953, 20-21. See also, J. F. Longworth and J. M. Thresh, The Reaction of Different Cacao types to Infection with Swollen Shoot Virus," A. A. B., 52 no.3 (December 1963): 117-124.

Plant viruses do mutate. This means they are able to reconstitute themselves into various strains and biotypes. Some mutant strains are less virulent than the original virus or other biotypes: see, Frolich and Rodewald, Diseases of Tropical Crops, (1970), 270.

Conversely, plants differ in their ability to resist particular virus isolates. Induced or acquired immunity is known to occur in some plants: Frolich and Rodewald, Diseases

of Tropical Crops (1970), 270, and Waters, E. J. E. A. (1970): 97.

In 1940, it became clear that viruses do not invade non-living tissues because they are incapable of an independent existence. They survive inside a living plant from which they derive their sustenance and survival: Chatt, Chocolate Conscience (1911), 4. Viruses are transmitted naturally from one plant to another in one of several ways: by insect bites; through nematodes, by contact, by seed, through the soil or by vegetative propagation or grafting. However, transmission by seed or soil, though possible, is uncommon: Frolich and Rodewald, Diseases of Tropical Crops (1970), 270.

When transmitted by sucking insects, the virus multiplies at the point at which the tree is attacked. The insect vector acquires the virus when it feeds on the phloem. The insect is able to pass the virus through its body and to liberate it during feeding. Once in the plant's phloem, the virus moves at the rate of 152.4 centimeters an hour. However, the rate of movement depends on the type of plant and virus isolate. The virus travels through the phloem because the translocation stream carries it from tissue engaged in photosynthesis to regions of active growth where the symptoms first appear. Some viruses move into regions of food storage and utilization or where the plant transports organic food materials: see, for example, C. W. Bennett, "The Relation of Viruses to Plant Tissues," The Botanical Review (Hereafter cited as T. B. R.) 6 no.9 (September 1940): 27 and 467.

Different viruses may cause identical symptoms in the same host plant. Infected plants may be symptomless and yet be carriers of the virus. In an infected plant, a virus may be localized or become systemic and spread throughout the host. If localized, the symptoms appear generally in the form of vein-clearing. When the effect is systemic, the virus moves through a particular tissue such as the phloem and invade all parts of the plant: see Bennett, T. B. R. (1940): 427.

Viruses can grow and multiply inside the living cells of plants and animals: available in Frolich and Rodewald and Rodewald, Diseases of Tropical Crops (1970), 269.

Some of the viruses were extremely destructive. Others were of intermediate virulence and others were mild. Most of the virus strains were present in the Eastern region of Ghana where the Swollen Shoot disease originated. The most prominent and virulent virus was the New Juaben Strain. In

1947, Posnette confirmed that this biotype produced swellings in the stem and on the tap and lateral roots of the cacao tree. The isolate also induced vein clearing, red-vein or chlorotic banding on the leaf and mottling on the cacao pod. Although this isolate occurred elsewhere in West Africa, it has been most devastating in Ghana's Eastern Region. See, A. F. Posnette, "Virus diseases of Cacao in West Africa. I. Cacao Viruses 1A, 1B, 1C and 1D," A. A. B., 34 (1947): 388-401.

Dr. A. F. Posnette, who identified the virus nature of the Swollen Shoot disease in the pre-war and wartime years, continued his research into the problem after the war. His numerous publications on the topic included, A. F. Posnette, Virus Diseases of West Africa," A. A. B., 34 no.3 (September 1947): 388-401 and A. F. Posnette, "Virus Diseases in West Africa," A. A. B., 35 no.1 (march 1948): 53-63; A. F. Posnette and J. McA. Todd, "Virus Diseases of Cacao in West Africa. IX. Strain Variation and Interference in Virus A.," A. A. B. 43 (1955): 433-453. Supporting information on Posnette's work is available in G. K. Owusu, "A Suspected Virus From Soybean Infecting Cocoa Seedlings," Ghana Journal of Agricultural Science, (Hereafter cited as G. J. A. S.) 4 (1971): 201-204;

The original source of the Swollen Shoot virus complex were forest trees. Tests conducted in Ghana's forest belt between 1946 and 1954 revealed that the Bombax Buonopozense and Cola Acuminata trees developed virus-like symptoms when grafted to infected cacao. This information indicated that the virus originated from certain forest trees to infect the surrounding cacao plantations. The most probable trees were usually the ones the farmers left standing to provide shade and wind-breaks for the cacao seedlings. The virus spreads from these alternative forest trees to cacao plants and from one cacao tree to the next.

Literature on the dynamics and causation of the Swollen Shoot virus and vectors in the field are extensive. See for example, J. McA. Todd, "An Indigenous Source of Swollen Shoot Disease of Cacao," Nature 167 no.4258 (June 1951): 952-953. See also, J. E. Van Der Plank, "The Relation Between the Size of Fields and the Spread of Plant Disease into them," E. J. E. A. 17, no.67 (July 1949): 141-147; A. F. Posnette, N. F. Robertson, "Virus Diseases of Cacao in West Africa. V. Alternative Host Plants," A. A. B., 37 (1950): 229-240. A. F. Posnette, "Virus Diseases of Cacao in West Africa," A. A. B., 42 no.1 (February 1950): 229-240. A. F. Posnette, N. F. Robertson, and J. M. A Todd, "Virus Diseases of Cocoa in West Africa: V. Alternative Host Plants," Annals of Applied Biology, (Hereafter cited as A. A. B), 30 no.229 (1950): 52.

T. W. Tinsley, "The Ecology of Cacao Viruses. I: The Role of Wild Hosts in the Incidence of the Swollen Shoot Virus in West Africa," The Journal of Applied Ecology (Hereafter cited as J. A. E.), 8 no.2 (August 1971): 491-498; A. A. Brunt, and R. H. Kenten, "Mechanical Transmission of Cocoa Swollen Shoot Virus to and from Cocoa and other Hosts," A. A. B. 50 no.4 (December 1962): 749-754. See also, A. Attafuah and T. W. Tinsley, "Virus Diseases of Adansonia Digitata L. (Bombaceae) and their Relation to Cacao in Ghana," Annals of Applied Biology (Hereafter cited as A. A. Biol.) 46 no.1 (March 1958): 20-22. A. Attafuah and T. W. Tinsley, "Virus Diseases of Adansonia Digitata L. (Bombaceae) and their Relation to Cocoa in Ghana," A. A. B. 46 no.1 (1958): 20-21; and WACRI Report for 1954-1955, 31-32.

The Swollen Shoot virus is dependent upon vectors to disseminate the disease through the cacao plantations. Mealybugs, an insect species with short legs, generally carry the virus. Because they secrete honey dew, Cremastogarine ants in return for this food source, protect the mealy bug vectors by building carton tents over them. The tents renders them free from attacks from rainfall, sunshine, and predatory insects. For studies into this natural phenomena, refer to the following sources: P. F. Entwistle, "Mealybug in Relation to Cacao in Ghana, T. G. F. 2 no.2 (May 1958): 64-69; P. F. Entwistle, "Mealybug IV - Their Relationship to Swollen Shoot Disease in Ghana," T. G. F. 2 no.4 (November 1958): 129-133. A. H. Strickland, "The Entomology of Swollen Shoot of Cacao. II. The Bionomics and Ecology of the Species Involved," B. E. R. 42 no.3 (1951): 65-103. A. F. Posnette, "Virus Diseases of Cacao in West Africa. VII. Virus Transmission by Different Vector Species," A. A. B, 37 (1950): 378-384. P. F. Entwistle and J. F. Longworth, " The Relationship Between Cacao Viruses and their Vectors: the Feeding Behavior of Three Mealybugs (Homoptera Pseudococcidae) Species." A. A. B., 52 no.33 (December 1963): 387-391; and Frolich and Rodewald, Diseases of Tropical Crops (1970), 272; P. B. Cornwell, "Movements of Vectors of Virus Diseases of Cacao in Ghana," B. E. R., 51 no.1 (April 1960): 175-201; and Frolich and Rodewald, Diseases of Tropical Crops (1970), 271-272; and P. B. Cornwell, "Movements of the Vectors of Cacao in Ghana," B. E. R. 51 (April 1960):175-201. Report of the Sixth Commonwealth Entomological Conference:Congress Held in London 7-16 July 1954 (London: Commonwealth Institute of Entomology, 1954), 241-242; A. H. Strickland, "The Entomology of the Swollen Shoot of Cacao I: The Insect Species Involved With Notes on their Biology," B. E. R., 41 no.4 (April 1951): 726 and 740-742. See also, Cacao Research Institute Report for 1965-1968, 36. M. J. Way, "Mutualism Between Ants and Honeydew Producing

Homoptera," Annual Review of Entomology, (Hereafter cited as A. R. E.) 8 (1963): 307-337.

A comparative though different study of the same natural phenomenon in the United States is available in: Neal A. Weber, "The Neotropical Coccid-Tending Ants of the Genus Acropyga Roger, Annnals of the Entomological Society of America (Hereafter cited as A. E. S. A.) 37 no.1 (March 1944): 89-122.

The West African Cacao Research Institute resorted to Predatory insects to rid the cacao farms of mealybug vectors. This failed for sundry reasons. P. B. Cornwell, "Some Aspects of Mealybug Behavior in Relation to the Efficiency of Measures for the Control of Virus Diseases of Cacao in the Gold Coast," B. E. R., 47 no.1 (March 1956): 137-166.

The wind is a vector carried mealybugs from one section of the farm to another. An interesting discussion of this factor is available in, P. B. Cornwell, "Movements of Vectors of Virus Diseases of Cacao in Ghana. II. Wind Movements and Aerial Dispersal," B. E. R. 51 no.1 (April 1960): 197-198.

For the organizational structure and discussion of the field experiments that validated the Institute's research findings, see O. J. Voelcker, "West African Cacao Research: Field Experiments," Empire Journal of Experimental Agriculture, 16 no.64 (October 1948): 241-248.

The West African Cacao Research Institute abandoned its international stature in 1961. It became known as the Cacao Research Institute of Ghana, operating under the Ghana Academy of Arts and Sciences. Its annual bulletins were renamed The Cacao Research Institute.

Since the mealybugs themselves were dependent upon a special ant species to move them from one spot to another and for protection, the destruction of these protective ants, it was thought, would facilitate the elimination of the virus. See, A. D. Hanna, E. Judenko and W. Heatherington, "The Control of Cremastogasterine Ants as a Means of Controlling the Mealybugs in the Gold Coast," B. E. R., 47 no.2 (July 1956):219-226. WACRI Report for 1949-1950, See also, P. B. Cornwell, "Some aspects of Mealybug Behaviour in Relation to the Efficiency of Measures for the Control of Virus Diseases of Cacao in the Gold Coast," B. E. R. 47 no.1 (March 1956): 137-166.

Because of the unpopular nature of the cutting out

policy, systemic insecticides attracted considerable attention in laboratory and field experiments in the period under review. These chemicals could be applied through the roots and then translocated through the sap stream of the plant for the mealy bugs to ingest and perish. Some of the procedures pursued in the various trials in the 1950s are available in, John Nicol, "Systemic Insecticides and the Mealybug Vectors of the Swollen Shoot Virus of Cacao," Nature, 169 no.4290 (January 19 1952): 120; A. D. Hanna," Application of a Systemic Insecticide by Trunk Implantation to Control a Mealybug Vector of the Cacao Swollen Shoot Virus," Nature, 173 no.4407 (April 1954): 730-731: A. D. Hanna and W. Heatherington, "Arrest of the Swollen Shoot Virus of Cacao in the Gold Coast by Controlling the Mealybug Vectors with the Systemic Insecticide, Dimefox," A. A. B, 45 no.3 (September 1957): 473-481; and A. D. Hanna and W. Heatherington, "An Investigation into the Possible Control of the Mealybug Vectors of Cacao Swollen Shoot Virus by Trunk Implantation with Dimefox," B. E. R. 50 no.1 (March 1959): 209-224.

See also, A. D. Hanna, E. Judenko and W. Heatherinton, "Systemic Insecticides for the Control of Insects Transmitting the Swollen Shoot Virus Disease," B. E. R., 46 no.3 (October 1955): 669-710. J. S. Bowman and J. E. Casida, "Systemic Insecticides for Theobroma Cacao L. Their Translocation and Persistence in Foliage and Residues in Cacao Beans," Journal of Economic Entomology (Hereafter cited as J. E. E.) 51 no.6 (December 1958):773-780.

Like Capsid insect pests, WACRI attempted to introduce parasitic insects to destroy the insect vectors of the virus in Ghana. See, Report of the Sixth Commonwealth Entomological Conference. Commonwealth Institute of Entomology. 7-16 July 1954 (London 1954), 242. Further discussions of this natural phenomenon are available in Anonymous, "Parasitism of the Mealybug Vectors of Swollen Shoot of Cacao," Nature, 163 no.4133 (January 1949): 105-106; and V. B. Wigglesworth, "Biology and Insect Pest Control," SPAN, 5 no.3 (1962): 114-117.

An interesting experiment to control the mealybugs with fungi also occupied the attention of the West African Cacao Research Institute. See, S. Rojter, J. K. Bonney, and J. T. Legg, "Investigations into the Use of a Pathogenic Fungus (Cephalosphorum spp.) as a Means of Controlling the Mealybug (Pseudococcidae) Vectors of Swollen Shoot Virus in Ghana," Ghana Journal of Science, 6 (1966): 110-114.

For the technical aspects of how Capsid lesions aid the

transmission of the fungus Calonectria Rigidiuscula in cacao, see P. D. Turner, "Leaf and Stem Infections of Theobroma Cacao L. in West Africa Caused by Phytophthora Palmivora (Butl. Butl.). T. A. 37 no.4 (October 1960): 321; and A. A. F. Brunt and A. L. Wharton, "Etiology of a Gall Disease of Cocoa in Ghana Caused by Calonectria Rigidiuscula (Berk. & Br.) Sacc.," A. A. B., 49 no.4(December 1964): 723-734.

Phytophthora Palmivora often assumed the form of a weakly parasitic fungus in dry seasons to await the wet season for full nourishment and activity. This phenomenon renders it difficult to eliminate it from the forest environment. See, Harold Owen, "Cacao Pod Diseases in West Africa," A. A. B. 38 no.5 (September 1951): 716.

In 1960, WACRI discovered that the Palmivora fungus has 179 isolates in West Africa. About 57 of these came from Ghana: P. D. Turner, "Distribution of Strains of Phytophthora Palmivora from Theobroma Cacao in West Africa," F.A.O. Plant Protection Bulletin 8 no.5 (February 1960): 59; P. D. Turner," Complementary Isolates of Phytophthora Palmivora from Cacao and Rubber and their Taxonomy," Phytopathology 53 (March 1961): 161-164. For an earlier study of this subject, refer to, Anonymous, "Strains and Taxonomy of Phytophthora Palmivora Butler (P. Faberi Maubl.)," Transactions of the British Mycological Society (Hereafter cited as T. B. M. S.) 14 no.2-3 March 1929): 18-38; S. D. Crowdy, "Observations on the pathogenicity of Calonectria Rigidiuscula (Bekr. & Br.) Sacc. on Theobroma Cacao L.," A. A. B. (1956): 307-321.

In 1962, the Institute observed that cacao seedlings were prone to Black Pod infections. The occurrence of this disease in young plant's usually reduced the sapling's root absorbing capacity. Defoliation and a decrease in stem length arises. This eventually reduced the weight of the raw cacao bean and subsequently its price. For a discussion of this problem, see P. D. Turner and E. J. A. Asomaning, "Root Infection of Theobroma Cacao by Phytophthora Palmivora, T. A. 39 no.4 (October 1962): 339-343. The plant's ability to resist the fungus infection is discussed in: E. J. A. Asomaning, "Varietal Resistance of Young Clones and Seedlings of Cocoa (Theobroma Cacao L.) to Root Infection by Phytophthora Palmivora," T. A. 40-41 no.4 (1963-1964): 251-256.

WACRI later noted that the giant African snail Achatina Fulica transmitted Black Pod sporangia in its feces, which in turn caused root rot among cacao trees. Apart from the Achatina, a special ant species Cremastogarine ants also dispersed the disease. These insects usually extracted the

outer layer of infected pods on the tree to build their tents. By this means, the insects infect healthy pods with the disease. See H. C. Evans," Invertebrate Vectors of Phytophthora Palmivora Causing Black Pod Disease of Cacao in Ghana," A. A. B. 75 (1973): 322; and H. C. Evans, "Transmission of Phytophthora Pod Rot of Cocoa by Invertebrates," Nature 232 (July 30, 1971): 346-347.

For an earlier discussion of this problem, see Irving W. Bailey, "Some Relations Between Ants and Fungi," Ecology 1 no.2 (April 1920): 174-178. Fungal infections are mainly caused by air-borne sporangia: C. A. Thorold, "Airborne Dispersal of Phytophthora Palmivora Causing Black Pod of Theobroma Cacao," Nature 170 no.4330 (October 1952): 718-719.

During trial experiments at WACRI in 1961-2, Perenox, Carbide-Bourdeaux and Bourdeaux mixture were the most effective fungicides. For a comparative study of fungicidal trials, refer to C. A. Thorold, "Observations of Fungicide Control of Witches Broom, Black Pod and Pink Disease of Theobroma Cacao," A. A. B 40 no.21 (June 1953): 362-376. See also, J. Bowden," Responses of Cocoa to Copper Sprays in Ghana," T. A. (October 1961): 325-343; and J. A. R. McClean, "Some Chemical Aspects of "Black Pod" Disease in West African Amelonado Cacao," E. J. E. A., 21 no.84 (1953): 340-349.

Like Capsid pest diseases, WACRI attempted to use fungus resistant cacao progenies in Ghana as the solution to the Phytophthora Palmivora and other fungal pathogens, see, John A. Spence, "Probable Mechanisms of Resistance of Cocoa to Black Pod Disease Caused by Phytophthora Palmivora (Butl.) Butl.," Nature 125 no.192 (October 1961): 278.

[39]Another device meant to resist Capsid attacks was the recourse to disease resistant cacao progenies. See for example, A. F. Posnette, "Resistance of Theobroma Cacao," B. E. R. 53 no.1 (December 1942): 214 and R. E. D. Baker, "The Botanical Programme," A Report on Cacao Research, 1945-1951, (Augustine, Trinidad: British West Indies, September 1953): 10-11; and Anonymous, Resistance of Plants to Insect Attack," T. A., 18 no.12 (December 1941): 229-231. See also, E. E. Cheeseman, "Recent Botanical Researches in Cacao," E. J. E. A., 19 no.76 (October 1951): 242-252. The botanical program also made possible the hybridization of high yielding and disease resistant Amazonia cacao progenies in Ghana to rehabilitate the cacao industry.

The use of virus resistant cacao progenies formed part of the devices employed in trial runs on virus control. See,

Anonymous, "Studies on Resistance and Tolerance to Cocoa Viruses in Ghana," A. A. B. 56 no.1 (1965): 219-225.

The initial attempts to develop cacao progenies occurred in the wartime period under the directives of Dr. A. F. Posnette, the virologist who first identified the virus nature of the Swollen Shoot disease. See, for example, A. F. Posnette, " Cacao Selection in the Gold Coast," T. A., 20 no.8 (1942): 149-153; for further discussions on the earlier aspects of the study outside of Ghana, see W. C. Price, "Acquired Immunity from Plant Virus Diseases," The Quarterly Review of Biology, 15 no.3 (September 1940): 339-359; J. F. Longworth and J. M. Thresh, "The Reaction of different Cacao Types to Infection with Swollen shoot Virus," A. A. B. 52 (1963): 117, 122 and 123; WACRI Report for 1945-1946, 17.

See also, A. F. Posnette, "Progeny Trial With Cacao in the Gold Coast," E. J. E. A., 19 no.76 (1951): 242-251; Alex Attafuah,and D. R. Glendinning, "Studies on Resistance and Tolerance to Cocoa Viruses in Ghana," A. A. B., 56 no.1 (March 1965): 227-230; and R. Knight and H. H. Rogers, "Recent Introductions of Theobroma Cacao and Related Species," E. J. E. A., 23 no.90 (1955): 113-125. T. A. Russell, "The Vigor of Some Cocoa Hybrids," T. A., 27-29 (1950-1952): 102-106.

VIII THE ORGANIZATION AND TREATMENT OF THE CAPSID, BLACK POD, AND SWOLLEN SHOOT DISEASES IN GHANAIAN CACAO FARMS, 1952-1965

Between 1952 and 1965, Ghana's Ministry of Agriculture implemented WACRI's recommendations on disease control with remarkable intensity in the rain forest. The economic necessity for these measures were clear. The crop averaged 90 percent of the country's farm exports and accounted for two-thirds of domestic farm production.[1] Specifically in 1948, cacao amounted to 70 percent of the total value of commodities exported from Ghana and about 92 percent of farm exports.[2] Such was the seriousness of the government's disease eradication exercise that the entire operation became, "The biggest plant disease control campaign undertaken anywhere in the world."[3]

The Ghana government, through its Ministry of Agriculture and the Cacao Marketing Board, organized the Swollen Shoot and anti-Capsid disease control ventures throughout the cacao belt. The state also funded extension stations and provided farmers with a variety of services and information on disease control. The role of Ghana's Public Relations Department and Information Services along with those of the Community and Social Welfare Department were no less significant. The government of Ghana established an insecticidal factory and directly subsidized disease control inputs like chemicals and

sprayers. Farmers in addition, received high-yielding and early bearing cacao planting stock from state sponsored agricultural stations. Each of these measures entailed substantial effort.

The Administrative Aspects of Disease Control

The Ministry of Agriculture administered the overall cacao disease control project. The endeavor to extirpate cacao pathogens involved several state institutions and farm agencies in Ghana. Prominent among these were WACRI, the extension services of the Ministry of Agriculture, the Public Relations Department, the Ministries of Information and that of the Social Welfare and Community Development. In the Agricultural Ministry, the divisions of Cacao Disease Control and Rehabilitation (Cacao Division) and Soil Survey, directly implemented diverse strategies to combat the Capsid, Black Pod and Swollen Shoot pathogens in Ghana.[4]

The Deputy Director of Agriculture, stationed at Accra, headed the Cacao Division. The Deputy Director had two assistants, one of whom worked at the headquarters at Accra. The other assistant, stationed at the Bunso agricultural station in the Eastern Region, trained agricultural staff to execute the disease campaign in the field. This training emphasized cacao agronomy. The trainees maintained close links between the Ministry of Agriculture and the West African Cacao Re-

search Institute.[5] In 1950, the Agricultural Ministry established a training schedule at Bunso to instruct staff in all aspects of cacao farming. The duration of Agricultural Survey Officers' Course was three months. On the other hand courses in Swollen Shoot control, Drawing Office Assistants and cartographical draughtsmanship ranged from four to six months. These latter study programs were needed because ex gratia payments under the revised grant payment scheme was based on assessment of acreage. The Agricultural Ministry also trained Field Assistants in cacao agronomy for two months to deal with cacao hybrid trials. A grant payment personnel operated as a special unit within the Ministry of Agriculture. A chief accountant based at Accra, headed this accounting section and disbursed payment to farmers who lost their trees during the treatment of the Swollen Shoot virus.

Ghana, in the period under review, had forty agricultural districts in eight regions to implement important farm projects. The Ministry of Agriculture and a special agency, the National Agricultural Council and its district chapters, planned farm policy. Each region had a team of extension officers who advised farmers in each district down to the village level.[6] The Cacao Division focused much of its work in the forest belt where Ghana's cacao is located.

To rehabilitate the country's cacao plantations, the Agricultural Ministry surveyed cacao soils in Ghana. This

procedure emanated from an earlier policy of the former Central Cacao Research Station and WACRI. The Ministry of Agriculture designed these surveys to locate plantations infested with the virus, and to judge whether cutting out would be the most effective cure.[7] The survey also aimed to gain reliable information on Ghanaian soils, their distribution and suitability for profitable cacao production. The Soil Survey division of the Ministry of Agriculture, which came into being on 1 April 1948 undertook the survey. In preparation for this undertaking, the Survey division devoted its first year to staff recruitment and training, the assembly of equipment, and the survey of proposed agricultural stations.[8] By the of the year, the division had completed soil surveys of Ghana's entire cacao belt. In 1949, the number 82 squadron of the British Royal Air Force used Lancaster and Dakota aircrafts on a photographic reconnaissance of Ghana's rain forest.[9] The Department of Soil Survey also investigated the possibility of establishing cacao plantations in areas of secondary forest where soils would be suitable for permanent cacao cultivation.[10] The emergence of detailed survey records of all cacao areas aided Ghana's Ministry of Agriculture to appraise the extent and severity of Capsid damage, and the means to fight the Swollen Shoot disease.[11]

The field work to control diseases involved the four cacao growing areas of Ashanti, Western, Eastern and the

Trans-Volta regions of Ghana. Principal Agricultural Survey Officers (P. A. S. Os), and Senior Agricultural Officers (S. A. Os) took charge of field work in the regions. These farm personnel had the support of Agricultural Survey Officers (A. S. O.s) who worked in districts where the incidence of the Swollen Shoot was paramount.[12] Each A. S. O. surveyed, organized and implemented cacao rehabilitation programs in his assigned district. This officer certified the documents required to authorize grant payments in his locale. A staff of clerical and drawing office personnel and field assistants who directed laborers in field operations assisted the A.S.O.s in their duties. In addition each A. S. O. had liaison officers who formed the link between the field staff and the farmers.[13]

In order not to miss any cacao and to avoid duplication, the A. S. Os divided their respective areas of operation into blocks. Depending on the density of cacao and incidence of the Swollen Shoot disease, the blocks varied in size from 50 to 300 acres or more. Draughtsmen and surveyors measured and numbered each block and prepared a block plan on a scale of 8 inches to the mile. The surveyors carefully demarcated and measured each farm within each designated block and produced a blueprint for each. Each plan became part of a farm record bearing the farm owners' name. After the liaison officer has ascertained the farmers' particulars, the field staff then

placed the farm's assigned number on record. The liaison officer then issued to each certified farm owner a numbered Farm Identity Card which he produced to obtain grant payments when his farm was treated.[14]

The Treatment of Swollen Shoot Infected Plantations

The Agricultural Officers implemented the disease control project from block to block. Before they brought down any tree, an Agricultural Officer other than the field personnel who first diagnosed it, had to confirm the plant was diseased. Only trees that bore definite leaf symptoms were destroyed. Rounded, instead of spherical pods, were accepted as evidence but not as definite proof of virus infection.

The Agricultural field staff in each district adopted a standard cutting out procedure. In this effort, they cleared the soil away from the foot of the tree, severed its lateral roots and cut through the trunk below ground level. The staff meticulously felled the tree into the middle of other diseased trees. The fallen trees were then cut into convenient lengths and stacked together at the ends for easy checking.[15] Since the total number of trees removed determined how much to pay farmers for their treated farms, the agricultural officers maintained records of how many cacao trees they brought down in each plantation and then stated the figure in the individu-

al farmer's record. These particulars were then retained in the office of the Agricultural Survey Department.

After first treatment, the agricultural field officers re-inspected and re-treated diseased farms at regular bi-monthly intervals. During such inspections, the farm officers carefully examined every tree located within a thirty yard radius of the nearest diseased plant. A Swollen Shoot out-break was considered controlled if, on twelve consecutive monthly re-inspections, the agricultural officers did not uncover any other infected trees.[16] This approach stood in dramatic contrast to the former policy of legal coercion to achieve results.

Ghana's commitment to utilize the extension services emerged in 1946, when the then Secretary of State for the colonies selected a number of senior officers in Ghana's Ministry of Agriculture to tour Great Britain, U.S.A., Canada and Puerto Rico to observe extension techniques. Upon their return, the officers documented the main features of the extension services in each foreign country in order to define methods most likely to succeed under Ghanaian conditions. This information assisted the colonial government to frame its own extension policies.[17]

The Role of Extension Services in Containing Cacao Diseases

Extension was the means the Ministry of Agriculture in Ghana transferred the results of agricultural science research to farmers. The process enabled rural populations to adopt improved farming methods.[18] Extension served essentially as a form of informal teaching. Without adequate and efficient extension service to transmit research findings and their practical application to cultivators, cacao research would have remained unproductive. Agricultural research and extension in the period under review were mutually complementary.[19]

Extension workers used a variety of methods including personal visits, meetings, lectures, conferences and demonstrations to transmit research information to cultivators. Literature in the form of books, pamphlets, journals, leaflets along with agricultural shows, the cinema, radio broadcasts and demonstration plots were among the devices the Ministry employed to transfer knowledge to the farmer in a form he could readily comprehend.[20] The moving cinema proved to be the most popular and effective extension service tool in the rural areas because they reached wider audiences.

To adequately serve cacao farmers with improved farm technologies on disease control, the Ministry of Agriculture built twenty agricultural stations in 1951.[21] The Agricultural Ministry also re-designed existing Agricultural Research

Stations to increase their capacity, and integrated them into farm extension work.[22] In the Eastern Region the Agricultural Ministry sited such stations at Bunso, Apedwa, Biene, Asamankese, Oyoko, Akwadum and Pankese. The extension stations for Ashanti included one at Juaso, and others at Poano, Fumso, Kwadaso, Jamasi, and Akumadan. Those established for the Western Region were Buaku, Assin and Asikuma, while the Kpeve Experiment Station, along with those at Akaa and Dodi Papase served the Volta Region.[23]

These research stations have since the 1950s, offered short term instruction to farmers on Swollen Shoot control, the demonstration of new farm techniques and opportunities to obtain improved planting material and spraying equipment. The agricultural sub-stations also instructed farmers on how to use spraying machines and anti-Capsid insecticides. By 1954, each of these stations possessed Farmer Training Hostels to board farmers who were on short courses.[24]

In 1959, the Ministry of Agriculture recruited and trained 157 Spraying Superintendents for two months in Capsid control. An additional 500 Field Assistants received special instructions to visit farmers who requested advise on all spraying matters. Furthermore, the ministry held refresher courses of one month duration for its field staff to keep them abreast of recent farm trends and changes.[25] The Ministry of Agriculture officially launched a Capsid trial control scheme

as a national project in July 1958. Also known as the Routine Gang Spraying Scheme, the ministry in collaboration with the United Ghana Farmers' Co-Operative Council covered 2,225,000 acres of cacao farms that year. These spraying projects were extensions of an earlier spraying trial in 1951, that covered about 750,000 acres of badly damaged cacao plantations.

The experience gained from these trials paved the way for what later came to be termed as the Expanded Routine Gang Spraying Scheme. To effectively implement the spraying programs, the Agricultural Ministry divided Ghana's cacao belt into 104 areas.[26] From 1954, when the trial spraying of farms began, the Cacao Industry Division covered 1,125,000 acres of cacao farms. This trial spraying was achieved with the single mist-blower technique. In 1959, the Capsid control scheme became the, "largest extension exercise ever undertaken in this country and present progress indicates that it is likely to achieve its objective."[27]

However, subsequent consultations between the government and the United Ghana Farmers' Co-Operative Council led to the view that the Routine Gang Spraying Scheme would be difficult, costly and unproductive. A major obstacle was that cacao acreage in Ghana which were generally tiny were always jam-packed with trees and interspersed with food farms. Besides, most plantations were irregularly spaced, a factor that precluded the use of the Routine Gang Spraying method. This

situation also restricted the use of tractor-drawn techniques which the Agricultural Ministry favored.[28] Aerial spraying was equally difficult. Giant forest trees that towered above the cacao plantations rendered such an approach worthless.

This peculiar cacao farming situation required portable spraying which the farmers could handle themselves.[29] The advent of engine-driven machine, such as the Kiekens-Dekker mist blower, made it possible for the individual farmer to treat his plantation with insecticides for the first time in Ghana. The breakthrough was significant because cacao, a forest crop, was inaccessible to wheeled spraying vehicles. The Ministry of Agriculture therefore subsidized farmers to acquire spraying machines and insecticides for themselves and encouraged trained agricultural officers to help cacao growers to control Capsids on their farms.[30] In 1959, the farmers officially became responsible for spraying their own cacao. State subsidies enabled them to acquire motorized hand sprayers from April 1959 at £14 each, or about 25 percent of their commercial value. In November 1962, the government directed that the country's imported stock of SOLO and KWH spraying machines to sell at £5 each and Mysto sprayers at fifteen shillings instead of £2.[31] The state imported spraying machines at an average rate of 2,000 per month to meet farmers' demand.[32]

The government also subsidized Gammalin-20 anti-Capsid

chemicals. During the first year of the anti-Capsid operations, i.e. April 1959-March 1960, the Ministry of Agriculture sold about a quarter of a million gallons of subsidized insecticides along with 20,000 motorized spraying equipment to cacao planters.[33] Without these subventions, the sprayers would have cost the farmer £50 apiece and raised spraying costs from £0.325 per acre to £1.05. The same measures applied to hybridized planting stock. From 1953 to 1962, government grants enabled farmers to replant 71,000 acres of devastated cacao farms in the Eastern Region. Government grants were indeed a major support to the overall cacao rehabilitation program in Ghana.[34]

To ensure a steady supply of Gammalin-20, the government in 1961 commissioned the Imperial Chemical Industry to open an insecticidal factory at the port city of Tema near Accra, to produce and supply the chemical to farmers. The Imperial Chemical Industries Limited was the first insecticide factory in West Africa. It was estimated that the factory would supply about 1,000,000 gallons of Gammalin-20 within three years.[35] In 1962, the Ghanaian press reported that Gammalin-20 so produced would spray over 3,000,000 acres of cacao plantations successfully. The Ministry of Agriculture freighted the product from Tema with tankers to twenty centers in the deep cacao forest. Each center possessed storage tanks to hold 20,000 gallons. Each unit also arranged the formulation,

package and re-distribution of the chemical to farmers.[36]

Public Relations Work on Disease Control

The Public Relations Department (P.R.D.) also contributed to the fight against cacao diseases. The P.R.D. had seven sections - Reference, Administration, Cinema, Film, Press, Broadcasting and Distribution. The Public Relations unit distributed newspapers, books, booklets, posters and picture supplements to illustrate information pertaining to disease eradication to farmers. In 1946, the Department's film section which operated from five cinema vans had only two films, one of which was titled "Swollen Shoot," and an un-named film strip for schools.[37] In 1948, the cinema vans increased to fourteen, nine of which functioned in rural areas.[38]

These mobile vehicles disseminated information in cacao villages where the cutting out program was current. In 1950, the Public Relations Department expanded its regional services and its mobile cinema units gave a total of 1,268 shows that year. The P.R.D. maintained its fleet of travelling cinema vans which constantly moved throughout the countryside and visited towns and villages in the period under review.[39] In 1952, for example, the cinema vans toured 2,132 cacao producing villages for the purpose. With respect to cacao disease propaganda, the Public Relations Department advised what circuits its cinema vans should follow. The mobile units also

distributed bulletins and other printed matter the Public Relations Department and maintained a liaison with the press and local commercial cinemas to serve similar goals.[40]

The Information Services Department, the United States Information Services and the British Council periodically operated mobile vans to serve a similar purpose. Ghana's Information Services supported the role of the P.R.D., the U.S.I.A. and that of the British Council. In 1955, for example, the Information Services with a fleet of 21 new cinema vans, toured 12,281 Ghanaian towns and villages. In this venture, the vans gave 11,343 cinema and talk shows to an estimated audience of 3,500,000 rural inhabitants.[41] Like the Public Relations Department, the Information Services produced pamphlets and booklets on cacao each month for cacao cultivators. The Department also supplied photo posters, and picture sheets on cacao diseases and publicized these in many places. One such poster was captioned, "The Golden Harvest-The Story of Ghana's Cacao Industry," and a popular booklet, Kofi the Good Farmer.[42] In its programs, the Information Services maintained links with the local press to deliver illustrated feature articles, press releases and news on cacao disease control.

WACRI in collaboration with the Ministry of Agriculture participated in the campaign to assist farmers to adopt modern practices of disease control. The Cacao Research Institute

regularly demonstrated the efficiency of D. D. T as an insecticidal agent against the ravages of Capsid pests at the station's experimental farms. The demonstrations served to show that D. D. T. was both economical and simple to use and that cacao farmers should experience no difficulty in its application.[43]

During the latter half of 1948, the Department stationed two of its officers at the Tafo research station to observe cacao disease control and rehabilitation techniques. The Department's officers in turn explained the nature, incidence of diseases and the means to control them to numerous chiefs and farmers who visited the research laboratory at Tafo. To emphasize their point, the officers of the Agricultural Department usually accompanied farmers to tour devastated areas and rehabilitated cacao farms.

The Department of Social Welfare and Community Development also assisted the Ministry of Agriculture in the campaign against cacao diseases. The Social Welfare and Community Development used four film strips to show farmers the best techniques to identify cacao pests and diseases. The Department also used colored posters printed in the vernacular and English to clarify salient features of the disease control project. The Community Development services registered its greatest impact at the village level. The Department spent ten months to train special propaganda units which they des-

patched in teams of five to every cacao producing district. These teams visited each village according to a schedule which the Department of Agriculture approved. The visit to each rural setting took two to five days, depending on location and accessibility.[44]

In each village, the teams held preliminary meetings with the traditional political authorities comprising of the chief and his elders. After the initial contact, the teams then organized a general meeting of farmers, farm workers and all interested rural inhabitants. At the meeting, the spraying teams discussed the key aspects of the anti-Capsid campaign and demonstrated the use of the Mysto Sprayer. Afterwards, the teams fielded questions and held discussions about Capsid spraying.[45] The general meeting with an entire village was a valuable public relations tool. It approached the farmer as an important person in his own community. Secondly, it recognized his long experience in cacao growing, replete with his own ideas on the subject which the spraying team was publicly willing to discuss. This approach often generated interest and goodwill in the village.[46]

Early the following morning, when Capsids were active, the teams demonstrated the practical application of sprayers to farmers on nearby farms. The spraying personnel often collected the dead insect pests to convince and impress farmers of the efficiency of the equipment. The Capsid hunt later

helped the farmers to identify such insect pests among their cacao trees. The teams also held discussions and transmitted instructions to groups of farmers and dealt with individual problems.[47]

The Social Welfare units used film strips during live talks to illustrate symptoms of cacao diseases. In this effort, the moving picture attracted rural folk more than static film strips. The cinema shows were by far the most effective in rural areas than all the various devices of the extension services because they reached more audiences. Mobile cinema vans showed special films in each rural area to illustrate the essential elements of the campaign in story form. The vans usually toured the area independently of the spraying teams because many villages were inaccessible to the vans. Moreover, only one van served a region and its districts at a time.

The teams used puppet shows in villages to demonstrate the dangers of cacao diseases. Sometimes, the team members enacted the stories themselves. Such themes centered on the bad farmer who consulted a magician to cure his ailing trees, and the good farmer who purchased a Mysto Sprayer to serve a similar purpose. As a teaching technique, the drama often impressed rural dwellers who could not read in English.[48] After the spraying teams have visited an area, local farmers often acquired sprayers. This behavior was partly in response

to the policy of the Ghana government which made the farmers responsible for spraying their own farms. In these instances, the demand for sprayers often exceeded the supply. Again, when one farmer succeeded with the new ideas, other farmers followed suit.

Most cacao villages requested more visits. Many farmers also realized that the first phase of the campaign required reinforcement because there was too much to grasp in one session. Many wanted a follow up from the spraying teams to obviate possible errors during the application of the spraying equipment in the plantation. The Mysto Sprayer seemed complicated and most likely to malfunction without expert help.[49] During the second phase or follow up campaign, the extension officers held "One-Day" schools for rural notables who could influence other village folks to adopt the farm equipments. The spray teams made available handbooks in the vernacular, explaining the proper use and care of the Mysto sprayer to the rural inhabitants. The expectation was that literates in the villages would read and explain it to illiterate planters.[50] Illustrated farming calendars showing the farmer what to do each month of the year, were printed and disseminated in rural areas.

Equipment Maintenance

The Ministry of Agriculture established central depots and workshops in strategic centers to rehabilitate and service

motorized spraying equipment that malfunctioned or broke down.[51] The central workshops were located at Swedru, Bunso, Kumasi and Bechem and Jasikan in the Volta Region. Some 237 mechanics were also trained to service and repair spraying machines. Five agricultural survey officers received special training to supervise the maintenance of the spraying machines. The central depots also received, checked and distributed throughout their respective regions all newly imported machines.[52]

These stations possessed the plants necessary to undertake major repairs. A trained mechanic working under the supervision of a spraying superintendent resided in each district. These individuals served as mobile workshops who toured the more remote areas in the forest to repair farmers' machines.[53] The spraying machines involved were generally listed as the KWH, SOLO, AYARESAFO, AKATEWURA and the MYSTO types. The period between 1952 and 1966 therefore represented a watershed in Ghanaian agricultural history. The state carefully orchestrated the control of cacao pathogens in the rain forest.

The surveying, identification and treatment of all outbreaks were costly in manpower and financial resources. Since the 1950s, the Swollen Shoot control has bulked largely in the operations of the Cacao Division, a division of the Ministry of Agriculture. The C. M. B. bore the full cost of cacao

rehabilitation. In 1960, it spent £27,000,000 on cacao replanting expenses out of which £14,000,000 went into the Swollen Shoot control program alone.[54] The cost of Capsid spraying schemes which the C. M. B. financed, amounted to £2,500,000 a year. In the 1956-7 cacao season, the C. M. B. paid out £2,800,000 to the Department of Agriculture which administered the replanting scheme.[55] The spraying of some 2,250,000 acres against Capsids in 1959 cost the government about £12,000,000.[56]

It is clear then, that from 1952 to 1965, the government of Ghana maintained a steady program of disease control. The program was extensive and intensive involving several departments and state organizations. The bid to eradicate the Capsid and the Swollen Shoot virus entailed considerable costs in finance, manpower and resources. The final chapter contains a critical appraisal of the impact of this project on Ghana's cacao economy.

Endnotes

[1]WACRI Conference 1953, 28

[2]Colonial Office. Annual Report on the Gold Coast for 1952, 32.

[3]Colonial Office. Report on the Gold Coast for 1947, 14-19. See also, Ministry of Agriculture, 1960-1961, 3-4.

[4]Gold Coast: Department of Agriculture: Report for the Year 1948-1949, 1-2.

[5]WACRI Conference 1953, 29-30. See also, Anonymous, "Science Comes to the aid of the Cocoa Farmer," Ghana Today 1 (1957-1958): 3.

[6]Anonymous, "Farming Affairs," The Ghana Farmer (Hereafter cited as T. G. F.) 10 no.1 (1966): 49.

[7]Colonial Office. Annual Report on the Gold Coast for the Year 1949, 20.

[8]Gold Coast: Department of Agriculture: Report for the Year 1948-1949, 2.

[9]Colonial Office. Annual Report on the Gold Coast for the Year 1949, 52.

[10]Gold Coast. Development Progress Report. 1 April 1952 - 31 March 1953, (Accra: Government Printing Department Gold Coast 1953), 6. See also, Annual Report of the Agricultural Research Institute. Soil Research Unit, Kwadaso, Kumasi, Ghana, 1962, (Accra: Ghana Academy of Sciences, Graphic Press Ghana 1962), 7.

[11]O. J. Voelcker, "The West African Cacao Research Institute," Nature 61 no.4082 (January 24 1948): 118.

[12]WACRI Conference 1953, 29.

[13]Ibid., 30.

[14]Ibid.

[15]Ibid.

[16]Ibid.

[17]Ghana. Parliamentary Debates. Official Reports, Vol. 40: Ghana National Assembly, 9 February 1966, (Accra, Ghana: Government Printing Department, 1966), 262.

[18]Ibid. See also, I. Arnon, "The Role of Agricultural Research in Developing Countries," W. C. (September 1964): 23. This author has argued that research in developing countries is unnecessary and that they should import scientific findings from industrialized nations.

[19]Anonymous, "Extension Work," W. C. (September 1949): 41-42.

[20]Ibid.

[21]Bourret, Ghana: 1919-1957 (1960), 207.

[22]Gold Coast. Development Progress Report 1952-1953, 9.

[23]Ministry of Food and Agriculture. Cocoa Industry Division. 1960-1961, 8-9.

[24]Ibid.

[25]Ibid., 7. See also, Anonymous, "Agricultural Education," W. C. (September 1949): 41-42; and Anonymous, "Extension and Training," T. G. F. 1 no.3 (August): 104-108.

[26]Ibid., 7-8.

[27]The best available sources on these trial insecticidal schemes in Ghana can be found in, N. Wright, "Fighting the Cocoa Capsid in Ghana - I. Organization of the National Spraying Campaign," W. C. (1959): 99-101; and his second article on the same theme also titled, "Fighting the Cocoa Capsid in Ghana - 2." W. C. (April 1959): 147-148; see also, P. S. Hammond, "Capsid Control on Mature Cocoa," New Gold Coast Farmer (Hereafter cited as N. G. C. F.) 1 no.3 (1957): 1-3; and Anonymous, "Cocoa Pests and Disease Control Rehabilitation Measures - Summary of Quarterly Progress Report, July-September, 1958," T. G. F. 3 no.4 (February 1959): 6-7.

The control of cacao Capsid pests was expected to increase production by 50,000 tons per year. See, Anonymous, "Steps to Prevent Cocoa Damage," Ghana Today 2-3 (1958-1960): 3.

[28]Ministry of Food and Agriculture. Cocoa Industry Division (1960-1961), 18.

[29]Wright, W. C. (1959): 99.

[30]Robert A. E. Galley, "The Control of Cocoa Diseases in West Africa," W. C. (May 1960): 191.

[31]Ministry of Agriculture. Cocoa Industries Division. (1960-1961), 18-20.

[32]Anonymous, "Sprayers: Chiefs Say Thanks to Osagyefo," Ghana Times (November 21 1962): 1.

[33]Ibid. Discussions on this subject occurred in the Ghana National Assembly. See Ghana. Parliamentary Debates. Official Report, 21 May 1965, 212.

[34]Harrison G. Wehner, "I.M.F. Viewpoints - The Supply Function of Ghanaian Cocoa: A Comment," J. F. E. 48 no.2 (May 1966): 467.

[35]Ghana Today 2 no.16 (October 1 1958): 3.

[36]Wright, W. C. (1959): 147.

[37]S. D. Cudjoe Aids to African Autonomy (London: The College Press Dulwich Village July 1949), 12-14.

[38]Great Britain. Colonial Report on the Gold Coast for the Year 1948, 12-13.

[39]Colonial Office. Annual Report on the Gold Coast for the Year 1949, 61; and Colonial Office. Annual Report on the Gold Coast for the Year 1951, 26. See also, Achievement in the Gold Coast. Aspects of Development in a British West African Territory (Accra, Gold Coast: Public Relations Department 1951), 47.

[40]Colonial Office. Annual Report on the Gold Coast for the Year 1948, 107.

[41]Anonymous, "The Impact of the Information Services on the People of Ghana," Ghana Today 1 (1957-1958): 3.

[42]Ibid.

The pamphlet Kofi the Good Farmer was designed to help farmers to avoid the development of weevily and slaty beans which were generally unacceptable to manufacturers. The information was set out in English and in the Twi and Eve vernaculars. The Agricultural Ministry deemed it appropriate

to relay the information to cacao growers during the anti-Capsid and Swollen Shoot disease control campaigns. See, Kofi the Good Farmer. (Ipswich: W. S. Cowell Limited N. D.), 1-49.

[43]Gold Coast: Agricultural department Report for the Year 1949, 10; and Colonial Office: Annual Report on the Gold Coast for the Year 1948, 76.

[44]M. L. Clarkson, "An Experiment in Evaluation of the Cocoa Extension Campaign in the Gold Coast," West African Institute of Social and Economic Research. Annual Conference Proceedings. March 1956. University College, Ibadan. (Cyclo-styled), 19. (Available at the Land Tenure Center, University of Wisconsin, Madison.) See also, Colonial Office. Annual Report on the Gold Coast for the Year 1954, 87-88.

[45]Ibid., 19.

[46]Ibid., 19-20.

[47]Ibid.

[48]Ibid., 20.

[49]Ibid., 25-26.

[50]Ibid., 25-26.

[51]Ghana. Ministry of Agriculture. Cacao Division. 1960-1961, 19.

[52]Ibid., 20-21.

[53]Ibid.

[54]Wright, W. C. (1959): 147. See also, Anonymous, "Six Priorities for Agriculture," Ghana Today 2-3 (1958-1960): 8.

[55]The anti-Capsid and Swollen Shoot virus control was costly to the Ghana government. In 1958 alone, about £-14,500,000 went into the campaign from state funds. See, Ghana Today 2 no.18 (October 1958): 3-4; and Ghana Today 2 no.10 (July 9 1958): 6.

[56]Further state expenditures into cacao diseases are available in the under-listed sources: Ghana Today 4 no.8 (October 1960): 1 & 7; and the following issues: Ghana Today 4 no.19 (November 1964): 7; and Ghana Today 9 no.14 (September 1965): 4-5; and Anonymous, "Fight Against Cocoa Pests: Plans

for Good Harvest," Ghana Today 4-5 (1960-1962): 6-8.

The Ghana Farmer, a state-sponsored Ghanaian periodical published progress reports on the anti-Capsid spraying scheme from the project's beginning until the early 1960s when farmers became responsible for spraying their own farms. See, Anonymous, "Cocoa Disease and Pest Control and Rehabilitation Measures, Oct-Dec. 1957," T. G. F. 2 no.2 (May 1958): 45-46; Anonymous, "Cocoa Pests and Disease Control and Rehabilitation Measures, Summary of Progress Report, April to June, 1958," T. G. F. 2 no.4 (November 1958): 126; Anonymous, "Cocoa Pests and Disease Control and Rehabilitation Measures etc.," T. G. F. 3 no.2 (May 1959): 46-47; Anonymous, "Cocoa Pests and Disease Control and rehabilitation Measures: Summary of Quarterly Progress Report - January to March, 1959," T. G. F. 3 no.3 (August 1959): 85-86.

Between 1960 and 1962, the same farm journal monitored and published the under-listed progress reports on the subject of cacao rehabilitation programs and Capsid control: Anonymous, "The Capsid Control Scheme," T. G. F. 4 no.1 (February, 1960): 7; Anonymous, "Progress Report - Cocoa Industry Division: Jan-Mar Quarter, 1960," T. G. F. 4 no.2 (May 1960): 39-41; Anonymous, Progress Report - Cocoa Industry Division, April-June Quarter," T. G. F. 4 no.3 (August 1960): 98-99; Anonymous, "Capsid Control," T. G. F. (August 1961): 101-103; Anonymous, "Quarterly Progress Report, Cocoa Industry Division, October-December, 1960: Summary," T. G. F. 5 no.1 (February 1961): 9-10.

IX THE RESULTS OF THE CACAO DISEASE CONTROL PROGRAMS

Introduction

The emergence of the Cacao Research Institute in 1944, the recruitment of international agricultural scientists, the years of research and intensive extension services produced mixed results. The Eastern Region lost its position as the world's most prolific cacao growing area. The Black Pod fungus disease could not be eradicated in the field. The control of the Swollen Shoot outbreak and Capsid ravages along with the creation of new plantations with high-yielding cacao progenies in the Ashanti, Brong Ahafo and Western Regions of Ghana almost doubled output. Yet world prices sagged and the country's export earnings were far worse than the depression years. Attempts to obtain favorable world cacao prices through a variety of measures brought no visible results. Faced with dwindling export revenues, the state withdrew inputs from disease control. Meanwhile the plant pathogens intensified.

Discussion

In the main, the Capsid control efforts substantially reduced the population of the Sahlbergella and Distantiella Theobroma Capsids Ghana up to 1966. The Agricultural Department of the University of Ghana derived these conclusions from

tests it performed on its experimental farms at Kade. Sample surveys in farmer's plantations at Bowakum village in Brong Ahafo, and at WACRI plots at Tafo confirmed provided similar results. In 1966, though Capsids were detected in some farms at Koaso in Brong Ahafo and at Adiewoso in the Western Region, their population level was too low to pose any concern.

The control of Black Pod pathogens was generally unsuccessful. Fungicidal applications under Ghanaian rural conditions encountered severe limitations. Copper-based fungicides washed off easily during rainfall in the forest where the disease was most serious. Moreover, the cost of fungicides was prohibitive to the average farmer. On balance, the official and private attention to the Black Pod disease was one of relative indifference. Compared to Capsid pests and Swollen Shoot, losses due to the Black Pod fungus were insignificant in Ghana. To date, Ghanaian farmers have made no significant effects to control the efforts of the Palmivora Phytophthora fungus in their cacao plantations. Though the Ministry of Agriculture has recommended monthly harvesting during the crop season, farmers have ignored the advise because of the extra labor and expense.[1]

On plant virus control, the results were rather mixed. From 1946 to 1956, the Cacao Division removed a total of 54,000,000 trees. Until 1966, the Cacao Division chopped down another 50,000,000 infected cacao plants. In 1953, and spe-

cifically in 1960, the disease was reported to be under control. However, this plant virus devastated a quarter of a million acres of cacao plantations which farmers abandoned altogether.[2] Because the disease was indigenous to Ghana, complete and permanent eradication of Swollen Shoot in Ghana cannot be expected. To quote one source, "It must in consequence be regarded as certain that plantations of cacao will always be liable to infection and the essential point is to reduce this susceptibility so far as may be practicable."[3]

Consequently, few of the devastated farms were successfully rehabilitated. The Eastern Region which pioneered Ghana's cacao economy in the 1880s to lead the world cacao output in 1911, never regained its former production levels. In the 1936-1937 crop season, this region produced 43 percent of the total national output of 300,000 tons. The Ashanti Region with 30 percent of the total, took second place. The Western and Central Regions, with a combined production tonnage amounting to 27 percent of the national output, followed in that order. A decade later, (1948-1949), the Ashanti Region produced 125,866, or 45 percent of the total national production of 278,372. The Eastern Region with 79,727 tons, generated 29 percent, and the Western and Central Regions took the third place with a combined total of 72,779 and 26 percent of the national output.[4]

The incidence of the Swollen Shoot disease and the incen-

tive of favorable post-war cacao produce prices, induced many farmers to migrate to Ashanti, the Brong Ahafo and Western Regions of Ghana where they built new plantations right up to the border with Cote D'Ivoire.[5] The acreage expansion was such that Ghana's cacao economy by the early 1960s occupied some 4,250,000 acres. The national output before then had averaged about 250,000 tons yearly. Thereafter, successful scientific research, effective government action, good weather, high-yielding cacao planting stock, almost doubled yields between 1960 and 1965 as shown in tabular form below.[6]

Year	Yield.[7]
1960-1	432,000.
1961-2	410,000.
1962-3	422,000.
1963-4	421,000.
1964-5	590,000.

This phenomenon has represented an expansion from existing holdings in eastern Ghana to newer and fresher areas in the west. To date, Ghana's cacao economy is centered in the Ashanti and Brong Ahafo Regions of the forest belt. Unlike the late eighteenth and early twentieth centuries when farm land for cacao was abundant, now potential Ghanaian farmers face a situation of land scarcity. Many have had to migrate to remote inaccessible places to acquire land. The westward expansion of cacao plantations also meant that the oldest Amelonado tree stocks of the late nineteenth and early twentieth centuries remained in the Eastern Region and eastern

Ashanti and parts of the Volta Region. The younger and early bearing Amazonian trees became concentrated in the Brong Ahafo and Western Regions.

Bumper Cacao Harvests and Sagging World Prices

Throughout the 1930s up to 1945, cacao production dropped because of the depression, wartime exigencies and the Swollen Shoot menace. The demand for cacao outstripped supply and cacao produce prices increased. Importing countries took austerity measures when cacao supplies dwindled relative to demand. For example, in April 1954, Switzerland, typifying most cacao manufacturing countries, increased the retail prices of chocolate up to 10 percent.[8] Cacao growing countries, on the other hand, received windfall profits. The Swollen Shoot epidemic contributed to, but was not solely responsible for the fall off in output and increased prices.[9] As stated earlier, wartime diversion to war-related activities and poor cacao produce prices were also responsible.

But these shortfalls remained true only in the short term. From 1957, and particularly in the first half of the 1960s, cacao output in Ghana rose substantially. D. E. Asafo Agyei, Ghana's Deputy Minister of Agriculture reported to the National Assembly that the nation's cacao exports rose from the 1957-1958 crop season by 109 percent during the 1960-1961 agricultural year, an increase of 225,781 tons. To quote one

source, "The increase was remarkable because the acreage under cacao had not doubled since 1957 and Swollen Shoot took some toll of the cacao trees."[10] Ghana's Central Bureau of Statistics in its economic survey for 1961, affirmed that this figure was 36 percent higher than the previous year's total and until then the greatest yield ever. The output for the 1960-1962 crop year was better still. In that year, a Ghanaian bulletin reported that, "it is already clear, that this year's crop which is about 400,000 tons, will beat all previous records."[11] The Foreign Agricultural Service affirmed that, "The crop was so large that there were not enough burlap bags for packing."[12] In 1964-65, Ghana's output represented 38 percent of total world production. By doubling production within a decade, Ghana maintained her position as the world's leading supplier of cacao. [13]

World prices, however, sagged from 23 cents per pound in October 1964, to 15 cents in January 1965, the lowest level since cacao trading resumed after World War 11.[14] In the early months of 1965, world cacao yields exceeded world consumption.[15] Since historically, an estimated 20 per cent of cacao always died from Capsid attacks, the impact of the spraying campaign substantially augmented production.[16] Again, the government's ability to stem the dangerous impact of the Swollen Shoot epidemic also contributed to the prolific yields. Martin Appiah-Danquah, the General Secretary of the

United Ghana Farmers Co-Operative Council, attributed the crisis of over-production and low prices to the fact that cacao spraying since 1958-1965 raised crop output from 195,000 tons to over 556,000 in the same period, hence the downward price spiral.[17]

However, the boom in cacao output derived from several variables. Yields increased because many of the high-yielding and early-bearing trees planted in the mid-1950s reached their profitable bearing years in the early 1960s. The average annual yield amounted to approximately 330 pounds per acre.[18] The weather also contributed to over-production and subsequent low prices. Generally, crops vary considerably from year to year because of climatic changes and the extent of pest and disease attacks. Most often, weather and pest attacks are correlated. In damp weather, fungus growths have tended to destroy ripe pods extensively.[19] But quite unlike the past, weather conditions for the 1964-5 crop year were exceptionally favorable to cacao growing in the tropics. Most cacao producing countries in West Africa also enjoyed optimal weather conditions that crop season and were able to increase crop yields. Cote D'Ivoire raised output by 44 percent compared to 35 percent for Nigeria and 42 percent for Togo in that order. Although young trees contributed to the record crops of 1964-5, it was the exceedingly favorable weather which made the greatest impact.[20]

The surplus production led to a further stock build up of raw cacao beans in cacao manufacturing countries. Consumption from 1957-8 to 1960-1 failed to keep pace with production from 1957 to 1960-1961.[21] Because cacao is a luxury item, many consuming countries limited imports through high taxation. Import restrictions in cacao manufacturing countries contributed to the lower cacao price levels.

While the three top producers, Ghana, Nigeria and Brazil expanded exports, other agricultural countries seeking to diversify their crop exports, took to cacao planting and helped to flood the world markets. Cote D'Ivoire, and to some extent, Eastern Nigeria, acting on the advise of the United States Agency for International Development and the European Economic Community in the 1950s, expanded cacao output for the first time. Similarly, Cameroonian farmers with E. E. C. aid, increased their plantings, while Togo augmented its cacao exports.[22] The index of world production of cacao showed a continuous rise to about 33 percent from the 1953-4 and the 1959-60 cacao seasons.[23] In effect, while cacao output mounted in Ghana, large harvests were also forthcoming from new plantings and improved technology in the Ivory Coast and Cameroon.

Similarly, cacao yield in the Western hemisphere also increased. Production in Brazil and the Dominican Republic, for example, improved considerably because of exceptionally good weather.[24] Comparable successes also occurred among Asian

producers, along with those in New Guinea and Oceania.[25] Ghana's cacao plantations, which at the start of the 1960s occupied some 4,250,000 acres, contributed 55 percent of the overall world supply.[25] Ghana's achievement did not translate into financial remuneration. As one source described the situation:

> The story of such rapid progress is dramatic. But what has this success meant to Ghana? Unfortunately over-production now threatens the basic economy of the West African producing countries and the worst affected of all is Ghana.[27]

Diminishing imports from the United States in the 1950s, the world's greatest consumer of cacao, aggravated Ghana's worsening cacao export earnings. American cacao purchases from Ghana fell. For example, U.S. overall commerce in cacao trade from 1952 to 1956, was 11 percent lower than the quinquennial period of 1947-1951. Per capita consumption of cacao dropped from 4.7 pounds in the 1936-1940 period to 3.55 from 1955 to 1958.[28] In the 1963-4 crop season, the volume of American imports came to 91,650 tons compared to 113,000 in 1962.

In Western Europe by contrast, cacao imports from 1956 to 1959 were 10 percent higher than those from 1952 to 1955. The combined imports from Eastern Europe and the U.S.S.R. from Africa increased from 28,000 1n 1953, to 68,000 in 1957 but declined to 48,000 tons in 1958. The U.K., Japan, and the Netherlands were Ghana's best markets for cacao.[29] But these

developments did not improve Ghana's earnings. The volume of imports from these countries were relatively modest compared to American purchases.

Despite the major fall in the cost of their primary raw material, the cacao buying and manufacturing companies did not reduce produce price to the final consumer. For example, a 50 percent fall in the price of the cacao produce reduced the six penny bar of chocolate in England by 0.75 percent of a penny. Gross profit margins which ranged from 18-26 percent of total costs, increased significantly in the 1960s. For example, in the United States, Hershey's surplus revenues rose from 23 percent in 1955 to 31 percent of production costs in 1963. In 1965 alone, Hershey's profit rose by a million dollars while the cost of its raw material sank from s53,000,000 to less than s40,000,000.[30]

Ghana's Response to Shrinking Cacao Prices

The drop in cacao export prices created a sharp verbal response from the then President of Ghana, Kwame Nkrumah, whose one party government was entirely dependent upon cacao export revenues to underwrite current and recurrent items of state modernization programs. On 12 January, 1965, the President, stated before Ghana's National Assembly that:

> When the cacao crop was being ravaged by Swollen Shoot and cacao was in short supply, the manufacturers appealed to us to do what we could to increase

> supplies. We spent a lot of money to increase production. The result of our efforts has been that production has almost doubled, but the manufacturers and the speculators in the cacao trade have taken advantage of this to depress the price of cacao.[31]

According to Nkrumah, Ghana's Head of State, the results of these adverse conditions in international commodity trade were that:

> [O]ur overall export earnings have failed to show a proportionate increase. On the other hand the need to press forward with our development programmes has resulted in an increase in imports, especially imports of machinery, plant and equipment from those very countries. The fall in our export earnings while our imports were increasing, has resulted in deficits in our balance of payments.[32]

The Ghanaian President announced his determination to forgo the hitherto bilateral commercial agreements with private financiers and intermediaries and to demand hard currency for cacao, in order "to ensure [the] availability of liquid funds to finance development programs."[33] Ghana responded to the ever shrinking cacao prices in several ways. The idea to diversify the economy which had hitherto hinged heavily on cacao received priority attention. Nkrumah, declared before parliament that, "The collapse in the world cacao price, the commodity which has hitherto supported about 66 percent of our total export earnings...should spur us on to a more aggressive export earning campaign."[34] His administration later attempted to de-emphasize cacao production and to stress rubber, citrus and oil palm production.

Ghana in 1962, participated with other major cacao producers, notably Nigeria, Brazil, Cote D'Ivoire and Cameroon in Lagos, the Nigerian capital to create the Cacao Producers Alliance.[35] In 1964, this body came together to secure agreements from cacao manufacturers to pay a minimum price of £190 per ton for the produce. This effort, occurring at a time when record crops had boosted supply above demand, failed.[36] Ghana and other cacao producing countries could not convince the major cacao importing countries from the West, notably the U.S., the U.K. and the E.E.C. members to participate in international agreements to stabilize prices and to reduce local taxes on chocolate products.[37] International marketing agreements for better prices also proved futile because of the declining consumption of chocolate in Western markets, especially, the United States and Sweden. In the period under review, chocolate manufacturers doubled their advertizing expenditure in order to maintain sales. In 1965, member countries in the Cacao Producers Alliance, (C.P.A.) obtained £90 a ton for their raw cacao, a price far lower than the worst slump years of the 1930s.[38]

The glut of cacao in the world market, led an F.A.O. study group to Accra in April 1961 to consider plans for price stabilization. The conferees suggested that producer countries should supply cacao on a quota system.[39] When prices still deteriorated, the F.A.O and cacao producing countries

convened at the University of Ghana in 1964 under the chairmanship of Krobo Edusei, Ghana's Minister of Agriculture. Here, the conferees resolved to utilize statistical techniques to forecast cacao output. The rationale, as Krobo Edusei announced, was to help stabilize cacao prices. To use his own words:

> We want to strengthen our bargaining position and remove the speculation on yield by speculators who plague the international market. We shall remove these parasites when the market knows that our forecasts are scientifically and internationally based.[40]

These forecasts predictably failed to ameliorate the poor produce prices for cacao. Cacao export prices continued to drop. Meanwhile, the C. P. A. considered other measures to resolve the problem of over-production. First, the Alliance attempted to divert a large tonnage of cacao beans into margarine and soap production. Here again, this solution was unworkable. Cacao beans would compete with other fats and oils, and might fetch only 5 cents a pound, a price drastically below what is payable for the crop.[41]

Ghana's Ministry of Trade meanwhile, searched for new export markets under the terms of the General Agreements on Tariffs and Trade (G. A. T. T.) This drive aimed to gain convertible currency to underwrite the country's heavy developmental commitments after independence. To quote Ghana's Trade Minister, F. K. D. Goka, "It is only by doing so that we shall be able to afford to continue to invest in this development

and to service the loans provided by the World Bank and [from] the Governments of other countries."[42] Up to 1958, Ghana's cacao sold in sixteen countries. In 1959, Ghana shipped cacao to East Germany, Israel, Japan, and Yugoslavia and China in 1960. In 1961, trade expanded to India, Czechoslovakia, the United Arab Republic and Poland.[43] By the 1960-1 crop season, Ghana exported 409,968 tons to 24 countries. The government of Ghana hoped to create markets in Eastern Europe and to encourage greater consumption in Africa, Asia, Australia, Western Europe and the U.S.A. through an aggressive export drive.

In comparative terms, however, the new markets in Eastern Europe were marginal compared to American and Western European demand for cacao. In the 1958-1959 crop year for example, the U.S. imported 142,000 tons of raw cacao beans. West Germany, ordered 70,745 in the 1959-60 crop season alone.[44] The U.K. and Holland imported 53,730 and 57,429 in that order, while Italy increased its consumption from 14,525 in 1959-60 to 17,040.

Ironically, therefore, the crash of cacao prices reflected the success of Ghanaian production. At independence in 1957, Ghana had £450,000,000 in external assets. In 1960, the government had accumulated growing deficits. Ghana's hard currency reserves dropped significantly in the 1960s partly because of a sustained drive in industrialization and modernization programs.[45] When the meager cacao prices could not

replenish the national foreign currency reserves to sustain Ghana's heavy expenditures on development projects, the government curtailed non-essential imports to conserve foreign purchasing power. The administration only purchased investment goods such as machinery, plant and equipment, to produce import substitutes for local consumption.[46]

In order to influence world prices, Nkrumah's government warehoused cacao at Ghana's ports of shipment in a bid to withhold about 200,000 tons of the produce from international commodity trade. The government also built silos to store 200,000 tons of cacao. As Nkrumah explained, "We increased our cacao production from 264,000 tons in 1956-7 to 590,000 tons in 1963-4 and huge silos had been built to store half the cacao crop to enable us to restrict exports and so ensure a fair price for our cacao in the world market."[47]

Ghana offered some of its limited storage capacity to other West African cacao producers and built additional storage facilities. Nigeria quickly erected six small storage sheds. Local stockpiling of cacao in Ghana could only offer a temporary solution. The practice added to production costs. Secondly, the rate of deterioration of primary produce in tropical countries, unlike temperate zones, was more intense and rapid. Conversely, the consumer countries usually stockpiled cacao up to the equivalent of six months supply.

The storage capacities of cacao manufacturing companies

abroad were more commodious and several times more extensive than those available to producer countries. For example, the Hershey Corporation of America alone possessed twenty seven large cacao warehouses in twenty-four states in the U.S. and five more in Canada. These facilities placed this manufacturing company in a position to purchase and reserve cacao stocks when prices were low as in 1958, and to utilize these supplies when world prices rose again.[48] For these reasons, the stockpiling of cacao in Ghana and elsewhere in West Africa registered precious little impact on world cacao price movements.

The Ghana government also established a factory to process raw cacao into cacao butter and chocolate tablets.[49] This endeavor aimed to add value to the crop in order to increase cacao export revenues.[50] On 6 December 1965, the Ghana chocolate factory which cost $5,280,000 to construct, opened at Tema. Dr. Noe Drevici, the general manager, observed that the factory was the first of its kind in continental Africa, and that, "the world cacao market would think twice before dictating prices."[51] However, these ad hoc measures failed to register the desired effect.

With the fall in world cacao prices, the government withdrew its support to disease control in order to cut costs and to avoid further production increases and subsequent world surpluses.[52] Paltry cacao revenues imposed severe foreign currency constraints making it difficult for Ghana to sustain

inputs into cacao disease control. The administration dissolved the Cacao Division in 1962 and left the responsibility of controlling the Swollen Shoot disease to the farmers' themselves. The cacao growers, however, failed to destroy the infected trees as aggressively as government-paid labor gangs working for the Cacao Division. The policy to leave the cutting out of infected trees to farmers subsequently led to a dangerous build up of infection.[53] In 1966, the re-constituted Cacao Division conjectured that a backlog of infected cacao trees had to be destroyed at the rate of 5,000,000 trees per year to keep the disease under control.[54]

A similar fate befell the government's anti-Capsid spraying program. The government placed import restrictions on spraying equipment and removed subsidies for chemical and spraying equipment. The evolution of Capsid strains resistant to the cyclodienne insecticides of which Gammalin-20 is one, further worsened matters. Capsid resistance to chemical sprays was most prominent in the Eastern Region where spraying had been carried out the longest.[55]

The reduction in government extension services exerted a deleterious impact on cacao farming. On 9 February 1966, J. K. Baffuor Senkyire, a parliamentarian, drew the attention of Ghana's National Assembly to the degraded quality of agricultural extension work in Ghanaian cacao villages. According to him the Ashanti Region, for example, had only twenty-three

trained extension service personnel to a total of 275,008 full time cacao farmers. This broke down to a ratio of one extension officer to 11,957 farmers. A cacao farmer, by implication, had to wait for fifteen years after his first service to receive further research information or practical aid from another extension personnel. What was worse, most extension officers had no facilities such as insecticides and departmental vehicles with which to operate.[56]

Meanwhile, the nation's insecticidal factory at the port city of Tema, near Accra, deteriorated. The Imperial Chemical Industries (I. C. I.) manufactured Gammalin-20, Ghana's most popular capsidicide. The Ghana Supply Commission had hitherto offered the pesticide to farmers through the United Ghana Farmers Co-Operative Council at subsidized rates. With falling cacao export revenues and a run down in the nation's hard currency reserves, the government on October 1, 1965 removed the subsidy on Gammalin-20. The I. C. I. found it difficult to obtain regular raw material inputs from overseas suppliers.[57]

These developments culminated in a situation which severely hampered Capsid spraying in the 1965 cacao crop season. The I. C. I. factory itself closed down periodically for several weeks at a time, facilitating the resurgence of Capsid attacks on cacao output particularly in the 1967/8 production period.[58] On 4 February 1966, G. E. Mensah, the parliamentary member for Nkawkaw, in the Eastern Region, drew

the attention of the National Assembly to the shortage of D. D. T. in cacao villages. On that day, he remarked:

> It is very pathetic for someone who is interested in cacao to travel along the Accra-Kumasi road and see the condition of the cacao trees. If nothing is done about it, not only will the country have some slight fall in the yield itself but the yield will come to the bare minimum. If it so happens, I do not know what will be the result and so I am appealing to the Government to do all it can to get some Gammalin for the farmers.[59]

A summary of the cacao disease control program after decolonization in 1957 reads:

> In short, the rapid expansion in output by Ghana's cacao farmers... contributed to falling world cacao prices, a severe strain on Ghana's balance of payments situation, food shortages and rising food prices, a drastic reduction in farmers' real incomes, and finally to curtailment of Government efforts to combat diseases which threatened the industry itself.[60]

Ultimately, it was the Ghanaian cacao growers who bore the brunt of low cacao prices the most. The raison d'etre of Ghana's Cacao Marketing Board after its inception in 1947 had been to guarantee a price ceiling to farmers regardless of international cacao price movements. In 1954, for example, the government pegged cacao prices at £3. 12s. 0d. (per load of sixty pounds) at a period when cacao prices stood at £500 per ton.[61] In 1965-1966, the government slashed real cacao produce prices. The price per headload of 60 pounds fell from £4 in 1957 to £2 in 1965-1966. Ghana's cacao production and corresponding producer prices since independence is set out in tabular form below.

Year	Producer prices in £. s. d.[62]
1957	4
1958	3:12
1959	3:12
1960	3
1961	3
1962	2:14
1963	2:14
1964	2:10
1965	2:10

The farmers' response to poor producer prices conformed to the pattern of the post-World War I period, the depression years and the Second World War. When faced with the discouraging prices, the farmers' impetus in cacao farming slackened. Most of them made no serious attempt at cacao rehabilitation. A considerable amount of cacao trees died from old age, Black Pod and Capsid diseases along with termite damage and a general lack of farm maintenance.[63]

Abandoned plantations either reverted to thicket or secondary forest. Some cacao planters resorted to food farming since this was more profitable. Accordingly, the staple food crops of maize, cassava, cocoyam, yams, plantain, bananas and vegetables became prominent. Occasional tree crops such as cola, oil palm, citrus and coffee were encouraged.[64] In his critical evaluation of the sudden decline in cacao produce prices, Ghana's President, Nkrumah, whose government administered the cacao disease control programs from 1951 to 1966, wrote:

> Both Ghana and Nigeria in the post-independence period enormously developed their production in cacao. This result has not been obtained by chance. It is the consequence of heavy internal expenditure on control of disease and pests, the subsidizing of insecticide and the spraying machines provided to farmers and the importing of new varieties of new cacao seedlings which are resistant to the endemic ills which previous cacao trees had developed. By means such as these, Africa as a whole greatly increased her cacao production, while that of Latin America remained stationary.[65]

The President then posed the rhetorical question:

> What advantage has Nigeria or Ghana gained through this stupendous increase in Agricultural productivity?...In other words, Ghana and Nigeria have trebled their production of this particular agricultural product but their gross earnings from it have fallen.[66]

The utter dependency of the world's primary producers upon the vagaries of international commodity trade which favored industrialized nations was not lost on the President. A continental African Union government, in Nkrumah's perception, represented the solution to the adverse terms of trade which historically has assailed nations dependent on agriculture for their sustenance. To quote Nkrumah, "A continent like Africa, however much it increases its agricultural output, will not benefit unless it is sufficiently politically and economically united to force the developed world to pay it a fair price for its cash crops."[67]

Unification of the African continent would certainly not be the answer to the issue. Primary products deteriorate rapidly under tropical conditions. Storage as a means to

withhold supplies from the world market could only serve as a temporary expedient, and not a permanent solution to the problem of over-production. With its immense agricultural and mineral resources, industrialization programs in Ghana and elsewhere in Africa, emphasizing an import substitution program deserve more attention.

Endnotes

[1]These developments have not been peculiar to Ghana. Fungicidal spraying trials in many countries have generally yielded unsatisfactory results: see, August M. Gorenz, "Chemical Control of Black Pod Fungicides," in Phytophthora Disease of Cocoa, ed. Gregory (1974), 235.

In fact, the application of cacao fungicides was bound to remain futile. There is one basic explanation for this. Other than cacao, the Phytophthora Palmivora fungus attacks over 51 genera of common plants, including rubber, cotton, various palms, citrus, pineapple, pepper, breadfruit, mango, guava and cinchona. The reservoir for pathogenic fungal attacks appear to be infinite: see, C. K. Hickman, "Phytophthora - Plant Destroyer," T. B. M. S. 41 no.1 (1958): 8.

In Ghana, farmers usually interspersed cacao plantations with food crops. The use of chemicals on cacao trees under these conditions would be ineffectual because other plants would always serve as reservoirs of infection.

Moreover, the effectiveness of spraying, depends on several variables difficult to sustain under Ghanaian farming conditions. These variables include the quantity of fungicides used and its adjuvant, the type of spraying equipment and method of application. The time farmers commenced spraying, the incidence of rainfall and the disease cycle on the tree and pods also affect the outcome. There is more. The frequency of spraying and the time the chemicals took to dissipate have always been critical in determining the success of fungicidal sprays. These factors, under Ghanaian rural and farming conditions, have been unattainable ideals: see, Gorenz, in Phytophthora Disease (1974), 236.

Above all else, climatic factors have always affected the outcome of fungicidal applications. These have invariably involved temperature, hours of sunshine, duration and frequency of rainfall, humidity and wind pressure. These environmental elements have also depended upon pruning, shade, weeding, age, size and height of the cacao trees to achieve satisfactory results. Since the interaction of so many elements determines success, the control of Black Pod with chemicals have always been difficult. For these reasons, H. A. Dade, the first real authority on Black Pod in Ghana, concluded that to be effective, fungicidal application must be so frequent as to make the exercise economically unviable. Ibid.

2Anonymous, "Cocoa: The Basis of Ghana's Economy," SPAN 5

no.3 (1962): 146-149.

[3]Anonymous, "Disease Problem Overshadows Conference," W. C. (October 1949): 117; and Food and Agriculture of the United Nations: Commodity Reports (Rome, Italy: 21 March 1951), 2.

The Food and Agriculture Organization of the United Nations also reported that as long as the reservoir of the virus remains in the forest, complete and permanent eradication of Swollen Shoot in West Africa cannot be expected. The only effective method is to cut the trees and the alternate hosts on the farm. See, F.A.O. Commodity Reports, (Rome, Italy: 21 March, 1951), 2.

[4]Colonial Office. Annual Report on the Gold Coast for 1949, 20.

The Eastern Region dominated cacao output from the 1890s until World War 11. In 1920, for example, this region led Ghana's overall output with 44 percent followed by the Central region with 21 percent. The combined production tonnage from the Ashanti and Western Regions amounted to 33 percent that crop year: Colonial Office. Annual Report on the Gold Coast for 1920, 25.

[5]Barbara Ingham, Tropical Exports and Economic Development. (London: The MacMillan Press, 1981), 6-8.

[6]SPAN (1962): 146-147.

[7]Kwame Nkrumah, Neo-Colonialism: The Last Stage of Imperialism (New York, N.Y.: International Publishers, 1965), 10.

[8]Anonymous, "The Present Position and Outlook of the Cocoa Industry," W. C. (July 1954): 293; and Anonymous, "Cocoa Supplies," W. C. (March 1955): 89-90.

[9]Carlson, Limits to Structural Change (1971), 199.

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[18]Draft Confidential. International Bank for Reconstruction and Development, 1966. Annex 10, 2-3.

[19]George Ordish, "Pest Control Economics," W. C. (March 1964): 88.

[20]Draft Confidential. International Bank for Reconstruction and Development, 1966, Annex 10, 9.

[21]F.A.O\U.N. Commodity Yearbook, 1961, 96.

[22]A. W. Seidman, Ghana's Development Experience: 1957-1965 (Nairobi, Kenya: East African Publishing House, 1978), 148-149.

[23]Economic Bulletin for Africa (Washington, D.C.: U.S. Government Printing Department, January 1961), 38-39.

[24]Shamsher Singh, Jos de Vries, John C. L. Hulley and Patrick Yeung, Coffee, Tea and Cocoa (Baltimore: John Hopkins University Press, 1977), 77.

[25]F.A.O\U.N. Commodity Yearbook, 1960, 86-87.

[26]SPAN (1962): 146-147.

[27]Ibid.

[28]Economic Bulletin for Africa (January 1961), 38-39.

[29]Ibid. See also, Ghana Today 8-9 (1964-1966): 6-8.

[30]Span (1962): 48-49.

[31]Ghana. Parliamentary Debates. National Assembly, Official Report: 12 January - 26 March 1965, 7-8.

[32]Ibid.

[33]Ghana. Parliamentary Debates. Vol 40. 10 June 1965 - September 1965, 34.

[34]Ibid., 23.

[35]Span (1962): 147-149.

[36]Seidman, Ghana's Development Experience (1978), 149-150.

[37]Ibid.

[38]Span (1962): 148-149. Seidman, Ghana's Development Experience (1978), 149-150.

[39]F.A.O/U.N. Commodity Yearbook, 1961, 96.

[40]Anonymous, "Delegates from West African Cocoa Producing Countries Meet in Accra," Ghana Today 8-9 (1964-1966): 7.

[41]F.A.O/U.N. Commodity Yearbook, 1965, 95.

[42]Anonymous, "Cocoa: Another Record Crop," Ghana Today 4-5 (1960-1962): 8.

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[44]Anonymous, "World Cocoa Output Again Fails to Match Increasing Demand," Foreign Agriculture no.18 (I May 1967): 8; Anonymous, "Africa's Cocoa, and Coffee Faced with World Surpluses," Foreign Agriculture (March 29 1965): 6 & 16; and Anonymous, "Cocoa Production Increase," Ghana Today 4-5 (1960-1962): 3.

[45]Young, Agricultural Politics in Ghana (1981), 170-171.

The then political administration under Nkrumah, placed

total confidence in its ability to generate huge revenues from cacao exports to finance modernization programs in the country. To quote the President's policy statement on this issue:

> As always, we recognize the paramount importance of agriculture in our economy and we have never lost sight of the fact that cocoa represents the economic lifeblood of our country. We are embarking on a very large scale campaign for spraying Capsid and I regard this as probably the most vital element in our current economic development; for if it succeeds, it can make a great difference to our total cocoa production and thus provide an invaluable revenue for further development.

See, Ghana. The Second Development Plan, 1959-1964 (Accra, Ghana: Government Printer, 1959), iv-v.

[46]Kwame Nkrumah, First Sessional Address. Ghana National Assembly. Official Report. 12 January, 1965, 7-8.

[47]Revolutionary Path (New York, N.Y.: International Publishers, Panaf Books, 1973), 400.

[48]Seidman, Ghana's Development Experience (1978), 150.

[49]Draft Confidential. International Bank for Reconstruction and Development, 1966, iv.

[50]D. E. Asafo Agyei, a parliamentary member of Ghana's "one-party" National Assembly, attributed the price drop to the, "machinations of certain imperialist interests and Governments." See, Ghana National Assembly. Parliamentary Debates. Official Report. 3 September 1965, 424 & 447.

[51]Anonymous, "Farming Affairs," T. G. F. 10 no.1 (December 6 1965): 49.

[52]Draft Confidential. International Bank for Reconstruction and Development 1966, Annex 10, i & ii.

[53]Ghana. Parliamentary Debates. Official Report: 21 May 1965 - 25 April 1965, 226; and Anonymous, "The State Farms," W. C. (December, 1963): 467.

[54]Draft Confidential. International Bank for reconstruction and Development, 1966, Annex 10, 4.

[55]Ibid., 7. See also, Singh et al., Coffee, Tea and Cocoa (1977), 77.

[56]Ghana. Parliamentary Debates. Official Reports. 9 February 1966, 262.

[57]Draft Confidential. International Bank for Reconstruction and Development, 1966, 7.

[58]Ibid.

[59]Ghana. Parliamentary Debates. Official Report, 4 February, 1966, 153.

[60]Seidman, Ghana's Development Experience (1978), 150.

[61]Ghana. Parliamentary Debates. Official Report. 3 September 1965, 423.

[62]Young, Agricultural Politics (1981), 174. See also, R. A. Kotey, Christine Okali and B. E. Rourke, The Economics of Cocoa Production and Marketing, (Legon: University of Ghana, 1974), 275.

[63]Soil Research Institute. Annual Report for 1974-1975. Council for Scientific and Industrial Research (Kwadaso, Kumasi: 1975), 38.

[64]Ibid.

[65]Kwame Nkrumah, Neo-Colonialism: The Last Stage of Imperialism (New York, N.Y.: 1965), 9.

[66]Ibid.

[67]Ibid.

CONCLUSIONS

The problem of plant pests and diseases is yet to carve its niche in African historical studies. The absence of research into government initiatives to suppress biological hazards that have afflicted Ghana's cacao economy, has promoted the persuasive but untenable perception that the state offered no contributions to the evolution of the world's biggest plantation system in Ghana. This study has synthesized data from a variety of government and international documents along with scientific journal publications, experiment station reports and material from the social sciences to demonstrate the significance of the government's long struggle with cacao plant pests and diseases in Ghana. As an operational definition, the state or government in this analysis, encompassed decision makers in the legislative and executive branches of government who formulated policies, enacted legal statutes, utilized bureaucratic institutions like the Department of Agriculture and the Social Welfare Services, or created specific institutions like the Cacao Research Institute to combat cacao plant pests and diseases.

The government used botanic stations and travelling inspectors initially to promote cacao cultivation for export in Ghana. However, it was in the realm of disease control that the state made its most signal effort to preserve Ghana's cacao economy from plant pests and diseases. Government

attention to mycological and entomological hazards to the cacao crop originated as an incidental adjunct to the primary official policy to promote export agriculture in Ghana. Once began, state involvement in disease control proceeded gradually over an extended time frame. The gravity of the problem of plant pathogens compelled bureaucrats in the colonial Department of Agriculture to build and strengthen its technical manpower division, albeit slowly over time, to research and eradicate the disease-causing organisms from Ghana's rain forest.

Between 1910 and 1935, it was the colonial Department of Agriculture and its technical staff of mycologists, entomologists and travelling instructors who worked to help protect Ghana's cacao economy from pathogenic attacks. These efforts were directed primarily against the Capsid and Black Pod diseases. With the outbreak of the Swollen Shoot epidemic in 1936, the state created an international cacao agricultural and research and experiment station in Ghana. This institution carried out biological research, and with the support of government bureaucratic mechanisms, extended research findings to farmers to curb cacao morbidity.

The colonial Department of Agriculture, in the preliminary phases of these initiatives, exhibited several weaknesses. From 1910 to 1936, bureaucrats in the Department advised cacao farmers to suppress fungal and entomological

problems without the services of a viable agricultural science research station. It is true that the colonial government created the Central Cacao Research Station in 1937 to pursue research work on cacao pathogens. But none of the station's scientific findings, especially on plant virus control, could be implemented owing in part to the depression of the 1930s and mainly because of the Second World War. The era between 1910 and 1943 may therefore be characterized as the period when the state initiated directives on cacao disease control but left the farmers to their own devices to implement them.

This study maintains that the impact of technocrats and bureaucrats in suppressing cacao pathogens in Ghana was marginal up to World War II. But their efforts provided a valuable foundation and guideline to biological research which the Cacao Research Institute, created in 1944, followed with remarkable consistency thereafter. The government's impact on cacao diseases after World War II, represented a significant turning point in Ghanaian agricultural history. Over the years, therefore, an unwritten partnership came to exist between rural Ghanaian cacao growers and the state, whose joint, although independent efforts led to the emergence and preservation of Ghana's cacao economy from plant pathogens. In this interaction both the farmers and the government acted in self interest. Cacao growers responded to market mechanisms for incomes to support their livelihood. The state

on the other hand, protected the cacao economy from pathogenic onslaughts because government revenues derived largely from cacao export taxes which financed state apparata and socio-economic improvements.

Had the government failed to perform this vital research service, (which lay beyond the skills and financial resources of rural inhabitants) Ghana's cacao plantations along with the financial health of the state would have faced extinction. Historical precedents of plant devastation by diseases in the earliest cacao economies of the western hemisphere provided strong support for these assertions. This work has evaluated the historical role of the state in promoting agricultural research and extension services to benefit Ghanaian rural farmers in the colonial and immediate post-independence period. The perception, therefore, that the colonial state neglected Ghana's cacao economy requires serious modification.

This work has revealed and presented new opportunities for research. Historical topics in Agricultural Science are feasible over the entire extent of Africa, Asia and Latin America. Specific aspects of this study on cacao pathogens in Ghana demand further in-depth investigations in their own right. These themes include cacao warehouse diseases, the enforcement of plant quarantine laws in Ghana, and the environmental impact of anti-Capsid spraying schemes in the countryside. But it is probably the role of Swollen Shoot

control politics in Ghana which requires top priority attention.

This research effort has highlighted the contribution of Ghanaian rural politics to the rise of mass agitation against British rule after World War II. This line of interpretation is significant historically because it helps to clarify two issues. An evaluation of rural politics in the era of decolonization explains why Ghana, a major dollar earner for the British, became the first to achieve political autonomy in sub-Saharan Africa, while Britain's other less resource-endowed dependencies remained much longer under colonial rule. Preliminary findings suggest that the cacao virus diseases from Ghana's forest belt created a series of political convulsions which mobilized rural inhabitants behind urban-based nationalist politicians in Ghana. This unique experience enabled the Gold Coast, among other factors, to emerge as the first independent Black African nation.

In essence, this analysis has demonstrated the need to examine the interaction of both urban and rural politics before and during the process of decolonization in Africa. The existing historiographical literature has presented an elitist bias purporting that the independence process in Ghana was uniquely urban in character. Rural discontent under colonial rule and beyond, deserves closer research consideration. Such an approach would offer realistic

interpretations of African rural politics, economy and society during the colonial and post-colonial era. Further studies of this subject in Ghana and elsewhere in Black Africa would be illuminating and intellectually fulfilling.

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EPILOGUE: GHANA'S CACAO DISEASE PROBLEM: 1967-1991

Ghana's cacao economy began a headlong decline in the mid-1960s when the state withdrew inputs from disease control. Before then, Ghana the world's most prolific cacao producer, contributed an average of 30.5 percent of global supplies. The nation reached its production peak with 590,000 tons in the 1964-1965 crop season representing 38 percent of world output. A different picture emerged in the 1968-1969 crop year when Ghana produced 339,300 tons of cacao and only 27.4 percent of world output. The downward trend has persisted. For example, in the 1979-1980 crop season, the country's cacao exports amounted to 271,000 and 18.1 percent of global cacao stocks. In 1981-1982, Ghana, with 225,000, contributed only 13.0 percent of total exports. In 1983-1984, Ghana's cacao plantations yielded only 158,000 tons and slipped from the top cacao producing nation in the world to the fourth in the 1987-1988 crop season. The leading cacao exporting countries today are Cote D'Ivoire, Brazil and Cameroon in that order.[1]

Under army rule, Ghana has since 1972, devised measures to revitalize the sagging cacao economy. Colonel Ignatius Acheampong's regime (1972-1979), in its time, initiated a five-year blue-print from 1976 to 1980 to contain the Black Pod disease which has traditionally destroyed 20 percent of Ghana's production tonnage over the years. The plan

emphasized frequent harvesting of all ripe pods. The regime rationalized that the incidence of the Black Pod fungal disease was too low to justify expenditure on fungicidal treatment. On insecticides, the government's policy aimed to substitute "Afrocarb" for Gammalin-20 because of Capsid resistance to the latter. The program also stressed seed multiplication and planting stock that was resistant to the Black Pod and Swollen Shoot diseases. Specifically on Swollen Shoot, the standard procedure of hewing down infected trees and replacing them with hybrid seedlings formed a strong part of the government's agenda. The state planned to renew all cacao inputs especially spraying machines, insecticides and extension services.[2]

In effect, the Cacao Production Division of the Ministry of Agriculture embarked upon a cacao improvement project in Suhum in the Eastern Region at a cost of six million dollars in 1970 with world bank loans. Targeted for completion in 1977, this undertaking aimed to replant 36,000 acres in the plan period. In the second phase, which started in the 1978-1979 crop year, the government highlighted the replacement of 25-30 year trees with high-yielding varieties.

These policies fell far short of their mark. In a survey conducted in 1977, cacao inputs such as insecticides, spraying machines, seed and seedlings proved inadequate. Though cacao planters required a total of 4.5 million liters of

insecticides, the state supplied only 875,000 or 19 percent of the total. In the 1970s, the supply of Gammalin-20, the most popular insecticide in Ghana, came up to 20 percent of the estimated demand. It was only in the 1976-1977 crop year that 56 percent of the required quantity could be satisfied. In 1977-78, Ghanaian cacao growers demanded an estimated 98,000 units of sprayers. In actuality, only 37,000 spraying machines in working order were available in the country. The quality of cacao seeds and seedlings obtainable from agricultural research stations was totally inadequate. Of the farmers interviewed, 60 percent reported that they produced their own seed and seedlings, which were not the usual high yielding Amazonia variety.[3]

In fact, Ghana's declining cacao economy reflected a general deterioration in the nation's fiscal programs. After independence in 1957, President Nkrumah's one party state spent intensively on modernization programs. The importation of equipment and machinery to construct roads, the harbor and township of Tema, several import substitution industries, a hydro-electric dam at Akosombo, numerous secondary schools, and two modern universities along with a policy of fee-free compulsory education ate deeply into Ghana's financial resources and foreign currency reserves. Moreover, the national budget also supported free medical care for all. These items of state expenditure were undoubtedly costly.

When cacao produce prices dropped drastically in the 1960s, the run down in Ghana's external purchasing power could not be replenished.

In 1966, the Ghana police and army uprooted President Nkrumah's government partly for reckless financial commitments and expenditures. Political instability, resulting from a military coup in 1972, another in 1979 and yet again in 1981 derailed the continuity of sound economic planning. The military junta under Colonel Acheampong, 1972 to 1979, was extremely profligate in its use of scarce national resources. Inputs into cacao disease control under this regime, if any, were indeed minuscule.[4]

Cacao farmers lost the incentive to produce when they received poor producer prices from the 1960s. Ghana's traditional cacao diseases namely the Black Pod, Swollen Shoot and Capsid pests made severe inroads into many farms. Labor shortage also jeopardized the cacao economy. Most cacao farms were built with family labor. After independence, the accessibility to education enabled most farmers' children to accept urban employments. Meanwhile most cacao growers aged. The dearth of family labor could not be redeemed with hired workers which was expensive. The nation's extension services deteriorated. When cacao trees aged and died, cacao growers did not replace them due to lack of superior planting stock but mainly because low produce prices provided no incentive to

effort.[5]

To gain better incomes, some cacao planters aggressively smuggled their produce for sale at higher prices in neighboring Togo and Cote D'Ivoire. Ghana experienced balance of payment difficulties when faced with constrictions in cacao export revenues. Meanwhile, state attention to the cacao economy remained static. A World Bank study report for 1984, observed that, "In spite of its importance, there does not appear to have been constructive government cocoa policies," and that "unless producer prices and insecticides are increased production would decline to less than 150,000 tons by the end of the 1980s."[6]
This assessment could not have been more accurate.

After a coup d'etat of December 31, 1981, the new military government under Flight Lieutenant John Jerry Rawlings instituted an Economic Recovery Program to revive Ghana's economy. The government increased producer prices from 12,000 cedis ($34.00) in 1982-1983 to 165,000 ($471.00) in 1988-1989, and then to 224,000 cedis ($640.00) in 1990 as an incentive to production. The newly created Cocobod (formerly the Cacao Marketing Board) introduced more seedlings, machetes, and spraying insecticides into cacao producing villages. These inputs and financial incentives boosted the farmers' efforts. Smuggling abated and production jumped to 300,000 tons for the 1989-1990 crop season.[7]

However, as in the 1960s, world cacao prices slumped. The producer price per ton which stood at $2,602.75 in 1980 dropped to $998.55 in 1989, a fall in export price by 61.6 percent. Ghana's estimated loss in export revenues amounted to $200,000,000. Overseas cacao manufacturers benefitted from the low produce prices. Wrote a London based African news magazine, "At the same time, the manufacturers of chocolate and its allied products reaped huge profits with chocolate prices for the same period increasing from $544.65 per ton in 1970 to $7,593.74 in 1989." Due to sagging export prices, the government of Ghana, as a remedial measure, considered processing cacao into high quality cacao liquor to improve earnings.

In Ghana, cacao plant diseases have persisted as a permanent menace. Yet still, their control have often led to higher output levels which automatically results in declining prices. Under-production on the other hand, have always produced less than an opposite effect. Unstable cacao prices therefore conform to the unwritten axiom that primary producers must industrialize in order to guarantee a measure of economic viability. Economic diversification stressing the production of several competitive cash crops in modest quantities might probably offer a viable substitute to a monocultural economy such as Ghana's cacao economy.

Endnotes

[1]Ghana. Ministry of Economic Planning. Five Year Development Plan, 1975/1976 - 1979/1980. Part II (Accra, Ghana: Ministry of Economic Planning, January 1977), 44.

[2]M. M. Huq, The Economy of Ghana, The First Five Years Since Independence (London: McMillan Press, 1989), 110. See also, Ministry of Agriculture Report on Ghana. Sample Census of Agriculture. Vol I (Accra, Ghana: Government Printing Department, 1970), 61.

[3]Five Year Development Plan, 1975/1976 - 1979/1980 (1977), 50-52.

[4]Huq, The Economy of Ghana (1989), 113.

[5]For a background study of the myriad of military coups in Ghana, see Barbara E. Okeke, 4 June: A Revolution (Ikenga Publishers, Enugu, 1982), 36 & 127; and Kojo Yakah, The Trial Of J. J. Rawlings: Ethos of the 31st December Revolution (Accra, Ghana: Ghana Publishing Corporation, 1986), 12 & 29.

[6]A World Bank Country Study. Ghana. Policies and Programs for Adjustment (Washington D.C.: The World Bank, U.S.A., 1984), 59.

[7]Ibid., 39.

[8]Anonymous, "Cocoa Boom," West Africa (8-14 October 1990): 2613; and Anonymous, "Ghana Export Venture," West Africa (6-12 May 1991): 716.

ACKNOWLEDGEMENTS

It is customary for students to acknowledge the role and influence of their academic advisors after completing their dissertations. This author faithfully follows this time-honored precedent. To my supervisor, Associate Professor, D.M.P. McCarthy, I say, accept my gratitude. My stay in the History Department at Iowa State has been fruitful and enjoyable with your kind support, rapport and empathy.

Let me also seize this opportunity to thank all the members of my committee, namely, Professors Adrian Bennett, Andrejs Plakans, Douglas Hurt of History and Robert Mazur in the Sociology Department. Your suggestions and recommendations to enhance the quality of this work were truly worthwhile. To Professors Richard Lowitt and Richard Kirkendall who afforded me the opportunity to fulfill my academic expectations and aspirations at Iowa State University, I extend my heartfelt salute.

Several individuals have made solid contributions to the outcome of this study. Dr. Jemmy Takrama, formerly of I.S.U. and now at Windsor, Canada, accept my profound gratitude for sharing your research experience in plant diseases with me. Thank you for carefully delineating the broad distinctions between virological, mycological and entomological plant pathogens. This timely gesture immensely aided the research and analysis of the data for this work. To Dr. Emmanuel

Asigbee, formerly of Lamoni and now at Kirkwood College at Cedar Rapids, thanks for your support. To Dr. Joseph Oppong, Visiting Professor of Geography at the University of Iowa (1990-1991), my infinite thanks to you for teaching me the fundamentals of word-processing and letting me use your office facilities deep into the night to complete this job. I am deeply grateful for your assistance.

Particular individuals deserve special recognition for their financial contributions to this project. Dr. David Henige of the Africa Department, University of Wisconsin, at Madison, directed me to valuable sources on plant disease control and its results at the university's Land Tenure Center and donated $25.00 towards xeroxing costs. Professor Henige, kindly accept my appreciation for your keen interest in my research at Madison in the summer of 1989.

At Ames, the chair of history, Professor Andrejs Plakans made funds available for photo-duplicating expenses. Plakans along with Professors Doug Hurt and Robert Scoffield offered me the I.S.U. History Department's Garst Fellowship for 1990-1991. Without this financial "privilege," the production of this dissertation would have faced formidable obstacles. To the Garst Committee therefore, I say thank you for placing your confidence in my abilities. It was a tremendous morale booster. I hope I have lived up to expectation. To the Roswell Garst Foundation of London, England, please accept my

deepest gratitude for making the endowment available for this project. The experience of producing the dissertation was at once uplifting, harrowing and memorable.

I also wish to acknowledge the personal efforts of Professor Adrian Bennett III towards my degree. At I.S.U, Professor Bennett offered me exceptional support and encouragement towards the doctorate. In 1988, he worked unstintingly with me to publish a prize-winning article in Agricultural History on Japan's food farming programs in wartime Southeast Asia. In the 1989-90 school year, he donated $300.00 towards xeroxing expenses. This financial grant made available to me a vast body of printed materials on plant diseases from a wide spectrum of scientific journals. During the leave of absence of my major supervisor to England in 1991, Professor Bennett as acting chair, communicated effectively and regularly with me about the progress and pace of my writing and promptly returned written work with detailed comments. These efforts, Professor Bennett, are indelibly etched on my memory. I shall forever cherish them.

At Oxford, Iowa, and at the University of Iowa, I encountered several individuals in a social setting who made my stay comfortable. To Robert Scherf, formerly of the U.S. army in Germany, and now a student at the University of Iowa, thanks for being the ideal house-mate. I shall forever remember your attempts to Americanize my eating habits and

repairing my car without charge to help me save money. May your recent marriage to Laura Boomershine be a long and fruitful one. To our landlady, Ellen Cline, also of the U.S. army in Germany and now in Turkey, it was good to know you. Thanks for typing the initial drafts of my dissertation.

To Dr. A. Ayebo, thanks for engaging me in numerous games of tennis and scrabble which helped to relax the tedium of my academic exertions. The same goes for Drs. Fubara Blessing of Coralville and Musah Alhassan at St. Cloud, Minnesota. To Dr. Stephen Ampofo, I say, accept my appreciation for assisting me to settle down speedily in Oxford. Without this aid, my ability to find a footing in the environs of Coralville and Iowa City would have been difficult. To all the other Ghanaians at Iowa City, Henry Owusu, Dr. Jay Sa-adu and his wife Hawa, Mr. Ofori Akyea and his wife Miranda, Eugenia Asigbee of Cedar Rapids and the kids, along with others too numerous to mention, thank you for your company and cordiality. You have all been wonderful.