

Delivery Order No. 2, Activity B

Contract No. DHR-5555-Q-00-1087-00



**EPAT/MUCIA**

**ADJUSTMENT, AGRICUTRURAL MARKETING, AND ENVIRONMENT:  
The Case of Ghana**

by

**Tugrul T. Temel  
Terry L. Roe**

July 1994

Prepared for

Office of Sustainable Development  
Division of Productive Sector Growth and the Environment  
Bureau for Africa  
U.S. Agency for International Development

by

Environmental and Natural Resources Policy and Training Project (EPAT)  
Midwest Universities Consortium for International Activities (MUCIA)





**EPAT/MUCIA**

Delivery Order No. 2, Activity B

Contract No. DHR-5555-Q-00-1087-00

**ADJUSTMENT, AGRICUTRURAL MARKETING, AND ENVIRONMENT:  
The Case of Ghana**

by

**Tugrul T. Temel  
Terry L. Roe**

July 1994

Prepared for

Office of Sustainable Development  
Division of Productive Sector Growth and the Environment  
Bureau for Africa  
U.S. Agency for International Development

by

Environmental and Natural Resources Policy and Training Project (EPAT)  
Midwest Universities Consortium for International Activities (MUCIA)



# TABLE OF CONTENTS

## PART I

Preface

Executive Summary

**1 INTRODUCTION**

**2 BACKGROUND**

2. 1. Overview of Economic Performance: 1955-1985

2. 2. Overview of Economic Performance: 1985-1993

2. 3. Ghana's Macroeconomic Imbalances

2. 4. Policy Reform and the Environment

**3 AGRICULTURAL MARKETS**

3. 1. Policy Reforms and Agricultural Markets

3. 2. Linkages Between Government and Private Marketing Institutions

3. 3. Cost Structure of Farm Product Marketing

**4 ENVIRONMENTAL IMPACTS**

4. 1. Sub-sectoral Analysis of Environmental Impacts

4. 2. Assessment of Environmental Interactions Between Sub-sectors

4. 3. Fishery, Forestry, Salt Mining, and Commercial Agriculture

**5 ENVIRONMENTAL AND MARKETING IMPLICATIONS OF ADJUSTMENT**

**6 CONCLUSIONS AND DISCUSSION OF FUTURE RESEARCH**

References

## PART II

### APPENDIX I

#### A SURVEY OF THE LITERATURE: THE IMPACTS OF ADJUSTMENT POLICIES ON AGRICULTURAL MARKETING AND ENVIRONMENT IN GHANA

- 1 Introduction
- 2 Background
- 3 Approaches to Evaluate Market Performance
- 4 Structural Adjustment
- 5 Agricultural Markets
- 6 Environmental Impacts

### APPENDIX II

#### A METHODOLOGY FOR ANALYZING SUB-SECTORAL ENVIRONMENTAL IMPACTS OF ADJUSTMENT

- 1 Introduction
- 2 Basic Concepts in Iconic Forms
- 3 Discussion and Conclusions

## PREFACE

This monograph focuses on the environmental and agricultural marketing implications of Ghana's structural adjustment program, and suggests areas in need of further query as well as expressing some concern and support for various components of the program. The monograph is largely based on a review of official documents and studies of the Ghanaian economy, and from the experience of other countries as they pertain to the Ghanaian situation.

The monograph is divided into two parts. Part I is the main body of the monograph. It has six sections. Following the introduction, Section 2 outlines the main characteristics of inward-oriented policies pursued prior to 1983, explores the constraints imposed on the economy by these policies, and highlights the major economic reforms implemented after 1983. Then, the macroeconomic imbalances existing in spite of economic reforms, and actions to correct for them are discussed. Section 2 concludes with a discussion of the environmental implications of the reforms on health, productivity, and the degradation of natural resources.

Section 3 describes the agricultural marketing system; attention is directed to marketing channels and the marketing services of time (storage), space (transportation) and form (quality, variety of goods and inputs). The interactions among institutions involved in marketing activities and how they relate to agricultural input and output markets are also discussed. In particular, the effects of economic reforms on marketing (market structure, conduct, and performance) are examined by focusing on (i) the linkages between public and private marketing agents and (ii) the cost structure of marketing.

Until recently, environmental impact analysis was primarily based upon the direct

effects of structural adjustment policies. Therefore, in Section 4, we emphasize the need for a more detailed analysis of environmental degradation at the sub-sectoral level and discuss the indirect environmental effects of economic reforms undertaken in 1983. Section 4 also explores a number of potential interactions between ten sub-sectors of the economy. The production activities of these sub-sectors are related to each other using a "policy matrix" approach in order to suggest the dominant sources of degradation. Moreover, we discuss the possible environmental effects of trade and investment policies (TIP) designed to encourage non-traditional agricultural exports (NTAE). This section underlines the developments in fishery, forestry, salt mining, and commercial agriculture sub-sectors which seem to have potential to increase export revenues. Section 5 extends Sections 3 and 4, and discusses the pathways through which economic reforms simultaneously influence the environment and agricultural marketing, i.e., emphasis is placed on the interactions between environment and marketing activities. Finally, Section 6 concludes Part I of the monograph by suggesting areas in need of further query.

Part II of the monograph has two Appendices. Appendix I has six sections. Its purpose is to survey the literature on the impacts of adjustment policies on agricultural marketing and environment. Hence, this material supports and provides input or "data" to the more evaluative nature of the material in Part I. Following the introduction, Section 2 highlights the key features of the Ghanaian economy by underlying the main macroeconomic policies and sectoral developments. Section 3 introduces the marketing approaches utilized in understanding the different dimensions of marketing activities. Section 4 classifies key policy issues pursued as a remedy to overcome the economic crisis stemming mainly from implementing inward-oriented policies. Section 5 discusses the weaknesses in agricultural input and output markets and the various constraints to the expansion foreign trade in agricultural goods. In

particular, regarding input markets, it summarizes studies on the developments in marketing institutions, credit markets, infrastructure, and scale and efficiency; developments in output markets are discussed in the context of time-space-form of markets. Section 6 draws attention to studies on direct and indirect environmental effects of policy reforms. The health and productivity effects of environmental degradation are discussed in some detail.

Appendix II in Part II introduces the "policy matrix" methodology that is used in Part I to explore the sub-sectors that contribute to the environmental degradation the most. Because designing policies requires the determination of the sources of degradation, this methodology contributes to an understanding of the information structure prevailing between sub-sectors and suggest the type of information needed for environmental monitoring.

## EXECUTIVE SUMMARY

Ghanaian reform and accompanying structural adjustment policies to increase sustained per capita GDP have impacted agricultural marketing activities and the environment. A key component of reform is directed toward reducing the country's dependency on cocoa exports by contracting the government's direct participation in areas where markets otherwise function well and expanding the private sector's production of non-traditional exports (NTEs). The incentives reform provides to producers in the NTEs sector are seen as a major measure to help reduce the risk and variance in foreign exchange earnings and augment the availability of foreign capital and technology to the Ghanaian economy.

With essentially this strategy in mind, the USAID supported Trade and Investment Program (TIP) is designed to increase and diversify export growth through increasing private sector NTEs. The TIP aims at providing an enabling environment for private sector activities through strengthening public sector institutions involved in investment and export promotion. It supports private sector associations and firms to improve their capacity to export and to obtain export financing.

The reform program, and the TIP in particular, may have two major weaknesses. The first is the perceived need for balance of payments support that, in our view, should proceed on the conditionality that additional reforms to alleviate the underlying cause of the balance of payments and inflation be undertaken. The TIP entails a cash grant totaling approximately \$60 million as balance of payment support which can be counter-productive if treating the symptoms of an over valued cedi and trade deficit alleviates pressures to tackle their fundamental causes. The second weakness is that neither the TIP nor the IBRD's program, in our view, provide

sufficient incentives for the Ghanaian economy to attract foreign savings, and foreign or multi-national firms.

Privatization of state fertilizer enterprises and their distribution channels were effective in lowering (i) the increase in cost of devaluation for imported agricultural inputs, namely imported fertilizers, and (ii) the negative impacts of exchange and fertilizer rationing on small scale producers. Areas that lack a serious effort in measuring the likely economy-wide impacts of reform include identifying (i) those resource, policy and institutional constraints in the economy that are most likely to "run counter" to the fundamental forces of supply and demand that reform induces and hence the most efficient allocation of the country's resources, (ii) those natural resources whose demand is likely to rise and commensurate opportunity costs (or shadow prices) to assure their husbandry and long-run sustainability, (iii) the likely changes in the incidence of environmental degradation that reform engenders, and (iv) the kinds and levels of environmental policy instruments that are "consistent" with Ghanaian capacity to implement and minimize the externalities that reform can induce on the environment.

Based on the literature reviewed and our assessment of it, the agricultural marketing implications of policy reform appears to have weaknesses in four areas: (i) the lack of attention and emphasis to the design of policies and strategies/programs for their implementation that take into account the special and unique role of women and their participation in marketing activities as middle-women and as agents in primary production activities; (ii) the lack of encouragement and support for increasing agricultural productivity through the development of public institutions whose mission is to develop, adopt and adapt new chemical, biological and mechanical technologies, and the extension - communication of these technologies to farmers and marketers of agricultural inputs and outputs, (iii) the development of well defined and

enforceable property rights, and the development of more efficient and decentralized capital markets with consideration given to ways of lowering the transactions costs of providing credit to a larger number of small holders (this does not include the interest subsidies), and (iv) to better enable business involved in foreign trade to be made more aware of the information and supporting services required to take advantage of foreign market opportunities. While components of the TIP are in the "spirit" of addressing these weaknesses, we feel these issues should receive more emphasis in terms of both resources and understanding.

To fully employ the country's human resources and ease the country's adjustment to reform and economic adjustment from other sources, women need equal access to education (which needs to be upgraded for all) and their special role in marketing should be better understood so that the process of reforming capital markets, property rights etc., does not inadvertently "disenfranchise" them from new economic opportunities.

As reform provides incentives for the traded goods sectors of the economy to expand production (in particular, agriculture), the value of sector specific resources (e.g., land) should, in principle, rise in value thus increasing the collateralized capacity of the sector, provided property rights are well defined and enforced. Hence, environmental considerations aside, the need is to proceed rapidly with the establishment of these rights.

Constraints in the financial system hinder the mobilization of resources to support investment. National savings and investment rates are insufficient for sustainable growth, at least in the intermediate run. These constraints can be ameliorated by policies which encourage foreign capital inflows, and by addressing domestic structural constraints and policy deficiencies that limit the mobilization of savings, and the expansion of credit, particularly to those for whom transactions costs

are high. Credit inadequacies can be attributed to non-performing loans, managerial and institutional deficiencies in the financial sector. These inefficiencies in the financial system contribute to low agricultural productivity in the following ways. First, poor access to credit has hampered effective demand for new technology and purchased inputs, particularly for small holders. Second, the insufficient flow of institutional credit lead small holders to borrow in informal credit markets at high interest rates. Measures to rectify these problems largely require encouraging institutional-capital market reforms and training programs that, among other effects, lower loan transactions costs for small holders.

Another issue tightly connected to weak credit institutions is the inadequate supply and distribution of inputs. Moreover, the privatization of agricultural input markets and removal of input subsidies are policy reforms expected to "rebalance" the former income transfers to large relative to small holders.

Inward oriented policies tended to provide disincentives to the creation of storage capacity in agriculture and fisheries. Reform is expected to increase incentives for increasing capacity. However, in the case of fisheries products, economies may exist for the public provision of storage (for a service fee), or storage provided by a association of producers; in either case subsidies per se should not be provided. That fisheries is an important source of income for small scale harvester should be taken into consideration in efforts to make market forces effective. Perishability of sea products is a crucial factor that influences their supply, preservation, and marketing. The lack of regulations, and in particular the enforcement capabilities of either government or an association of "fishery harvesters" threatens to cause over-exploitation of sea products. The development of an internationally competitive shrimp-prawn industry is also hindered by the externalities of effluent discharge from gold processing and human wastes.

While opening the economy to world markets should encourage the inflows of new agricultural technologies, cooperation between public and private sector research institutions, and the CGIAR should be further encouraged. Delays in the use of new technologies (chemical, biological, mechanical) by small holders and inefficiency in the existing credit institutions will lower the multiplier effects of reform on income growth. Therefore, a macroeconomic policy package should consider this strong complementarity between new technology and credit supply.

The major environmental problems encountered in Ghana are deforestation, soil degradation, water pollution, and air pollution. Policies to encourage the entry of foreign firms should also be accompanied by laws and regulations to assure their compliance with established environmental standards and husbandry of natural resources. For instance, reductions in subsidies, a competitively priced cedi, and the reduction of trade barriers induce foreign and local firms to be more competitive which in turn tends to increase the price (or social opportunity costs) of natural resources. Therefore, to better assure their husbandry, a strong legal system and an enforcement mechanism needs to be in place so that the replacement cost of these resources are fully reflected in the decisions of individual firms. Again, this emphasizes the need for property rights and a sense for the true opportunity costs of natural resources.

An improvement in agriculture's terms of trade and increasing migration to villages and cities will tend to have some positive and some negative implications for the country's natural resources (land, forest, and soil fertility). Deteriorating soil fertility is expected to place more importance on new technology and the efficient use of inputs, which in turn places demand on agricultural research and extension services to assist farmers in sustaining the productivity of fragile lands. Empirical case studies show that economic growth is the driving force of internalizing some health effects (those referred to as embodied) of environmental degradation. Other health

effects (referred to as disembodied) are less self correcting with growth than the former.

This observation implies that as per capita income growth occurs, Ghanaians are expected to spend an increasing portion of their income on activities to correct for some of the ill health effects of environmental degradation, while other adverse effects will require public intervention including sanitation, environmental controls, and disposable facilities for solid and gaseous industrial effluent. This brings about the issue of designing a national environmental policy as an indispensable component of a sound macroeconomic policy reform. In addition to mentioned need for policy which husbands, in a socially optimal way, the country's natural resources, the general objective of a national environmental policy should be to encourage economic activity that increases the economy's production of "Goods" which augment well-being and decreases its production of "Bads" which otherwise decrease well-being.

In order to identify technologies and activities that decrease the environmental impacts of economic growth, sector specific studies should be conducted to collect data and determine those activities that lead to unsustainable use of the environment. Furthermore, the linkages between foreign firms and environment-natural resource use need to be identified so as to determine how much environmental degradation occurs owing to policies that encourage the foreign investment.

As noted reform, if successful, will drastically alter incentives of what, where and when to produce and consume. While it is clear that reform will provide increased incentives for the traded goods sector of the economy (both for export and import competing goods, factors and services) to expand production relative to the home goods sector, it remains unclear which of the traded goods sectors, in relative terms, will expand and which will contract, which resources (including various human skills) will become relatively more scarce and hence act as a constraint to further expansion.

Moreover, it is also clear that reform will alter the incidence of environmental and natural resource degradation. Since Ghana is relatively natural resource rich, a risk exists of over exploitation so that growth cannot be sustained without appropriate safe guards. Further, it is likely that the livelihood of the low income quartile of the population is more dependent on natural resources than are those in higher income profiles. It is also true in many other countries that the environmental impacts on health are more deleterious for low income households. An economy-wide analysis of these key linkages are required to identify and guide domestic and supporting donor policy to deal with these key issues and bottlenecks to attaining a more efficient and sustainable growth path. Studies of this type are now fairly common. They draw upon the so called computable general equilibrium methodology, and a number are based on a country's "green accounts," i.e., national accounts that take into consideration a country's stock of natural resources and their rate of degradation.

## 1. INTRODUCTION

The events leading to Ghana's Economic Recovery Program (ERP) in 1983 included a precipitous decline in real GNP, a fall in agricultural productivity, increasing budget and trade deficits, fall in private capital formation, and virtual lack of liquidity to engage in foreign transactions (Clark and Lofchie, 1993). A consequence was the government's inability to deliver basic services and mobilize the returns from public investments, Alderman (1991). Switching from inward-oriented<sup>1</sup> to outward-oriented policies as well as increased reliance on market mechanism required several fundamental changes in the government's policies. Efforts to remove subsidies, liberalize the country's trade and payments regime and the privatization of state-owned companies received high priority in the reform program.

This monograph consists of two parts. Part I is the main body of the monograph that focuses on the environmental and agricultural marketing implications of structural adjustment program pursued by the Ghanaian government. First, we outline major policy reforms and then discuss their direct and indirect effects on environment and marketing. Special emphasis is given to sub-sectoral analysis of environmental factors and the implications of reforms on the activities taken place in input and output markets. Part I is concluded by indicating areas that need further research. Part II consists of two appendices. Appendix I aims at providing a more detail discussion of reviewed studies. Appendix II introduces a methodology which helps establish a structure of environmental factors at sub-sectoral level to determine the dominant sub-sectoral activities that contribute degradation the most.

---

<sup>1</sup>This terminology is largely due to Bala Balassa (1986) and refers to policies that protect an economy from foreign competition, and thus tend to decrease the share of the economy involved in foreign trade.

## **2. BACKGROUND**

The following section analyzes the performance of the Ghanaian economy before and after the 1983 reforms. Here we discuss the major constraints imposed on the economy by the inward-oriented strategy and the consequences of outward-oriented policies designed to open the economy to the world market. This discussion provides insights into the consequences of pre 1983 policies on the economy, the consequences that reform seeks to undo, and its success to date.

### **2. 1. Overview of Economic Performance: 1955-1985**

The deleterious consequences of import-substitution industrialization (ISI) policies pursued before 1983 brought the Ghanaian economy to a near crisis. Some of general consequences of ISI policies include: (i) low returns to resources in the production of agricultural tradables, (ii) a concentrated and capital-intensive industrial structure, (iii) narrow marketing margins that tended to discourage the private sector from agricultural marketing activities, (iv) rural-to-urban migration, (v) biasedness in the distribution of public goods between urban and rural sectors, and (vi) an industrial structure that made an inefficient use of the country's environmental and natural resources, Tritel and Thoumi (1986), Roe (1993) and IMF (1993). The distortions created in the economy by the ISI policies lead to additional government interventions. These interventions include subsidies, capital market controls, and import quotas.

The basic economic indicators of Ghana's economic performance during the period of 1955-1985 is provided in Table 2-1(a). Government interventions at levels that exceeded its capacity to balance its budget began in the early 1960s, and grew to crises proportions in the mid 1980s. Government expenditures exceed fiscal revenues by an average of 22 percent from about 1960 through 1972, reaching an average high deficit of 73 percent of revenues during the "oil shock" decade 1973-1983.

Table 2-1(a): Economic Indicators, 1955-1985 (millions of cedis)

| Period  | Nominal<br>GDP | Govt.<br>Rev. | Govt.<br>Exp. | Govt.<br>Surplus | % of      |     | 1972=100<br>CPI | Annual<br>Rate of<br>Inf. (%) |
|---------|----------------|---------------|---------------|------------------|-----------|-----|-----------------|-------------------------------|
|         |                |               |               |                  | Govt. Rev | GDP |                 |                               |
| 1955-57 | 695            | 122           | 99            | 23               | 14        | 3   | 38              | 3                             |
| 1958-66 | 1,083          | 182           | 225           | - 44             | -22       | -4  | 50              | 8                             |
| 1967-72 | 2,130          | 365           | 442           | - 77             | -22       | -4  | 83              | 5                             |
| 1973-83 | 42,393         | 2,632         | 4,564         | -1,931           | -73       | -6  | 2,980           | 62                            |
| 1984-85 | 321,772        | 30,210        | 36,229        | -6,019           | -21       | -2  | 21,262          | 25                            |

Stryker (1991) p. 88-90.

These expenditures in excess of revenues emanate from a host of interventions that are most easily typified as those associated with countries pursuing policies of import substitution industrialization (ISI) accompanied by efforts to maintain low prices for food staples. Associated with these policies was the creation of a host of state and quasi-state owned enterprises. These enterprises were created in response to two general forces. They were created as part of the structure needed to implement the ISI policies, and they were created in response to pressures of special interests whose support was sought by the public sector.

The inevitable result was a number of macro economic imbalances that further exacerbated the direct effect of the ISI distortions on the economy. Inflation rose to 62 percent and 25 percent, respectively for the periods 1973-83 and 1984-85 (Table 2-1(a)). The resulting appreciation of the real exchange rate lead to sizable trade imbalances (Table 2-1(b)) as producers of the export goods sectors of the economy were implicitly taxed, consumers of these commodities and services subsidized, and resources were pulled from the production of export goods and pushed into the production of non-traded goods and into the production of import - competing goods. Since the

agricultural

Table 2-1(b): Current Account Balance, Actual and Equilibrium Exchange Rates, 1958-85

| <i>Period</i> | <i>Current Account Balance (millions of dollars)</i> | <i>Nominal Exchange Rate</i> |                 | <i>(NC) Equilibrium</i> |                 |
|---------------|--|------------------------------|-----------------|-------------------------|-----------------|
|               |  | <i>Official</i>              | <i>Black Mk</i> | <i>PPP</i>              | <i>Model(a)</i> |
| 1958-66       | -87.0  | 0.71                         | 0.83            | 0.97                    | 1.29            |
| 1967-72       | -46.3  | 1.01                         | 1.70            | 1.38                    | 1.46            |
| 1973-83       | -135.5   | 1.97                         | 20.20           | 19.17                   | 18.15           |
| 1984-85       | -238.7   | 44.70                        | 147.50          | 125.90                  | 107.47(b)       |

PPP, purchasing power parity

(a) Estimated using a simulation model; (b) does not include 1985

Stryker (1991) p. 88-90.

sector of the Ghanaian economy is a major producer of traded goods, policy discriminated against resources in this sector. Stryker's estimates (p. 104) of the level of total nominal dis-protection of cocoa producers range from an average of 42 percent of relative boarder prices during the 1973-83 period to 59 percent during 1984-85.

Listing some of the key negative effects that these policies appear to have had on the Ghanaian economy is useful because the list suggests the types of activities and policies that need to be encouraged in order to undo them. An overview of this list is provided in Figure 1.

First, in the absence of other distortions and resource transfers to agriculture, the results provided by Stryker and others (Bates & Krueger, 1993) suggest that: (i) the returns to resources in agriculture were more adversely affected by macro-economic policies and policies pursued to benefit the urban industrial sector than they were by

policies within the sector alone and (ii) policy has served to decrease the returns to resources employed in the production of export commodities, i.e., in commodities where returns to resources are relatively high, compared to the resources employed in the production of import competing commodities.

Non-traded commodities also are affected by the distortions in traded commodities. The ISI policies tend to cause the ratio of the prices of non-traded to traded agricultural commodities to rise (although, the prices of non-traded commodities may fall in absolute terms) in the presence of an over valued currency. Consequently, the implicit taxes imposed on traded commodities can be expected to "push" more resources into the production of non-traded sector. Second, protection of the import-competing industrial sector tends to lead to a concentrated and capital intensive structure, with small relatively high-cost plants unable to compete in world markets. Scale economies are limited to the domestic market, so that agriculture tends to suffer an additional source of taxation. The intermediate factors of production that agriculture obtains from protected industries tend to be of inferior quality and often more costly than those available in world markets, while prices of agriculturally produced goods sold to these industries tend to be under priced relative to the world market.

This is not an unusual outcome. In the case of Brazil for example, Brandao and Carvalho (1991) report that the farm gate prices of soybeans were lowered by export taxes placed on soybeans to encourage the domestic milling of oil; Intal and Power (1991) report that the Philippines banned the exports of copra to encourage the domestic processing of oil. If inputs are subsidized, then part of the burden is passed to the government, although poor quality and problems of timely delivery can be viewed as an increase in the real prices of inputs to producers.

Third, the narrowing of the marketing margins that intervention in selected agricultural input and output marketing activities often implies generally leads to an exodus of the private sector from these activities<sup>2</sup>. Effectively, the public sector assumes many of the functions of resource allocation over time (storage), space (transportation) and form (processing). While these interventions tend to lower temporal variation in prices, the result is inefficiencies in both public and private sector resource allocations and the emergence of parastatal fiscal deficits that are eventually funded through domestic resource transfers, money creation, or foreign borrowing.

Fourth, prospects of relatively high real wages in urban areas tends to induce a rural-to-urban migration. Migration is further induced as these policies tend to draw more resources into the production of non-traded goods produced in urban areas. In spite of the migration into urban areas, the absorptive capacity of urban labor markets is limited because of the mentioned industrial structure that import substitution policies tend to induce. Labor, that for numerous reasons finds it difficult to migrate, tends to get "locked" in agriculture. In the presence of high population growth rates, the absence of technological change and increased capital inputs, land-labor ratios can fall leading to a decline in the real wage in agriculture. These outcomes often create the illusion of economic problems in agriculture when the actual problem lies with the industrial sector of the economy.

Fifth, since protection makes the industrial sector appear profitable relative to agriculture, agriculture is forced to compete for resources that are artificially made more dear. This includes peak seasonal demand for labor and credit. Agriculture must also compete for public investments. If the analyses of the net social value of public

---

<sup>2</sup>For specific examples, see Von Braun and de Haen (1983), and Greene and Roe (1989) for the case of Egypt and the Dominican Republic, respectively.

investments by authorities does not adequately take into consideration the artificially induced profitability of returns to investments in the protected sectors, then public investments in the rural economy (education, health, physical infrastructure (Schuh, Roe, and Godoy (1994)), and agricultural technology in particular, are likely to be less than they would be in the absence of protection. As Braverman and Kanbur (1987) have shown, countries pursuing inward-oriented policies experience an urban bias in the allocation of public goods. An urban bias is particularly harmful to agriculture since its supply response is sensitive to the provision of public goods (Binswanger, 1989).

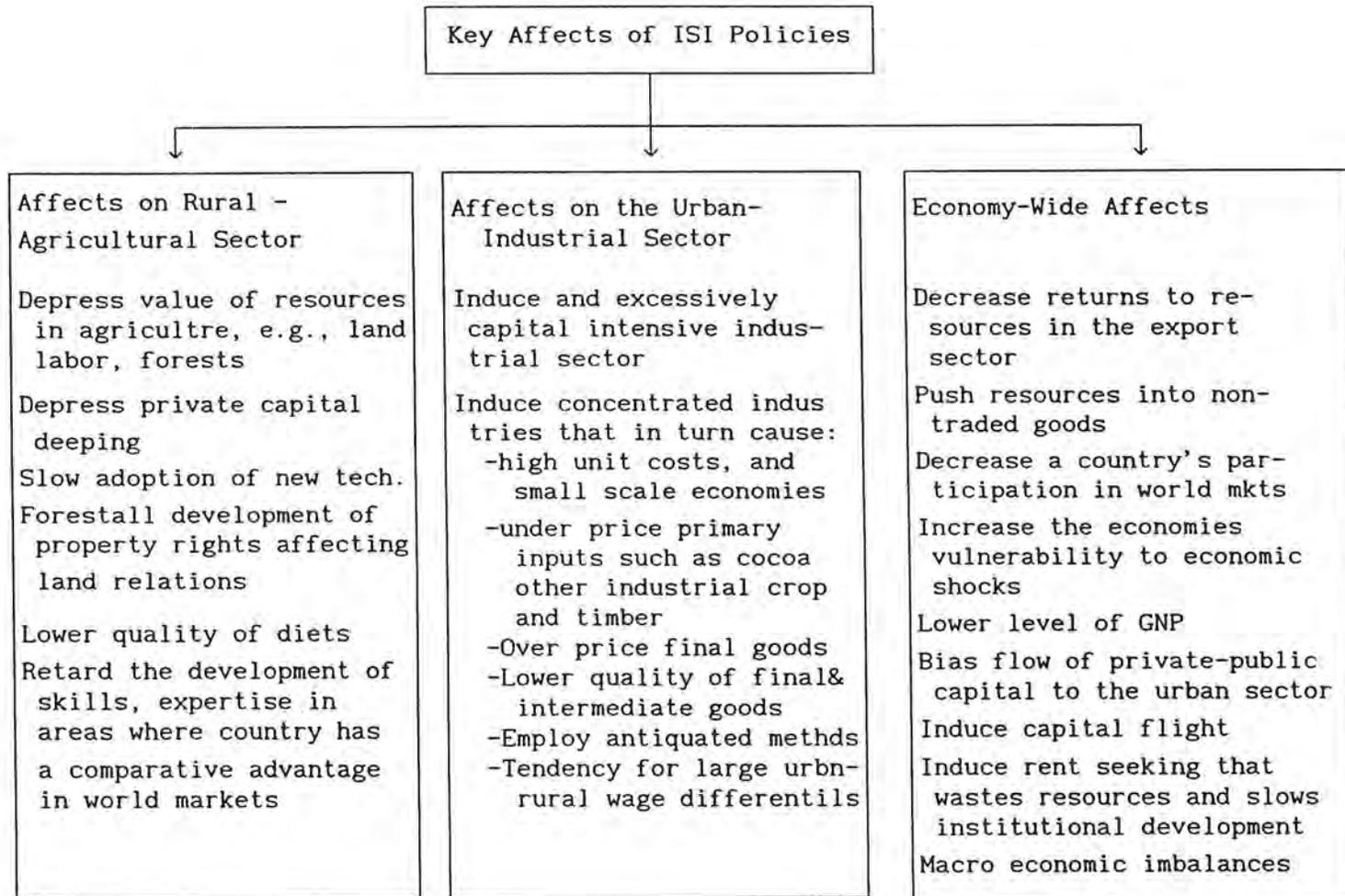
Sixth, while the provision of public goods may have an urban bias, the total level of public goods provided tends to fall below the level which would otherwise prevail in the absence of inward oriented policies<sup>3</sup>. Consequently, it is often the case that even the capital and/or regional administrative centers may have an inadequate provision of public goods to attract industries that could otherwise draw upon the country's most abundant factors of production. This lack of urban development further diminishes the opportunities for employment outside of agriculture and to concentrate employment in a few major cities.

Ghana's traditional exports (timber, cocoa, gold) are largely based on its endowment of natural resources. Since the ISI policies tended to tax the production of traded goods, the opportunity costs of these resources were almost surely biased downward. At the same time, the focus on market interventions, as in other countries pursuing similar policies, tends to retard the development of institutions and the definition and enforcement of property rights that can lead to a better husbandry of these resources, as we discuss in more detail in Section 5 of Part I.

---

<sup>3</sup>For a discussion of these issues, see George S. Tolley and Vinod Thomas, eds., The Economics of Urbanization and Urban Policies in Developing Countries, A World Bank Symposium, 1987.

Figure 1



The challenge facing reform is to reverse the effects of previous policy on the economy, while redirecting intervention into those areas where markets typically fail to optimally allocate society's resources; namely, areas which lower the transactions costs of market activities, and correct for the externalities that waste the country's environmental and natural resources.

## **2. 2. Overview of Economic Performance: 1985-1993**

The Economic Recovery Program (ERP) aimed at switching from direct intervention and controls toward increased reliance on market mechanisms. Financial and trade payments reforms were also implemented with the intention of opening the economy to the world market in order to bolster the competitiveness and increase the efficiency of domestic economic activities. Policy reforms regarding the efficient production, processing, and marketing of agricultural commodities targeted increasing productivity through the adoption of new technologies, the provision of efficient and reliable financial services, and rehabilitation of infrastructure. Among other objectives, the reforms are designed to raise rural incomes, improve efficiency in resource use, promote food security, increasing export revenues, and reduce balance of payments and budget deficits.

More specifically, the measures to achieve these objectives included trade liberalization, removing restrictions on internal trade, disseminating price information, restructuring public and banking sectors, encouraging cooperatives to participate in agricultural input markets, reducing input subsidies, and simplifying the export licensing system. Reforms also include the devaluation of the cedi after a long period of a constant nominal value (and hence an appreciating real rate), the adjustment of the price paid to cocoa farmers by the Ghana Cocoa Marketing Board, redeployment of labor in the public sector to increase productivity, undertaking such

programs as building roads, railways, health, and education programs to address the problems resulting from a biased distribution of public goods in favor of urban sector. Interest rates were gradually raised reaching positive real levels by 1985. Reforms in fiscal management were centered on the elimination of various subsidies and mobilization of new resources through improved tax collection.

In their review of these measures, Sarris and Shams (1991) conclude that the government has made significant strides toward realigning exchange and interest rates, providing an environment in which producers and consumers interacted on the basis of market signals, rehabilitating the social infrastructure, and restoring fiscal and monetary discipline. Fiscal revenues were also increased following reform of revenue collection and sales tax regulations.

These policies have resulted in a major improvement in Ghana's economic and financial performance since 1983. In particular, growth in real GDP recovered, inflation declined, and the overall balance of payments position switched from deficit to surplus. Devaluation of the cedi sharply reduced the black market premium and discouraged smuggling of the main export products. Reform improved the terms of trade for the non-agricultural component of the export competing sector of the economy and reoriented capital flows to the sector with a resulting increase in its output. Following reform, the industrial and service sectors have grown more rapidly than agriculture, while the flexible exchange rate policy and the associated gains in external competitiveness have contributed to an expansion in the volume of exports at an average annual rate of 10 percent during 1983-90.

The country's Transport and trade sectors, which are keys for the marketing of agricultural and manufacturing output, significantly contributed to the growth of agricultural sector. In 1987, agriculture contributed about 75 percent of total foreign exchange earnings, derived mainly from cocoa and timber. With increased

output, cocoa foreign exchange earnings increased thus contributing to a steady improvement in the country's balance of payments position (IMF (1991) and Sarris and Shams (1991)).

The objective of diversifying agricultural export and export promotion in general were not judged particularly successful. Therefore, in spite of the mentioned favorable adjustments, the strain on the balance of payments remained an important barrier in meeting external debt obligations.

Prior to 1983, emphasis was tended to be placed on large-scale, capital-intensive modes of agricultural production over small-scale farm units. An inevitable result of this biasedness in scale and factor intensity was the tendency to restrict resources and commercial opportunities to some farmers at the expense of small holders. This policy tended to decrease the multiplier effects from investments relative to the effects that would otherwise result when economic activity is linked to a larger number of independent enterprises. The absence of an agricultural policy to address this bias was clearly evident. For this reason, in 1986, a more scale neutral policy was undertaken. Its objectives include self-sufficiency in the production of food and industrial raw materials, improving storage, processing, and improvements in the distribution systems to lower post-harvest losses, increasing production of exportables, ensuring adequate returns to middlemen to strengthen the channels between producers and consumers, and improving existing institutions and facilities, such as the agricultural research centers, credit facilities, marketing facilities, etc.

Even though economic reforms under the ERP have been successful in realigning relative prices, improving fiscal and monetary prudence, enhancing the private sector investment climate, and initiating the rehabilitation of key infrastructure, many constraints to establishing sustained growth, increasing foreign and domestic investment and expanding exports still remain. In the context of the ERP, the

following obstacles to expand economic growth remain (USAID (1991z):

- i. a persistent inflation due to a combination of excess liquidity, a poor harvest in 1990, and exogenous shocks to the economy such as 1990-1991 Persian Gulf crisis;
- ii. trade deficit;
- iii. low mobilization of domestic resources to support investment;
- iv. low accountability of business risks due to a weak legal framework;
- v. speeding-up the divestiture of state-owned enterprises to make additional resources available for infrastructure, health, education, etc.;
- vi. constraints in agricultural sector include enhancing aggregate income growth, agricultural exports, and market access and integration (infrastructure such as the ports, harbors, feeder and major roads, railroads, telecommunication networks); and
- vii. numerous constraints in private sector relate to private sector led export growth.

*Issues relating to the design of policies to encourage foreign investment as a way to augment domestic savings are not addressed in USAID (1991z), nor does it appear that explicit emphasis has been given elsewhere (such as in the IBRD documentation) to these types of policies/strategies which attract foreign savings, and foreign or multi-national firms. One of the major successes of Mexico's reform program was the attracting of foreign savings<sup>4</sup>. Ghanaian policy makers need to design policies that place more emphasis on attracting foreign capital.*

---

<sup>4</sup>See the Special Issue of *The North American Journal of Economics and Finance*, 3(2), "NAFTA: Economic Effects on Agriculture, Capital Markets and Selected Environmental Outcomes," 1992:83-185 for a discussion of Mexico's reform policies and their affects on capital flows.

The survey of the literature on the above policy reforms pursued in Ghana focuses on (i) problems due to import substitution strategy and (ii) reforms to correct these problems and open the Ghanaian economy to the external world. Some of the studies this report examined, in this respect, include Tabatabai (1989), Hutchful (1985), IMF Occasional Paper (1993), and Bates and Krueger (1993). The main policy reforms implemented under the structural adjustment program are examined by Tabatabai (1986), the UNDP (1989), Srtryker and at. all. (1990), UNCED (1991), Jebuni, Sowa, and Tutu (1991), Goldman, Roemer and et al. (1992), Sarris (1992), World Bank (1993), IMF Occasional Paper (1993), USAID (1992a, 1992b, 1993) and Younger (1993). These studies are reviewed in detail in Sections 2, 4, and 5 of Appendix I. They also discuss the implications of such reforms as (i) liberalization of exchange rate, (ii) rehabilitation of the industrial, agricultural, and mining sectors, (iii) restoration of the infrastructural base of the economy, (iv) implementation of fiscal and monetary policies to achieve and sustain reasonable economic growth, and implications for government budget management, sectoral incentives, and international competitiveness. The effects of reforms on consumers' welfare, food security, producers' profit margin, and government's ability to implement policies are discussed in the following studies; Sarris (1992) measures the direct effects of reforms on the household welfare; Sarris and Shamas (1991) investigate the reasons why the rural food terms of trade dramatically declined after 1984; Alderman, Canagarajah, and Younger (1993) address the indirect effects of policy reforms such as redeployment of civil service staff on the government's ability of implementing policies. Sarris (1992a) discusses policies to alleviate food insecurity and the effect of growth on food security. His results show that food insecurity can be substantially reduced through increases in the incomes of all the groups, especially of the poor. Furthermore, growth policies that favor the poor or rural groups and agriculture, which provides a large source of income for the

poor, were found more effective at reducing food insecurity than growth policies that favor the non-poor or the urban sector in general.

Exchange rate policy which is the main tool in international competitiveness is examined by Kyereme (1991), Ghartey (1987), Ghartey and Rao (1990), Sherbourne (1986), and Pinto (1984, 1989). Chhibber and Shafik (1990) model active parallel market and show that in the presence of an active parallel market, official devaluation does not cause inflation because prices have already adjusted to the parallel exchange rate. Sherbourne (1986), Pinto (1984, 1989) analyze the implications of the unification of black and official exchange markets for the export sector. They investigate the relationship between (i) exchange rate, prices, and output, and (ii) devaluation and correcting the balance of payments deficits. We provide more detail on these studies in Sections 2 and 4 of Appendix I.

The main area in which the government's efforts are not succeeding is in managing fiscal deficits. The effects of large fiscal deficits and an over valuing exchange rate on the cocoa sector, which is the main source of government revenue, is studied by Sherbourne (1986), Islam and Wetzel (1987), and Catsambas and Pigato (1992). Furthermore, they study the inter-relationship between the fiscal deficit, the real interest rate, the real growth rate, and the real exchange rate and find the conditions under which Ghana's debt-to-GDP ratio is stabilized.

### **2. 3. Ghana's Macroeconomic Imbalances**

The Trade and Investment Program (TIP) of USAID for delivery in FY 93-94 seeks to support and be "consistent with" support from other countries and the programs of the IBRD and IMF<sup>5</sup>. Approximately \$80 million in outlays is planned over the five year life

---

<sup>5</sup>See the various USAID documents, in particular the Project Assistance Approval Document - Ghana Trade and Investment Program and the accompanying documents and appendixes.

of the program (TIP document, p. 1). While it is not our purpose to review, evaluate and assess the details of this program, we highlight here its major thrust, and leave to other sections of this monograph the details of the program on specific sectors, and agricultural marketing and exports in particular. As with any program, some gaps seem to exist, and some assumptions upon which the program is based may not be valid. We provide more detail on these general concerns in this section.

The general objectives of TIP are to: (a) increase the nominal value of the country's non traditional exports (NTE)<sup>6</sup>, (b) increase the number of firms directly engaged in NTE activities, (c) increase real per capital income, and (d) to create at least 60,000 new full-time NTE related employment opportunities by the end of the program<sup>7</sup>. The strategy for accomplishing these objectives are to: (i) improve the enabling environment, and (ii) increase the capacity of the private sector to export.

The enabling environment includes improving the country's ability to establish and develop a "policy framework," to reduce regulatory and administrative transactions costs, and to improve public sector export support services. These efforts include lowering the disincentives exporters now face in licensing regulations, making of export taxes and other regulatory activities more transparent and less discriminatory, developing a more uniform codification of commodity exports and imports, and more open and transparent legal structures. Efforts to increase the capacity of the private sector to export include training, technical and marketing assistance to business firms and business associations. Technical assistance will focus on helping the private sector to increase production volume, productivity, improve quality and uniformity,

---

<sup>6</sup>Non traditional exports include: wood products, sheanut and kolanut, aquacultural products, horticulture and handicrafts. Traditional exports include cocoa, gold, timber and electricity which have accounted for about 87 % of export earnings.

<sup>7</sup>This material is taken from the Agency's Project Assistance Approval Document.

sector to increase production volume, productivity, improve quality and uniformity, timeliness of product delivery, and the sourcing of materials, equipment, and services. Marketing assistance will seek to establish business associations to ease communication and contact with foreign firms and markets.

Hence, the program seeks to increase the level and rate of real growth by addressing those constraints that prevent or slow market forces from reorienting the allocation of resources in the economy in the direction of the traded goods sector, namely in the direction of NTE. Increasing NTE will also address the problem of increasing the country's foreign exchange earnings that in turn will be needed to recapitalize the country's obsolete, and in some case, misplaced plant and equipment. Since, as mentioned and summarized in Figure 1, previous policy implicitly taxed and thus retarded the growth of the export competing sectors of the economy, the overall thrust of the TIP seeks, correctly so, to redress these deficiencies by helping the Ghanaian government to provide public goods (broadly defined), to lower the transactions costs faced by producers and marketers of NTE, and to provide interim support to alleviate foreign exchange shortages.

The TIP and IBRD documents note that the country continues to incur a trade imbalance in goods and services, an unacceptably high inflation rate, and concern with the capacity of domestic savings to meet investment needs commensurate with attaining real rates of per capita GNP growth in the neighborhood of 5 percent. The persistence of these macro economic imbalances suggests that policy induced distortions which threaten the country's adjustment to a more balanced growth path.

*The causes of these imbalances are poorly understood and in need of further study. Our review suggests that the country's trade imbalance and persistent inflation rates cannot be explained by the inflow of capital alone. Consequently, in real terms, the country's currency appears to be over valued (over priced in terms of foreign exchange).*

This inference may seem odd when a "free" market exists for the currency, so that a value of the currency is obtained which, for all practical purposes, causes markets for exchange to clear. However, even though currency markets clear, the currency can become over valued when policy "shifts" or distorts the underlying demand and supply schedules for the currency. Distortions in the economy that almost surely contribute to the over valued cedi include: the financing of state enterprise deficits, the numerous non-tariff barriers which constrain exports, and the foreign payments regime which induces high transactions cost to carry out foreign trade. These distortions alter the supply and demand for foreign exchange such that the "free" currency market clears at an over valued price of the cedi relative to other currencies. An over valued cedi induces and perpetuates the types of economic distortions seen during the 1970's and early 1980s, including implicit taxes on producers in the traded goods sectors of the economy, trade and invariably fiscal deficits. We suggest that the TIP should place even more emphasis on alleviating these distortions.

The structure of the country's capital markets also contributes to the over valuation of the cedi. Current policy, which entails the need to finance the country's fiscal deficits, tends to crowd out private investment in spite of fairly high real interest rates. Due to the structure of capital markets, these rates are not attracting the level of domestic savings needed to finance capital investments and to dampen domestic demand for goods and services. Since, "too much" of the economy is still focused on the production of home goods (non-internationally traded goods), the growth in demand causes their prices to rise.

*The rise in home good prices is the primary cause of inflation. The rise in these prices "pulls" resources away from the production of traded goods, while at the same time, increasing demand for foreign goods; thus, a persistent trade imbalance even though the market for the cedi clears.*

It is likely that capital inflows (including donor assistance) are also contributing to the increased demand for the cedi, and thus contributing to its over valuation. To counter this effect, a program which seeks to sterilize the effects of the capital inflows on the value of the domestic currency should be considered. The over-valuation due to demand pulls from money creation and credit supply, should be countered by policy that dampens the demand for goods and services and encourages saving and investment.

*This discussion rises another concern with the strategy of the TIP. A cash grant totaling approximately \$60 million is foreseen as balance of payment support. This support can be counter-productive if treating the symptom of an over valued cedi alleviates pressures to undertake the mentioned reforms that cause it to be over valued.*

As mentioned, more emphasis should be placed on attracting foreign capital. The inflow of capital not only substitutes for domestic savings, it also alleviates government (public) debt, transfers liability to the private sector, and decentralizes investment decisions. While the TIP focuses on developing Ghanaian entrepreneurial capabilities, particularly in the NTE sector, too little emphasis, in our view, is given to providing incentives for multinational firms to enter the economy. Ahiakpor (1986) and World Bank (1991), in this respect, discuss the profitability of investments of foreign firms.

*Reforms in property rights system and financial market were also indispensable to correct the distortions in land markets. Furthermore, the direct effects of weak property rights system on investment decisions of both domestic and foreign investors severely contributed to declining agricultural productivity as well as weak private R&D investments Brown (1986), Sirleaf and Nyirjesy (1990), Dapaah and Oteng (1992). Well defined property rights system is expected to encourage investments in particular foreign investment.*

These firms, as is well known, are attracted by "cheap" human and primary resources relative to other countries. Their presence in the Ghanaian economy not only pays returns to Ghanaian resources, they also provide capital, technology and expertise of world caliber, and perhaps most importantly, they also provide a learning environment. Empirical evidence from other countries clearly shows that learning by doing is a major source of human capital accumulation and economic growth, not only within a sector where foreign firms are present, but also by the "spinning off" of new firms by employees that have learned new skills from employment in foreign firms<sup>8</sup>.

#### **2. 4. Policy Reform and the Environment**

The environment, broadly defined to include renewable and non-renewable resources, impacts on well-being in three distinct ways; it impacts directly by environmental impacts on health, and on amenities, and indirectly through the degradation of resources. The degradation of natural resources typically increases the cost of their extraction, the remaining natural resources are often of lower quality, and the decline in their quantity and quality tends to lower the productivity of the labor and capital with which they are combined to produce goods and services for final consumption. Hence, the degradation of natural resources tends to lower productivity and income, therefore causing well-being to fall. An economy tends to under produce "Goods" and over produce "Bads" when markets do not exist and/or fail to induce individuals to incorporate into their resource allocation and consumption decisions the negative consequence of their actions on others. Under these circumstances, private benefits and costs of economic activities depart from their social benefits and costs.

---

<sup>8</sup>The USAID documents reviewed for this report noted the results from surveys of firms involved in foreign trade. A survey of foreign firms to obtain insights into the disincentives they face should also be considered.

Effectively, under these circumstances, free markets do not succeed in attaining the highest possible levels of well-being. Then, collective action by individuals whether through private associations, cooperatives, municipalities or national governments, can, in principle, intervene by using policy instruments to correct for these failures and induce the economy to increase its production of "Goods" and decrease its production of "Bads." thus raising the citizenry's level of well-being<sup>9</sup>.

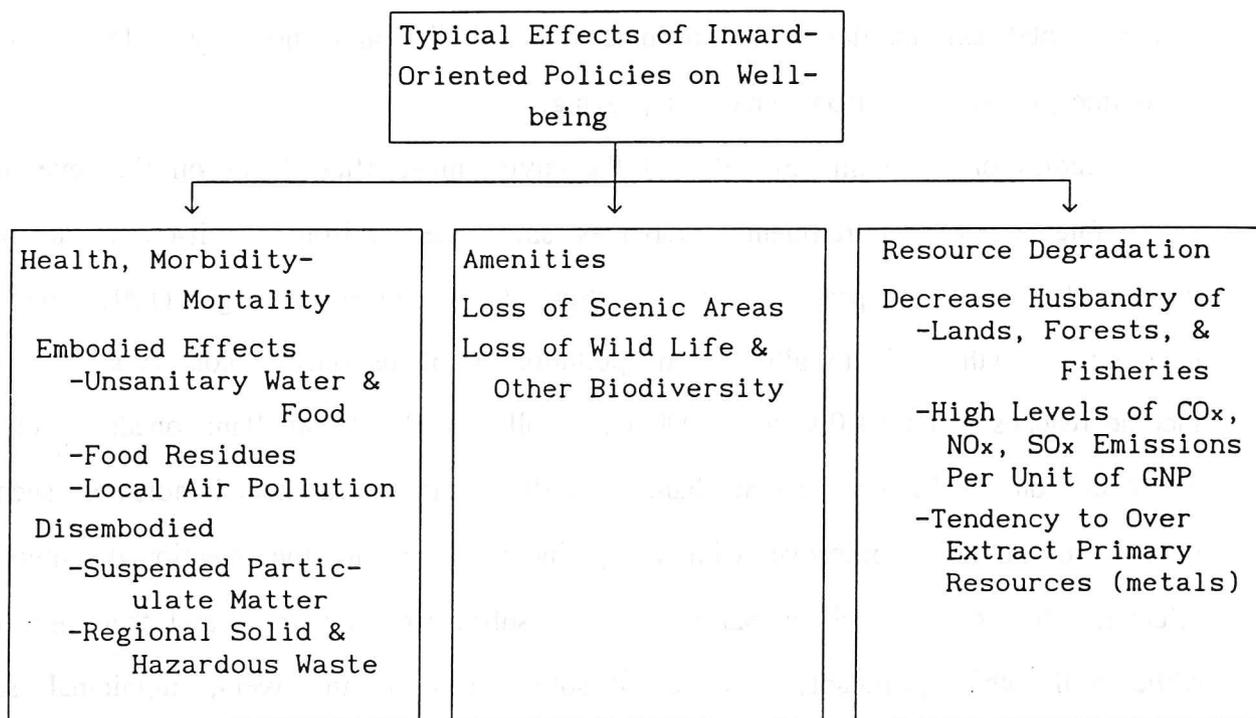
When countries pursue the type of inward oriented policies pursued by Ghana during the 1970-1985 period, a number of negative impacts on health, amenities and resource degradation result. The challenge is to pursue policies (often referred to as win-win) that encourage economic growth while husbandrying the country's natural resources and ameliorating health and amenity impacts on well-being. The environmental consequences of the type of policies Ghana pursued during the mentioned earlier years are depicted in Figure 2.

Health effects are divided into two kinds, embodied and disembodied. Embodied affects are associated with the consumption of a good or service, such as pesticide residues on food. Disembodied effects are akin to skin diseases caused by increased radiation from ozone depletion; these effects affect well-being, but they tend to have little affect on the demand for goods and services. The empirical evidence of Gertler and van der Gaag (1990) suggests for the case of several other countries that health is a luxury good. That is, as incomes rise, individuals choose to spend an increasing proportion of their rising income on ensuring higher levels of health. The use of distinguishing these two extreme types of effects is that in the presence of economic growth, individuals can partially adjust and correct for the market's failure to over produce Bad embodied effects on health, while the disembodied effects typically require

---

<sup>9</sup>See Baumal and Oates, "The Theory of Environmental Policy," Cambridge Univ. Press, Second Edition, 1988 for a primer on this subject.

Figure 2



public intervention. An important implication is that the new sources of income growth that come about when countries pursue more efficient economic policies, as Ghana is doing, lead individuals to be more concerned about their health. Being more concerned about their health means that they are willing to spend more on alleviating those environmental externalities that contribute to morbidity and mortality. In this case, economic growth is environmentally improving.

Studies on economic growth and the environment often focus on the level of a sustainable use of environmental resources since the environment itself is an input used in the production process. In their study, Grossman and Krueger (1991) find that economic growth tends to alleviate air pollution problems once a country's per capita income reaches about \$4,000 to \$5,000 U.S. dollars. Shafik and Bandyopadhyay (1992) and Anderson (1992), on the other hand, find that some environmental indicators such as water and sanitation improve with rising income (due to the mentioned embodied effects), while others such as particulates and sulfur oxides worsen and then improve, while still other pollutants such as dissolved oxygen in rivers, municipal solid wastes, and carbon emissions steadily worsen with income growth. These patterns reflect social choices about environmental quality at different income levels. It is unlikely that Ghana will depart from this general pattern.

The pattern of environmental effects of policies is somewhat less clear in the case of amenities and natural resource degradation. In the case of many countries, inward-oriented policies increase the population densities on land, causing farming on hill sides, shortening of fallow periods, excess consumption of forest lands due to grazing, firewood harvesting, and excess state enterprise mining of natural resources in order to earn foreign exchange. On the other hand, when reform to open an economy to world markets provides incentives to produce traded goods that are natural resource based, and property right structures are not in place to appropriately price these

resource stocks at their "true" opportunity costs, then excessive exploitation of these resources by domestic and international firms often occurs.

The level and incidence of the environmental impacts of Ghanaian policy reform can only be roughly sketched from the available evidence. The TIP expressed concern for four sub-sectors, commercial agriculture, mining, fisheries, and forestry. We discuss these sectors in more detail in the environmental section of Part I, and omit detailed discussion here except to note that it is clear that the incidence of environmental degradation will be affected by the new pattern of incentives that reform implies for the traded goods sector of the Ghanaian economy. Since Ghana is relatively rich in natural resources, it is likely that the country's comparative advantage in world markets will be natural resource based. In this case, it is important that a mechanism exists to price these resources at an opportunity cost which reflects their discounted expected value to current and future generations in order to assure their husbandry. Well defined, credible, implementable and enforceable system of property rights are, in most circumstances, a mechanism to assure this result.

But, the predictions of trade theory suggest that not all traded goods sectors of the economy are likely to expand, and not all natural resource based factors of production are likely to rise in price as reform progresses. Unfortunately, no empirical research could be found to help chart which sectors are likely to expand, which are likely to contract and what the incidence of environmental impact is likely to be. Hence, we suggest:

*A serious effort to measure the likely economy-wide impacts of reform are critical to provide policy guidance to: (i) identify those resource, policy and institutional constraints in the economy that are most likely to "run counter" to the fundamental forces of supply and demand and hence the most efficient allocation of the country's resources, (ii) identify those natural resources whose demand is likely to rise and the commensurate opportunity costs of these resources to assure*

*their husbandry and long-run sustainability, (iii) identify the likely incidence of environmental degradation of reform, and (iv) to suggest the kinds and levels of environmental policy instruments that are "consistent" with Ghanaian capacity to implement and minimize the externalities that reform can induce on the environment.*

Examples of the studies of the nature suggested can be found in publications from the World Resources Institute, and from studies of Mexico, Turkey and Morocco at the University of Minnesota, among others.

### **3. AGRICULTURAL MARKETS**

#### **3. 1. Policy Reforms and Agricultural Markets**

In this section, we first survey the literature on the developments in agricultural input and output markets. Second, we discuss several of the direct and indirect effects of agricultural marketing reforms on economic performance of the sector and conclude by highlighting a number of issues that need further work.

Before discussing the literature on this subject, let us first outline several of the policy issues regarding marketing activities. Some of the policy issues to be addressed include (i) low spatial price transmission, (ii) farmers' lack of access to new technology, (iii) heavy dependence of government's revenue on cocoa exports, (iv) poor quality of agricultural products & low nutritional products, (v) inadequate returns to invest in improved technology, (vi) unreliability of local sources of agricultural raw materials in terms of quality, quantities, and year round availability, (vii) neglecting agricultural R&D, (viii) low agricultural productivity, (ix) self-sufficiency in production of cereals and industrial raw materials, (x) insufficient flow of institutional credit, (xi) inadequate supply and distribution of inputs, and (xii) inadequate storage and marketing facilities such as improving information channels. These are the commonly expressed issues upon which this

monograph focused in particular attention. For the review of studies discussing these policy issues in detail, see Section 5 of Appendix I.

Given the above policy issues, we present the studies in the literature in seven groups: credit, storage, infrastructure, new technology and extension, privatization, market women, and property rights. Each group first outlines the main points discussed in the literature and then indicates the areas that need further work.

With respect to credit facilities, studies mostly focus on the ways to improve the existing marketing institutions associated with banking system, credit system, and capital markets. The participation of private sector in the financial transactions was the main objective in reforming the banking system. The determination of factors motivating the private sector to conduct financial transactions in the formal and informal financial sectors was the first step in minimizing the *financial dualism*, which was a serious problem that the Ghanaian economy had, since policies for increasing the efficiency of financial transactions in the formal market and therefore the agricultural productivity through small holders' access to credit and new technology are based on those factors.

*Studies examining the major constraints to the sustainable agriculture in Ghana focus mainly on (i) the insufficient flow of institutional credit, (ii) inadequate supply and distribution of inputs, and (iii) inadequate storage and marketing facilities. Changes in banking structure and efforts to lower transactions cost of loans made to small holders without subsidizing credit terms are fundamental to increasing the supply of credit. Extension, technical information on yield response to purchased inputs, access to product markets and absence of state enterprises in input markets are needed to encourage the development of a private enterprise based input marketing sector. Future studies should analyze the direct and indirect effects of these measures on farm size, land, labor, and capital markets.*

*Agricultural pricing policy in general aims at self-sufficiency in production through reforms that improve (i) marketing facilities (i.e., storage, processing, transportation,*

distribution, and information) and (ii) credit institutions. We question the self-sufficiency object. Self-sufficiency in many other African countries has resulted in the taxing of export crops to subsidize import competing crops. Even when self-sufficiency was obtained, resources were not allocated efficiently.

Economic reform will tend to increase the value of sector specific resources, such as land, since agriculture is a traded goods sector of the economy. When property rights are well defined and enforced, these rising values will tend to increase agriculture's collateral capacity and hence increase its credit worthiness. Institutional changes in property rights and rural capital markets are critically important to the efficient utilization of this capacity in order to increase capital deepening (investments in buildings, equipment, land improving etc.) in agriculture. Future research should explore and identify constraints to the efficient transformation of property rights and rural credit institutions.

Since reform will tend to bid up wages, small holders are important potential users of new technologies and therefore a potentially significant source of technology diffusion and efficiency. In designing policies for encouraging the use of new technologies, the needs of small holders should be well analyzed and evaluated; otherwise, the scarcity of labor and inefficiency in the existing credit institutions may further contribute to a duality in agriculture that harms the welfare of small holders.

Risk diversification efforts of lending institutions were practically not feasible due to large farmers' access to existing lending institutions and the segregation of small holders from intermediary institutions. This segregation caused them to borrow from informal markets at a high rates of interest. For the security of rural financial markets, and increased participation of small holders in financial transactions, authorities should design policies that lower the transactions costs (e.g., costs of servicing a large number of small loans as opposed to a small number of large loans) of supplying credit to small holders<sup>10</sup>.

---

<sup>10</sup>The experience of other countries suggests that if property rights are well defined and enforced, and rural capital markets are relatively "free" from the lobbying - political influence of large holders, then dualism in credit markets that discriminate against small holders is virtually non-existent. Further, as economy wide reform continues to reallocate resources to areas of higher returns, rural labor will tend to migrate to towns, villages and cities where employment opportunities are more attractive than farming, thus alleviating some of the pressures created by the current dualism in agriculture.

Research analyzing the above issues include Koo (1973), Desai (1980), Brown (1986), Paul (1990), Stryker (1990), USDA (1990), Ministry of Agriculture (1990, 1991), Sarris and Shamas (1991), Feder and Fenny (1991), Borish (1991), Aryeetey and Gockel (1991), Dapaah and Oteng (1992), Pearce (1992), USAID (1992a, 1992b, 1993), Guinnane & Miller (1993), World Bank (1990a, 1990b, 1992, 1991a, 1991b, 1993), Harvey (1993), and Horatio (1994). Several of these studies note the unique role of women in Ghanaian agriculture, and express concern that developing institutions (education, extension, banking) to better serve agriculture does not disenfranchise women from these critical services.

The need to privatize public institutions involved in agricultural marketing activities receives virtually unanimous support in studies of Ghana's adjustment program. Some of the studies discussing the above issues on privatization and commercialization of government production and distribution units include U.S. House of Representatives (1989), Asiedu (1989), Stryker (1990), USDA (1990), Ministry of Agriculture (1990, 1991), World Bank (1990a, 1990b, 1991b, 1993), Sarris and Shamas (1991), Borish (1991), Yudelman, Coulter, Goffin, MsCune, Ocloo (1991), Dapaah and Oteng (1992), Jebuni and Seini (1992), and Horatio (1994). These studies are summarized more detail in Section 5 of Appendix I. They focus on the efficiency gains that can be obtained from the privatization of the input distribution and importation channels for fertilizers and seeds, and of other chemical, biological and mechanical technology available in from the world market. The two major gains from privatization are: to reduce the government's involvement in economic activity because of its inherent inefficiency relative to the efficiency attainable by allowing market forces to determine the time - space and form of those activities to be performed; the second is to reduce the government's fiscal burden of carrying out these activities due to the

persistence of large budget deficits which eventually become a constraint on the public sector's capacity to investment in projects (e.g., extension, education, roads, electrification, infrastructure, environmental control and management) where markets typically fail to efficiently allocate resources.

*A number of studies suggested that devaluation of the currency and removing the public sector from the provision of inputs such as fertilizer could be harmful to small holders unless this reform was accompanied by at least an interim subsidy to lower the price of fertilizer to small holders. We conjecture that a subsidy to, say lower the price of fertilizer, is not socially profitable. Instead, the resources that would be consumed by the subsidy should be allocated to augment public investments in making higher yielding and pest resistance varieties of seeds available to farmers, and investments in roads, infrastructure, port facilities and so on, that serve to provide small holders access to both input and output markets. If pressures for subsidies of this type are strong, then this conjecture should be further investigated.*

The lack of storage facilities, infrastructure investment, technology, transportation, and information were frequently identified as among the various factors contributing to agriculture's poor economic performance. Increases in post-harvest losses led some to study options for improving storage, processing, and distribution systems. Studies emphasizing the urgent need for a new storage policy regarding the location of new storage capacity, and the degree of government involvement in the provision of this capacity include Brown (1986), Asiedu (1989), World Bank (1990b), USDA (1990), World Bank (1990b), and Sarris and Shamas (1991). It should be kept in mind that these inefficiencies are the result of past policies that, due to state enterprises, provided little incentive for the private sector to invest, for example, in storage capacity since the returns to this capacity are determined by the seasonality in prices which were largely precluded by price policy. As mentioned, government's preoccupation with market interventions precluded it from investing and

intervening in areas where markets fail. Since, as perhaps best pointed out by Binswanger (1989a), agriculture's supply response is particularly sensitive to the provision of public goods, past policy caused markets to perform inefficiently both as a direct effect of intervention, and indirectly because of government's inability to provide public goods. The encouraging side of this outcome is that these are now the major sources of efficiency gains that are potentially forth coming from the reform program. Hence,

*Ghana needs to augment its capacity to research, monitor and evaluate the market failure problems faced by its farmers in order to identify areas where the provision of public goods (broadly defined to include extension, communication, access to new technology, infrastructure) are socially profitable.*

Public storage facilities are especially needed in fishery industry due to the perishability nature of these products. The fact that fishery is an important source of income for small exporters should be taken into consideration in efforts to make market forces effective. This issue is addressed by Annex X in TIP, where it is stressed that the smaller exporters are expected to encounter the most difficulties. In the fishery industry, the main constraints include the use of old - traditional technology - which increases harvest losses and decreases the time that can be profitably allocated to harvesting activities. In the case of lobsters, the lack of cold stores at the fishing centers and inappropriate packaging tend to lower the value of the product. Besides the factors that restrict the supply of sea products, the fishing industry suffers especially from inadequate credit facilities and investment (USADI (1991z)).

*Perishability of sea products is a crucial factor that influences their supply, preservation, and marketing. The lack of regulations governing the supply of the product is another factor that causes over-exploitation of sea products.*

On the technology side, transmission of proven technologies and extension service, improving coordination efforts with research and extension, supply of inputs, credit-access to new technology (with care not to exclude women), and modernization of traditional environmentally safe technologies received much discussion in the literature. Studies include Panin (1986), Asiedu (1989), USDA (1990), Ministry of Agriculture (1990, 1991), Borish (1991), Sarris and Shamas (1991), USAID (1992a, 1992b, 1993), Dapaah and Oteng (1992), Pearce (1992), World Bank (1990a, 1990b, 1991a, 1991b, 1992, 1993), and Horatio (1994). Note that these studies did not address the need for a farmers' association that can organize collective activity for the provision of new technologies, by which the bias in the distribution of government funds available for developing new techniques that increase the efficiency of agricultural inputs can be reduced.

*Hence, we encourage efforts that seek to organize farmers into organizations, to consider the formation of cooperatives and, essentially, forms of social organization that lower the costs of coalition formation so that farmers can lobby public authorities in the provision of public goods (i.e., an organizational way to speak in a unified voice that informs public authorities of their need for public goods, and to prevent other, perhaps urban based and large-holder interests, from "out-competing" them in the provision of these goods).*

Women's participation in marketing activities was considered in designing policies to improve women's access to resources and markets; however, the women's issue was not only the lack of efficient policies that inhibited equal opportunities, but also the problem of correcting gender segregation that the Ghanaian society had. Donor countries have recently noted that the cultural endowments can be directed to the public production activities at least to minimize the inefficiency in government's provision of public goods owing to the lack of adequate resources, Smale and Ruttan (1994), Temel and Smale (1994). Existing studies in the literature examine (i) the

role of women in food production, processing, and marketing; (ii) the segregation of women from the production activities; (iii) savings behavior of the lowest-income women, (iv) the role of credit expansion in women issues such as welfare improvement, (v) self-confidence, health, and nutrition; and (v) the role of home-based technologies in women's participation in marketing. Some of the studies reviewed include Amerteifio (1985), World Bank (1990b), USDA (1990), Ameyaw (1990), Sarris and Shamas (1991), Annorbah-Sarpei, et al. (1992), Ashe, et al. (1992), Dapaah and Oteng (1992), and USAID (1989, 1992a, 1992b, 1993). Section 5 of Appendix I discusses these studies more detail.

*Policies should be designed (i) to strengthen the savings behavior of lowest-income women and seek to integrate them into marketing activities, (ii) to explore the areas where women can participate in production activities, such as in the food processing industries, mechanized agriculture, and higher education, and (iii) to encourage women's participation in marketing activities thus helping to connect farmers with central markets.*

In particular, increasing investment in transportation and communication, and providing incentives for market women are viewed as keys to establishing an efficient cadre of middle-marketing agents that "connect" farmers to central markets, and hence increase the efficiency of spatial price transmission. Direct effects of these reforms will serve to also improve consumers' welfare through the more efficient supply of the key marketing functions of time, space and form. The planned reforms, as noted above, are and will likely continue to have indirect effects on marketing process such as providing increased incentives to expand storage capacity. Another commonly mentioned policy issue was farmers' weak access to new technology which reflects, in part, the inattention given by public institutions to utilize and expand upon the services provided by the CGIAR system.

Evidence cited in the studies suggests that reform is paying high rewards in agriculture. The direct effects of reform include increasing crop yields, migration to rural areas<sup>11</sup> due to increasing productivity of labor, increased access to inputs by small holders, reducing the risk of lending, and increasing demand for new technology. As mentioned, the indirect affects include increasing need for storage and transportation, and encouraging private sector in middlemen activities to link farmers and suppliers of inputs. Table 1 outlines some of the policy issues, reforms to remedy them, and their direct and indirect effects on agricultural marketing system.

In order to present a complete scenario of how agricultural marketing activities were influenced by reforms, the main characteristics of output markets in Ghana should also be identified. Among the key concerns with the performance of agricultural output markets is the view that while responding to the reform, private savings and investment is relatively low, and the rate of supply response should likely be higher than it is, given strong foreign aid flows, increasing government spending on public goods. Reports by USAID (1992a) conjecture that the relatively weak supply response, relative to potential, by the private sector is a result of the donor community concentrating on rebuilding government institutions rather than private sector development USAID (1992a). One of the main reasons for weakness on the supply side is that government institutions were not able to create an environment where policy reforms would be effective in encouraging private sector investment. For example, with the strategic objective of increasing private sector-led export production and investment, the government targeted to improve infrastructure needed for export expansion.

---

<sup>11</sup>It was not clear from the studies reviewed whether migration to rural areas meant to rural towns and villages or into farming. An apparent universal law of development is that labor leaves agriculture because of the higher rewards to employment in towns and villages servicing agriculture, and to major cities that are the center of service supply and manufacturing.

TABLE 1: STRUCTURAL ADJUSTMENT AND AGRICULTURAL MARKETING PROCESS: ISSUES IDENTIFIED IN THE LITERATURE

| POLICY ISSUES  | POLICY REFORMS  | DIRECT EFFECTS  | INDIRECT EFFECTS   |
|--|---|---|--|
| Low spatial price transmission   | <ul style="list-style-type: none"> <li># Increasing investment in infrastructure such as transportation, communication</li> <li># Providing incentives for market women and private sector to fill the gap between farmers and central markets</li> <li># Elimination of dual pricing in transportation</li> </ul>  | <ul style="list-style-type: none"> <li># Increasing consumers' welfare through competition and lower cost</li> <li># Increase spatial market access of producers and consumers</li> <li># Increasing commodity arbitrage</li> <li># Spatial specialization &amp; economies of scale</li> </ul>  | <ul style="list-style-type: none"> <li># Increasing need for storage due to increasing supply of food</li> <li># Increasing government involvement in providing storage facilities</li> <li># Encourage formation of markets in local villages for inputs and outputs of goods and services, increase employment, increase expenditures on non-food items, decrease seasonality in quality of diets</li> </ul> |
| Farmers' lack of access to new technology  | <ul style="list-style-type: none"> <li># Reorganizing credit institutions (reforms in financial sector) to provide small holders with credit</li> <li># Extension services regarding the use of new techniques (Farm support services)</li> </ul>   | <ul style="list-style-type: none"> <li># Encourage: better land husbandry, use of purchased inputs; Decrease risk of loan default, increase specialization; # Increasing crop yields</li> <li># Increasing access to subsidized inputs by smallholders</li> <li># Decreasing risk of lending due to diversifying borrowers</li> <li># Increasing demand for new technology</li> </ul> | <ul style="list-style-type: none"> <li># Land degradation due to reducing fallow periods</li> <li># Encouraging private sector in middlemen activities to link farmers and suppliers of inputs</li> <li># Decrease duality among small and large farmers</li> </ul>  |
| Heavy dependency of tax revenue on cocoa exports   | <ul style="list-style-type: none"> <li># Incentives for producers of non-traditional export products; # Diversification of tax base to property tax, sales tax, value added tax</li> </ul>  | <ul style="list-style-type: none"> <li># New sources for financing government infrastructure expenditures</li> <li># Decreasing smuggling</li> <li># Decreasing risk and variance in foreign exchange earnings</li> <li># Increasing transmission of favorable world prices for agricultural exports;</li> </ul>  | <ul style="list-style-type: none"> <li># A more modern cocoa marketing system</li> <li># Private sector's involvement in marketing activities as middlemen in linking farmers' demand with central market supplies; # Encourage local public maintenance of roads, schools and other infrastructure, decrease likelihood of fiscal deficits</li> </ul>   |
| Poor quality of agricultural products & low nutritional products   | <ul style="list-style-type: none"> <li># Institutional arrangements for monitoring quality standards; # Encourage competition in procurement, processing; encourage foreign firms</li> </ul>  | <ul style="list-style-type: none"> <li># Improve sanitary standards, provide clear price signals to goods high demand, increase competitiveness with imported agr. products</li> </ul>  | <ul style="list-style-type: none"> <li># Improve health, decrease morbidity and infant mortality of those facing diet and health contingencies</li> </ul>  |
| Inadequate returns to invest in improved technology  | <ul style="list-style-type: none"> <li># Design policies (i) to reduce the cost of new technology and (ii) link research institutions and universities; # Adopting technology produced by CGLAR; foreign capital</li> </ul>   | <ul style="list-style-type: none"> <li># Encourage: capital deepening, use of purchased inputs, increase returns to labor</li> </ul>  | <ul style="list-style-type: none"> <li># Increase food production, place down pressure on food-price-inflation, increase foreign exchange earnings; # Increase formation of rural village input supply industry</li> </ul>   |
| Unreliability of local sources of agricultural raw materials in terms of quality, quantities, & year round availability  | <ul style="list-style-type: none"> <li># Provide access to foreign and domestic markets; allow temporal price variation to provide incentives for storage</li> </ul>  | <ul style="list-style-type: none"> <li># Decrease seasonality in processing and value added agricultural processing industries, decrease dependence on imports</li> </ul>   | <ul style="list-style-type: none"> <li># Encourage specialization, economies of scale, increase employment in agr. processing sector</li> </ul>  |
| <ul style="list-style-type: none"> <li># Insufficient flow of institutional credit;</li> <li># Inadequate supply and distribution of inputs;</li> <li># Inadequate storage &amp; marketing facilities</li> </ul> | <ul style="list-style-type: none"> <li># Reforms in financial market</li> <li># Privatization of public distribution channels</li> <li># Incentives to private sector in marketing activities; # Low transaction cost of providing credit to smallholders; encourage rural cooperative credit unions; # Lower spatial costs, supply information, decrease state enterprise involvement in direct mktg activities</li> <li># Permit seasonal price variation, provide technical assistance and short-term credit for storage facilities; # Extension program to inform, educate farmers on purchased input use and better animal and land husbandry practices</li> </ul> | <ul style="list-style-type: none"> <li># Access to formal credit, and therefore to new technology</li> <li># Increasing welfare of smallholders due to their access to inputs</li> <li># Decreasing cost of inputs</li> <li># Minimize post harvest losses</li> <li># Price stability</li> </ul>  | <ul style="list-style-type: none"> <li># Encourage development of commercial agriculture, increase market surplus</li> <li># Decrease duality in the agricultural sector</li> <li># Increase income of owners-operators</li> </ul>   |
| Low agricultural productivity  | <ul style="list-style-type: none"> <li># Increasing tax &amp; other incentives for investment in rural infrastructure</li> <li># Issuing agricultural development bonds</li> <li># Establish a credit monitoring &amp; auditing system; # Privatization of commercialization of intermediate technology transfer units to encourage greater distribution and use of technologies; # Improving coordination efforts with research &amp; extension; # Resource allocation for the maintenance of agricultural machines;</li> </ul>  | <ul style="list-style-type: none"> <li># Improving income distribution between rural and urban sectors</li> <li># Employment generation through increasing production in agricultural industries</li> </ul>   | <ul style="list-style-type: none"> <li># Increase: industry-agriculture connection, demand for storage and transportation</li> <li># Increase: demand for labor and therefore migration to villages</li> </ul>   |

Public investments in transport that is particularly beneficial to the traded goods sectors include investments in the railways and road networks that accelerate the marketing of agricultural and manufacturing outputs, Tabatabai (1986), Killick (1978), and Bequele (1983).

*Output marketing reforms aimed at creating a strong supply side and spatial integration of markets. World Bank (1990b) emphasizes the need for new roads, telecommunications, and information network to help spatially integration of markets. Increasing investment in infrastructure served to this objective.*

Inefficiencies in output markets regarding the low speed of price transmission across markets are addressed by Alderman (1992). The developments in trade sector, on the other hand, are analyzed by Pearce (1992), Chibber and Shafik (1990), Sarris and Shamas (1991), Sherbourne (1986), Catsambas and Pigato (1992), Bateman, et al. (1987), Boteng, et al. (1987), Varanis, et al. (1987), Migot, et al. (1990), Abdulai and Egger (1992), and Borish, et al. (1991).

### **3. 2. Linkages Between Government and Private Marketing Institutions**

In the previous section, we summarized the policy reforms regarding the agricultural sector and their implications for agricultural marketing activities, in particular agricultural input and output markets. Almost all existing studies that this monograph summarized in Appendix I, repeatedly emphasized isolated problems of each single marketing agent (farmers, middlemen, government, consumers, producers, and world market) relative to the problems originating from the interactions between marketing agents. For the purpose of showing possible policy issues that need to be addressed in this context we construct Table 2 (see Appendix II for further information on why we constructed such a policy matrix and how we use it) to indicate the areas

that future studies should focus on.

The representation in Table 2 is a simple illustration of linkages between marketing agents. It allows not only to see the interactions but also to determine the direction of interactions between marketing agents. Some of advantages of this technique formulizing the binary interactions are (i) it does not require one to have any theoretical knowledge and (ii) each system consisting of agents/variables in the leading diagonal of Table 2 is a closed system; it means that adding new agents/variables to the existing system does not change the fundamental relations between them.

The way we formulize the linkages between marketing agents allows one to design policies to suggest their side effects on other marketing agents. This technique helps establish a structure for marketing activities. In particular, we establish a structure for interactions between marketing institutions/variables and an information - auditing issues that might accompany policy reform. By constructing Table 2, we can, in principle, determine the *dominant*<sup>12</sup> agent/variables which participate in marketing activities. Implications of this determination of *dominant* agent/variable are twofold. The first is that it allows us to design efficient policies; the second is that it provides us with the knowledge of information on the structure of interactions of key importance.

The table suggests that government activities can *dominant*, or link to and influence a broad array of other activities, as can be seen since every cell in the fourth row corresponding to government has some factors that influence the rest of the marketing system. The economic activities through which government influences farmers are (i) providing cheap credit and inputs such as fertilizers and seeds, (ii)

---

<sup>12</sup>See Appendix II where we explain how to determine the *dominant* variable(s) in a system.

TABLE 2: POLICY MATRIX OF LINKAGES BETWEEN GOVERNMENT AND OTHER AGENTS IN AGRICULTURAL MARKETING PROCESS: ISSUES IDENTIFIED IN THE LITERATURE

|   |   |  |  |   |  |   |
|---|---|--|--|---|--|---|
| FARMERS<br># Private<br># Cooperatives<br><br>C(1,1)  | # Supply of farm products such as maize, rice, cassava, groundnut<br><br>C(1,2)   | # Supply of farm products<br><br>C(1,3)                                | # Collective action for improved technology<br><br>C(1,4)                    | <br><br>C(1,5)  | <br><br>C(1,6)   | <br><br>C(1,7)  |
| # Credit<br># Transportation<br># Communication facilities<br># Storage<br># Inputs i.e. seeds, fertilizers, agrochemicals, machinery<br>C(2,1)   | MIDDLEMEN<br># Retailer, # Wholesaler<br># Broker, # Commissionmen<br># Speculator, # Processor<br># Manufacturer<br>C(2,2) | # Supply of farm products<br><br>C(2,3)                                | # Rent-seeking for subsidized inputs<br><br>C(2,4)                           | # Financial market<br><br>C(2,5)  | # Processing<br># Providing inputs<br><br>C(2,6)                   | <br><br>C(2,7)  |
| # Demand for farm products<br><br>C(3,1)  | # Demand for goods<br><br>C(3,2)  | CONSUMERS<br><br>C(3,3)  | # Income tax<br># Supply of capital and labor<br><br>C(3,4)                  | # Formal and informal savings<br><br>C(3,5)   | # Input and output markets<br><br>C(3,6)                           | <br><br>C(3,7)  |
| # Credit; # Subsidy;<br># Transportation; # Communication<br># New technology;<br># Extension service<br># Inputs i.e. fertilizers, seeds<br># Tax; # Storage; # Human capital<br># Land tenure<br># Land markets and institutions (land rental, careaker farmers, visiting tenants)<br># Farmers' association & agr. cooperatives to play central role in input distribution<br>C(4,1) | # Regulation<br># Supply of imported products<br># Encourage retail dealers to form associations<br><br>C(4,2)              | # Public goods<br># Supply of imported products<br># Tax<br><br>C(4,3) | GOVERNMENT<br><br>C(4,4)   | # Regulation<br># Monetary and fiscal policy<br># Reforms in capital market i.e. issuing agricultural development bonds<br><br>C(4,5) | # Tax<br># Public institutions<br># Providing inputs<br><br>C(4,6) | # Trade policy<br># Export marketing<br># Cocoa marketing<br><br>C(4,7) |
| # Lending<br><br>C(5,1)   | # Supply of credit<br># Lending to brokers<br><br>C(5,2)  | # Return to savings<br><br>C(5,3)                                      | # Intermediary institutions for modes of financing<br><br>C(5,4)             | FINANCIAL INSTITUTIONS<br><br>C(5,5)  | # Lending<br><br>C(5,6)  | <br><br>C(5,7)  |
| <br><br>C(6,1)  | # Supply of products<br><br>C(6,2)  | # Input and output markets<br><br>C(6,3)                               | # Rent-seeking for subsidized inputs<br><br>C(6,4)                           | <br><br>C(6,5)  | PRODUCERS<br><br>C(6,6)  | <br><br>C(6,7)  |
| <br><br>C(7,1)  | # Imports of spare parts<br><br>C(7,2)  | <br><br>C(7,3)   | # Imports of sugar, rice and wheat<br># shocks to world market<br><br>C(7,4) | # Shocks to world market<br><br>C(7,5)  | # Shocks to world market<br><br>C(7,6)                             | WORLD MARKET<br><br>C(7,7)  |

subsidizing their products, (iii) provision of storage, transportation, communication, and information facilities, (iv) extension services needed for the use of new technology, (v) investing on human capital i.e., education and health, and (vi) providing institutions to land markets and farmers with cooperatives that helps distribute inputs. These factors are located in the cell C(4,1) in Table 2. Likewise, the factors in the cell C(4,2) are those through which government influences middlemen's activities. They are new regulations and distribution of imported products. The second important component of marketing is middlemen. They influence farmers through the factors in the cell C(2,1) in Table 2 such as (i) providing credit, transportation, communication, information, and storage facilities and (ii) input supply. On the other hand, private and cooperative farmers (or a possible coalition thereof) influence government through the factors in the cell C(1,4) which we abbreviate as the *collective action for improved technology*.

*Given a structure for interactions summarized in Table 2, future studies should focus on the channels (hence the role and influence of middle agents) through which developments in financial and world markets affect farmers, since much of Ghana's comparative economic advantage lies in the agricultural sector of the economy.*

By utilizing the same technique, we present Table 3 to establish a structure for cereal marketing (maize, rice, sorghum, millet). The same kind of table can be easily constructed for each crop. The agents participating in the cereals market are the elements in the leading diagonal: private marketing intermediaries (i.e., itinerant traders, middle women, market-based traders, and cooperative associations), state marketing institutions (Ghana Food Distribution Corporation and Grain Warehousing Company), producers, consumers, government, and world market. In the same way as in Table 2, we summarize interactions among agents by following "clockwise convention" see Appendix II for a diagram explaining this term). As will be noticed, government is

TABLE 3: **MARKETING STRUCTURE FOR CEREAL** (Maize, Rice, Sorghum, Millet)  
 Objective: Improve the efficiency of marketing institutions by developing all the characteristics of a competitive market

|   |   |   |   |                             |  |
|---|---|---|---|-----------------------------|--|
| <b>PRIVATE MARKETING INTERMEDIARIES</b><br>#Itinerant traders<br>#Middlewomen<br>#Market-based traders<br>#Cooperative associations<br>B(1,1) | B(1,2)  | #Provide market information<br>#Provide storage and transportation<br>B(1,3)  | #Provide market information<br>B(1,4)     | B(1,5)                      | #Exports and imports of cereals<br>B(1,6)  |
| #Provide licences to private intermediaries<br>#Sell cereals<br>B(2,1)  | <b>STATE MARKETING INSTITUTIONS</b><br>#Ghana Food Distribution Corporation<br>#Grain Warehousing Company<br>B(2,2)         | #Supply of seeds and inputs<br>#Purchase cereals at guaranteed minimum price; #Storage, transportation, quality control & extension<br>#New buying center (L)<br>B(2,3) | B(2,4)                                    | B(2,5)                      | #Exports and imports of cereals<br>B(2,6)  |
| #Sell cereals<br>B(3,1)   | B(3,2)  | <b>PRODUCERS</b><br>B(3,3)  | #Supply<br>B(3,4)                         | B(3,5)                      | #Exports and imports of cereals<br>B(3,6)  |
| B(4,1)  | B(4,2)  | B(4,3)  | <b>CONSUMERS</b><br>B(4,4)                | B(4,5)                      | B(4,6)   |
| #Institutional credit (L)<br>#Market information (L)<br>#Design storage policy (L)<br>#Exchange rate reforms<br>B(5,1)                        | #Fund for storage<br>#Design storage policy (L) and the policy on the role and function of itinerant women trader<br>B(5,2) | #Exchange rate reforms<br>#Guaranteed minimum price<br>#Institutional credit (L)<br>#Design storage policy (L)<br>#Infrastructure rehabilitation<br>B(5,3)              | B(5,4)                                    | <b>GOVERNMENT</b><br>B(5,5) | #Restrictions on imports<br>#Exchange rate reforms<br>#Tariffs<br>#Subsidy exports to enter world market<br>B(5,6) |
| #Exports and imports of cereals<br>B(6,1)   | #Exports and imports of cereals<br>B(6,2)   | #Exports and imports of cereals<br>B(6,3)   | #Exports and Imports of cereals<br>B(6,5) | B(6,5)                      | <b>WORLD MARKET</b><br>B(6,6)  |

We place the participants in the marketing in the main diagonal. Capital L in bracket indicates the lack of respective service or policy.

again a key or dominant agent in the marketing of cereals; the factors in the cells B(5,1), B(5,2), B(5,3) and B(5,6) summarize how government policies influence the rest of the cereal marketing system. Furthermore, interactions among private agent, public institutions, and producers are the relatively informative about how these three agents lead to the whole cereal marketing system.

*In this connection, the effects of policy reforms that influence these three agents on the rest of the system should be monitored for developing a sound marketing structure of cereals. Future studies should investigate the transactions costs incurred by producers and consumers in the cereal marketing system to identify sources of possible inefficiencies in the performance of marketing functions. The roles of marketing agents participating in export and food crops should also be better understood, with particular attention given to the efficiency gains that might be realized from the participation of multinational firms<sup>13</sup>.*

### **3. 3. Cost Structure of Farm Product Marketing**

Interestingly, there are few studies examining the cost structure of farm product marketing. Here we present some of the components of cost structure of farm products to explore how policy reforms affecting the cost of marketing activities create "narrow tunnels" and how these tunnels can be enlarged to increase the flow of goods from farmers to consumers. The term "narrow tunnels" refers to marketing channels in which the flow of goods move slowly due to increasing cost of marketing. The components of marketing cost consist of mainly loading, transportation, jute bag, storage, handling, processing, overhead, bank charges, overdraft, and special duties. For the purpose of illustration of how the cost structure of farm product marketing changes, we present

---

<sup>13</sup>In the case of multinationals, beside efficiency gains from world market linkages, another source of possible efficiency gains is the use of futures markets to hedge for currency and spot market price fluctuations. Since multinational firms are major participants in these markets, evidence from other countries suggests that these gains can be passed on to other countries when multinationals participate in their markets.

Table 4(a)-4(c) which summarize the cost components determined by Ministry of Agriculture (1993). Table 4 indicates the marketing cost structure of ground nut, maize, palm oil processing, wheat, sugar, and rice. Each marketing agent bears different cost components. For instance, in Table 4(a) farmers bear the cost of loading and transportation when they sell their ground nut and maize; assembly traders bear the cost of loading, paying marketing tolls, and the costs bagging (jute bags); wholesalers bear the cost of loading, transportation, jute bag, storage, and market toll; finally retailers bear the cost of transportation, handling, and market toll. Table 4(b)-4(c) have the same flow chart to indicate the agent that bears the cost and also show the direction of goods.

*Research should focus on the determination of cost factors for each crop and of each agent that bears the cost. An increase in the cost of storage (see Table 4(a)), for example, will lead to wholesalers and retailers to bear this extra cost since they are the only agents influenced by this increase in cost. Our "narrow tunnel" in this example will be the channel that connects wholesaler-retailers with consumers. Therefore, policies for improving the efficiency should address the cost structure of wholesale and retail markets. Research should be designed to determine the real sources of inefficiency so as to protect consumers against welfare loss and permit retail market prices to be more quickly and efficiently transmitted to the "farm gate."*

The literature on cost structure of farm product marketing includes Gersovitz (1987), Gronau (1991), Ministry of Agriculture (1993). As these studies emphasize, increasing maintenance cost of transportation led policy makers to increase the annual fee for heavy trucks supposedly damaging the roads the most. Table 4(a)-(c) helps clarify the links between agents bearing the increasing cost to identify the impact of increasing annual fees for heavy trucks on the cost structure of cereal marketing. The effects of increasing cost of transportation are twofold: domestic price effect in

TABLE 4(a): COST STRUCTURE OF FARM PRODUCT MARKETING FROM FARMERS TO CONSUMERS (Groundnut and Maize)

|         |  |  |   |  |
|---------|--|--|---|--|
| FARMERS | FARMERS' COST<br># Loading<br># Transportation |  |   |  |
|         | ASSEMBLY TRADERS                               | ASSEMBLY TRADERS' COST<br># Loading; # Mktg toll<br># Cost of jute bag |   |  |
|         |  | WHOLESALERS  | WHOLESALERS' COST<br># Loading; # Transportation<br># Cost of jute sack<br># Storage; # Mktg toll |  |
|         |  |  | RETAILERS   | RETAILERS' COST<br># Transportation<br># Handling<br># Mktg toll |
|         |  |  |   | CONSUMERS  |

TABLE 4(b): COST STRUCTURE OF FARM PRODUCT MARKETING FROM FARMERS TO CONSUMERS (Palm oil processing)

|         |   |   |  |   |
|---------|---|---|--|---|
| FARMERS | FARMERS' COST<br># Transportation to the mill |   |  |   |
|         | PROCESSORS (Middlemen)                        | PROCESSORS' COST<br># Handling; # Storage<br># Processing; # Overhead |  |   |
|         |   | WHOLESALERS   | WHOLESALERS' COST<br># Handling;<br># Transportation<br># Storage; # Overheads |   |
|         |   |   | RETAILERS  | RETAILERS' COST<br># Handling;<br># Transportation<br># Storage; # Overhead |
|         |   |   |  | CONSUMERS   |

TABLE 4(c): COST STRUCTURE OF FARM PRODUCT MARKETING FROM IMPORTERS TO CONSUMERS (Wheat, Sugar, Rice)

|           |  |   |   |   |
|-----------|--|---|---|---|
| IMPORTERS | IMPORTERS' COST<br># Bank charges; # Overdraft<br># Special duties; # Overhead |   |   |   |
|           | MILLERS (Middlemen)  | MILLERS' COST<br># Transportation from harbor to factory<br># Processing; # Handling<br># Storage; # Overhead |   |   |
|           |  | WHOLESALERS   | WHOLESALERS' COST<br># Handling; # Transportation<br># Storage; # Overheads |   |
|           |  |   | RETAILERS   | RETAILERS' COST<br># Handling; # Transportation<br># Storage; # Overheads |
|           |  |   |   | CONSUMERS   |

ground nut, maize, palm oil markets and external price effects through the increasing cost of exports and imports.

*The social profitability of public investments in road improvements, and the geographic concentration of these investments should receive increased attention since these networks are critical to information flows, and access to markets of virtually all kinds. Moreover, accompanying this concern, should be a concern for the reform of local taxing authority so that funds for road improvements and management can be decentralized.*

#### 4. ENVIRONMENTAL IMPACTS

The introductory section of this monograph provided a background on "environmental concepts" and the general affects of economic activity on the environment and natural resources<sup>14</sup>. Here, we narrow our focus, even more detail is provided in Appendix I. The concern with sustaining agricultural productivity has increased the awareness of environmental factors as a potential cause of productivity decline. In this section we discuss the impacts of the structural adjustment program on environmental degradation and attempt to sort out possible consequences on health and productivity.

In order to identify the sources of environmental degradation, we first classify the major environmental problems Ghanaian encounter, as identified in the literature, into four categories:

- i. *deforestation* caused by land conversion to agricultural uses,

---

<sup>14</sup>Again, it may be important to note that the degradation of some resources may be socially optimal, at least from the welfare perspective of Ghanaian citizens, while from the rest of the world's perspective (especially the North), the loss of amenities, biodiversity and forested lands may be viewed as undesirable. The challenge is to discern the true opportunity costs of natural resources in terms of Ghanaian welfare, and if the rest of the world is in "disagreement," then some form of compensatory payments from the North to Ghana may be appropriate.

- inappropriate timber harvesting policies, indiscriminate fuel wood harvesting;
- ii. *degradation of soil base and soil loss* caused by over-grazing, inappropriate soil conservation practices in farming, soil contamination from industrial activity, and inappropriate land reclamation following open cast mining;
  - iii. *water pollution* caused by industrial and municipal wastes, and agricultural activities (chemical inputs, siltation, etc); and
  - iv. *air pollution* caused by the deposition of acidifying and poisonous agents from, for example, oil refining and cement-asbestos processing.

Among some of the common health effects of environmental degradation are (a) intestinal and parasitic illnesses due to water pollution and water scarcity; (b) acute and chronic health impacts of air pollution, (e.g., excessive urban particulate matter levels are responsible for premature deaths of those with congestive disorders and chronic coughing; women and children are frequently affected by smoky indoor air pollution caused by smoke and fumes from indoor use of biomass fuel; (c) diseases spread by unsanitary conditions, such as rotting garbage, inadequate disposal of humans, and various other hazardous wastes; (d) reduced nutrition of rural poor farming on depleted soils. Long-term effects cited by the IBRD (1992) include (a) potential loss of new drugs due to loss of biodiversity and (b) possible shifts in vector-borne diseases, risks from climatic natural disasters, and diseases attributable to ozone depletion due to atmospheric changes. As seen from the above classification, there is a variety of sources of environmental degradation that has health implications.

In order to distinguish the types of health effects from environmental degradation that can be partially ameliorated by income growth, Roe and Mohtadi (1992) introduce the concept of embodied and disembodied effects and then discuss policy instruments by which harmful health effects of degradation might be corrected. Such effects as contaminants on food, contaminated drinking water, unsanitary disposal of

household wastes and indoor air pollution are classified as embodied because they are associated with goods consumed; and effects such as ozone depletion, sulfur dioxide and particulate matter from the burning of fossil fuels beyond the control of individuals are classified as disembodied since they tend not to be associated with the consumption of a particular good.

Regarding the embodied health effects of environment, numerous studies (Pitt and Rosenzweig (1985), Cohen (1988), Rosenzweig and Wolpin (1982), Thomas, Strauss, and Henriques (1990a, 1990b), Barrera (1990), Boulier and Paqueo (1988), Rosenzweig and Schultz (1982), Behrman and Wolfe (1987b, 1982a), Heller and Drake (1978), and Ana and Senaur (1993)) focus on those factors that help reduce the ill health and productivity effects of environmental degradation. Some of these factors are mother's schooling, the presence of public and quasi-public health facilities, education, and family planning. The indirect effect of the environment on health can be viewed as working through the following channel: environment first impacts on health, which impacts on productivity, which impacts on income, which in turn decreases incentives to mitigate health effects because of the "luxury" good nature of health. A growing literature related to indirect effects of the environment on health and nutrition and labor productivity includes the following; Strauss (1986) estimating the effect of a family's average intake of calories on the productivity of on-farm family labor; Deolalikar (1988) investigating the impact of nutrition and health on agricultural productivity; Behrman and Deolalikar (1989) exploring the labor market effects of health and nutrition; and Moock and Leslie (1986) and Jamison (1986) investigating the effect of health and nutrition on schooling productivity. These studies suggest that the productivity of human capital is sensitive to the provision of public goods beyond just education, and include various factors that link health to nutrition and the environment.

Table 5 summarizes the discussion thus far regarding the direct and indirect effects of a specific policy reform on the environment. Our survey of the literature on policy reforms that have indirect environmental implications includes the following studies. Munasinghe, Cruz, and Warford (1993) explore the links between policy issues and indirect environmental effects of policy reforms. These policy reforms can be grouped in two categories. The first set of environmental - policy reforms links agricultural expansion and deforestation to the reduction in taxes and subsidies, exchange rate and trade reforms, property rights reform, and poverty and income distribution policies. As noted, switching to flexible exchange open economy regime promotes the production of traded goods. Hence, reform can lead to increased deforestation from timber and forest product exports while creating additional employment in the traded goods sector: thus, some sectors of the economy may experience increased degradation.

Furthermore, agricultural intensification in settled lands tends to increase crop yields but also increases the possibility of overuse of fertilizers and chemicals while the migration of individuals to employment in towns and villages can lower population densities on fragile lands. Removing price distortions and permitting world market prices to prevail in the domestic economy tends to promote competition and efficiency and the adoption of less pollution-prone technologies, but it can also lead to an influx of hazardous industries that choose to use the country as a "waste sink." Changing rules and regulations to promote and ease the entry of foreign companies is an indispensable step toward the establishment of a free market mechanism, but safe-guards need to be in place to prevent this type of adverse actions. Of course, the technologies used by foreign companies will lead to a change in the allocation of domestic resources between industries and possibly accelerate the rate at which natural capital stock-minerals and timber are exhausted.

TABLE 5: STRUCTURAL ADJUSTMENT AND ENVIRONMENT: ISSUES IDENTIFIED IN THE LITERATURE

| POLICY ISSUES  | POLICY REFORMS  | DIRECT EFFECTS   | INDIRECT EFFECTS   |
|--|---|--|--|
| Trade deficit and increasing external debt                                   | # Flexible exchange rate policy<br># Decentralize the authority to export commodities to low level monitoring unit<br># Incentives to producers of non-traditional crops for export   | # Promote exports and reduce imports<br># Terms of trade between traditional and non-traditional goods   | # Indirect effects may lead to more deforestation for export, but it could also lead to substitution of tree crops for annual crops; # Industrial job creation may reduce pressures on land resources<br># Soil erosion and loss of soil fertility due to increased cultivation of non-traditional export<br># Forms of land tenure and the use of land; # Marketing and pricing agricultural products |
| Food security and unemployment   | # Privatize public input & output distribution channels<br># Agricultural intensification in settled lands and resettlement programs for new areas<br># Designing research projects on new variety of crops   | # Increase crop yields and absorb more labor   | # May reduce migration to ecologically fragile areas. However, there is potential for over use of fertilizers and chemicals.   |
| Lack of industrial competitiveness   | # Reduction of tariffs and special incentives<br># Promote resource based industrial production by improving the linkage between agriculture and industry<br># Flexible exchange rate   | # Promote competitiveness and industrial efficiency  | # More openness may lead to adopt more energy efficiency or less pollution prone technologies. However, it may also lead to influx of hazardous industries.  |
| Collapse of essential export infrastructure                                  | # Extending credit to export industries   | # Promote export   | # Increasing export of cocoa and timber had an adverse impact on the environment.  |
| Low level of foreign investment  | # Change in rules and regulations   | # Facilitate entry of foreign companies  | # Increasing the liquidation of natural capital stocks-minerals, timber.   |
| Lack of cocoa workers during the peak season                                 | # Design policies that provide shelter, infrastructure, and public services   | # Construction of new buildings, roads, and shelters causes productive land to be used in unproductive activities  | # New institutional arrangements in land markets (i.e. rental) and capital market. Increasing land prices due services provided by the government causes more deforestation and less land will be used in productive activities.   |
| # Increasing population growth & density                                     | # Reform in land tenure system; # Reform in capital markets   | # New land markets; # Access to credit; # Breaks down property arrangements; # Bring land into environmentally inappropriate use; # Exacerbates poverty and neglect of environmental sustainability                        | # New institutions that release the constraints in the existing land markets.<br># Increase in the price and incentives for rapid resource use; # Speed up the conversion of land to agricultural use; # Decrease in soil fertility  |
| Low agricultural productivity  | # Providing technology for intensive agriculture<br># Reform in land tenure system i.e. land titling<br># Incentives for private R&D to develop new variety crops   | # Increasing agricultural production; # Demand for credit to buy new technology; # Encouraging replanting of tree crops since most farm operators tend to be sharecropper;<br># Increase in shareholders' access to credit | # Decreasing soil fertility and pressure on forest<br># Protecting biodiversity  |
| Inadequate provision of public input & output                                | # Eliminate subsidies; # Deployment of labor in public service;<br># Incentives to non-traditional export sector i.e. agricultural export diversification; # Reforms in financial market; # Reduction of government borrowing; # Public sector expenditure strategy (develop feeder road, support small scale irrigation, help private and other commercial storage); # Identify licences and legal conditions to establish input supply firms; # Privatize public marketing institutions | # Efficient allocation of public goods and inputs between rural and urban sectors  | # Deployment of labor puts pressure on land since deployed labor migrates to rural area;<br># Efficiency in capital market releases constraints on land market; # Agricultural production increases due to smallholders' increasing access to new technology and inputs  |
| Agricultural marketing of cocoa and coffee is dominated by the public sector | # Creation of adequate transport, infrastructure especially feeder roads, communication facilities for the dissemination of market information; # Promotion of efficient financial markets to support commodity markets through credit extension to traders, transporters, and wholesalers; # Establishment of legal and institutional mechanisms for the standardization of weights and measures & guarantees of free entry into markets   | # Private sector's involvement in marketing activity especially as middlemen; # Spatial integration of markets due to the dissemination of market information  | # Credit with low interest rate might increase investment in technologies used in resource extraction  |

*As the economy becomes more open and farmers have access to herbicides and pesticides available on the world market, information, controls and training are likely to be required to lower the harmful health and pollution effects of these chemicals. Policy reform which succeeds in speeding up the free entry of foreign companies, almost surely will need to be accompanied by laws and regulations which screen the activities and technologies of entering firms to assure their compliance with established environmental standards and husbandry of natural resources. Furthermore, care must be taken that environmental safeguards do not become protectionist barriers to local industries.*

Among other indirect environmental impacts of policy reforms is the possible loss of natural resources subject to open access, such as biodiversity and common lands. Providing land titles to farmers may help reduce the damage through the private protection of land, i.e., creditable and enforceable property rights should induce land owners to husband land resources to sustain future productivity.

As mentioned, a common feature of countries experiencing a long and sustained period of economic development is the migration from farming to villages and cities while those remaining in agriculture deepen their capital investments in land, physical and biological capital and human capital. The inward oriented - import substitution industrialization policies pursued by countries like Ghana served to not only lower the level of per capita incomes overall, but to lock households in agriculture and to induce inefficient land relation arrangements (Roe, AJAE, December 1993:1261-1262). In general, and absent high infant mortality rates, low income households respond rationally to low incomes by having relatively large families. Hence, the past policies gave rise to two major types of population pressures on resources. One source of pressure is the relatively high population densities on cultivatable lands, the other is overall population growth rate pressures on resources. Population pressure tends to bring land into environmentally inappropriate uses (farming on hillsides and

on lands that are fragile to use without capital deepening, thus causing reduced vegetative cover, loss of soil fertility and soil erosion) and breaks down communal property arrangements.

Policy reform, well conceived to include an openness to world markets, creation of institutions to enforce privately negotiated contracts and property rights, and gender equity in education and access to economic opportunities, can, in the longer run, be expected to induce a migration from cultivatable areas with high population densities to villages and cities. At the same time, households are likely to choose to have smaller families but to invest more in each family member (education, health, clothing, housing, etc.).

That the low inherent fertility of many Ghanaian soils is a major problem increases the importance of farming systems and new technologies in improving the productivity. A proper farming system with a proper technology is the key in saving the land nutrients. In addition to the effects of farming system and technology on environment, inputs such as seed, fertilizers, and mechanization directly affect the quality of land.

*Low soil fertility places more importance on new technology and the efficient use of inputs, which in turn places demand on agricultural research and extension services to assist farmers in sustaining the productivity of fragile lands.*

#### **4. 1. Sub-sectoral Analysis of Environmental Degradation**

In the context of sub-sectoral analysis of environmental degradation, and as component of the TIP project, Samba (1994) examines the institutions that are involved in the implementation of the Environmental Management, Evaluation, and Monitoring Program (EMEMP). The need for funds to support field monitoring activities in the salt, fishery, forest/furniture, and the NTAE industry is emphasized. The following

activities are proposed: (i) baseline data collection and analysis of key environmental factors; (ii) preparation of field sheets; (iii) preparation of a database; and (iv) assembling of field teams. The Samba report discusses issues of environmental management, and recommends various approaches to the potential problems that the Ghanaian government is likely to encounter.

The environmental concerns facing the Shrimp and Prawn industry are discussed in Annex X of the TIP. Shrimp, lobster, and prawn have been identified as one of the NTE sectors that could benefit from the TIP. In order to increase exports of shrimp, lobster, and prawn (product), several options are available: (i) increase the amount of product that exporters catch, (ii) increase the proportion of landed product exported, (iii) increase the value of the exported product, and (iv) use aquaculture to produce more product. As part of the final preparations for the TIP, USAID is required to prepare a short overview of the potential long-term environmental impacts related to the proposed project goals outlined in items (i)-(iv).

As discussed in more detail in the Appendix I, this sector faces a number of environmental difficulties. They include: externalities from other sectors that can threaten the viability of the industry such as effluents from gold processing, and human wastes for densely populated coastal areas, problems with enforcing regulations on the quantity and age of the shrimp harvested, and in general, the establishing and enforcing property rights on what is otherwise an open access resource. Given the perishability of the products harvested, the traditional technologies now employed and the various environmental and open access externalities the industry faces, in our view substantial investments in infrastructure and institutions will be required before this sector is likely to make any major contribution to the agricultural-fisheries component of the economy.

As emphasized by Adzobu (1993) and the World Bank (1992), efforts should be made

at the outset to incorporate the environmental component into the structural adjustment program. This is not an easy task since it requires knowledge of the various resource processes at the sub-sectoral level and entails the need to define a set of policy actions and legal and institutional strengthening activities in order to make Ghana's development strategy more environmentally sustainable. One of Ghana's major difficulties is the lack of policy and legislative instruments for the management of natural resources. It was noted that no comprehensive national policy to influence the use and exhaustion of natural resources existed. This indicates that the interactions between sub-sectoral production activities which use environment resources as a common factor of production, and the identification of the channels through which the activities impact the environment is a necessary component of development of a sound national environmental policy. In order to help develop such a policy, future studies should focus on establishing a structure of sub-sectoral and vertical market linkages to environmental and natural resources. It should also be emphasized that the returns to environmental resources are broadly based, i.e., they affect the productivity of a number of sectors. Hence, the private sector (interest groups and their coalitions) need to participate in the design of this policy in order to avoid difficulties of enforcement, and to decentralize policy formation and implementation.

Now we indicate areas that the other studies reviewed in this monograph did not address. Table 6 is presented to help delineate the possible factors (that can also be considered in designing a national environmental policy) playing a dominant role in environmental degradation. In doing so, the focus will be on (i) the sub-sectoral environmental impacts of policy reforms, (ii) the main source of environmental degradation, (iii) the design of sub-sector specific policies that might be considered to control degradation, and (iv) the design of the new institutions that increase the information flow in the system.

In order to explain how relations among variables can be characterized, we construct a policy matrix whose leading diagonal has ten variables (items): industry, mining, energy, agriculture, land cover-use-transformation, ecosystem, socio-economic conditions, human settlement, health, and environmental management. Having defined the variables along the leading diagonal, we now wish to specify the direct relations between each pair of variables. For instance, the factors placed in the cell A(1,5) in Table 6 summarizes the interaction between industry and land cover-use-transformation. In other words, the channels through which industry influences land cover-use-transformation are soil and land degradation, discharge of effluents and emissions, deforestation, and over extraction of minerals. However, note that there is no channel through which the land cover-use-transformation influences industry since the cell A(5,1) in Table 6 is empty<sup>15</sup>. It is empty simply because no studies, to our knowledge, have discussed this particular linkage. Another example is the interaction between energy and human settlements. Following a clockwise convention<sup>16</sup>, energy influences human settlements by the factors placed in the cell A(3,8); similarly, human settlements impact on energy production by the factors summarized in the cell A(8,3). As noted there are total of ninety interactions (10 rows x 10 Columns less the 10 diagonal elements). Each cell in the policy matrix indicates the binary interaction between the two corresponding and leading diagonal variables. The term "binary interaction" refers to the "isolated" influence of one variable on another.

---

<sup>15</sup>Cell A(5,1) could have an entry of course. Suppose industry was a purchaser of the crop grown. Then, industrial discharge that affected the productivity of the crop grown would feed back to industry by lowering the supplies of the crop to the industry. An "institutional" solution to this problem could be some form of contract for vertical integration between producers and processors so that the externality of industrial discharge could be internalized into the joint decision making of producers and processors through this contract-vertical integration mechanism.

<sup>16</sup>See Appendix for a diagram explaining "clockwise convention".

TABLE 6: A POLICY MATRIX OF ENVIRONMENTAL INTERACTIONS AMONG SECTORS: ISSUES IDENTIFIED IN THE LITERATURE

|  |   |  |  |   |  |   |   |   |  |
|--|---|--|--|---|--|---|---|---|--|
| INDUSTRY   | #iron & steel milling<br>A(1,1)           | #natural woodlands for industrial fuelwood<br>A(1,2)   | #discharge of food processing industries; #organic solid waste #soil contamination<br>A(1,3)   | #soil & land degradation; #discharge of effluents & emissions; #deforestation due to industrial plantations; #over extraction of minerals<br>A(1,4)   | #air & water pollution influence wildlife conservation<br>A(1,5)   |   | #industrial wastes pollutes water #deposition of poisonous particulates pollutes air<br>A(1,6)  | #water & air quality; #solid industrial wastes; #toxic particulates & gases<br>A(1,7)                       |  |
|  |   | Mining   |  | #health of crops & livestock; #inappropriate reclamation causes soil loss; #open pit mining causes soil erosion; #blasting<br>A(2,1)  | #soil & land degradation #land pollution by contaminated mine water<br>A(2,2)  |   | #resettlement due to valuable minerals<br>A(2,3)  | #water & air quality; #visual intrusion #toxic particulates & gases<br>A(2,4)                               |  |
|  |   | ENERGY   |  |   | #indiscriminate fuelwood harvesting; #lucrative markets for charcoal and fuelwood in urban areas stimulate deforestation<br>A(3,1)   |   | #forest reserves; #fossil fuels; #thermal pollution of water; #indiscriminate harvesting of fuelwood<br>A(3,2)                        | #thermal pollution of water; #air pollution<br>A(3,3)   |  |
|  |   |  | AGRICULTURE  |   | #overgrazing; #use of fertilizer; #inappropriate timber harvesting; #crop rotation; #mechanization causes erosion & sub-soil compaction; #use of new seeds & biocides; #deforestation; #hill side farming; #soil quality impacts vegetation which impacts the speed of erosion & crop yields<br>A(4,1) |   | #land tenure reform #intensive agriculture decreases migration to ecologically fragile areas; #developing new variety crops<br>A(4,2) | #agr. wastes i.e. fert. & pesticide cause water pollution; #water born diseases<br>A(4,3)                   |  |
|  |   |  |  | LAND COVER, USE & TRANSFORMATION  |  | #mgt & allocation of land; #deforestation<br>A(5,1)   | #urban development<br>A(5,2)  | #anti-erosion barriers #transportation<br>A(5,3)  | #crop rotation decreases dependency on fertilizer; #land degrada. causes lack of nutrition; #crop & live stock health; #soil fertility<br>A(5,4) |
|  |   |  | #protection of rivers, dams; #produce of energy by wood<br>A(5,1)  | #crop rotation, land suitability, deforestation; #water conservation devices i.e. reservoirs #land pollution from wastes; #soil fertility<br>A(5,2)   |  |   |   |   |  |
|  |   |  |  |   | ECOSYSTEM  |   | #loss of amenities<br>A(6,1)  | #quality of water<br>A(6,2)   | #water born diseases; #loss of biodiver. affects drug products<br>A(6,3)   |
| #urban growth #Population<br>A(7,1)  |   |  | #deforestation; #human pollution of rivers; #decreasing follow period due to increasing population<br>A(7,2)   | #bush fires #deforestation due to increasing population; #migration to rural areas<br>A(7,3)  | #degradation due to population increase;<br>A(7,4)   | SOCIO-ECONOMIC CONDITIONS<br>A(7,5)   | #population; #income; #migration; #urban growth; #provision of public goods<br>A(7,6)   | #social, work, community & home environment; #rural-urban drift lead poor sanitation<br>A(7,7)              |  |
|  |   | #energy demand puts pressure on fuelwood resources<br>A(8,1)                                   | #reforms in land & capital markets due to high demand for land; #resettlement program for new areas absorb more rural labor<br>A(8,2)  | #construction of new buildings & roads<br>A(8,3)  | #destruction of wildlife conservation; #infrastructure migration to ecologically fragile areas is reduced by resettlement<br>A(8,4)  | #public services i.e. primary schools, recreation<br>A(8,5)   | HUMAN SETTLEMENT<br>A(8,6)  | #waste disposal; #drainage channels; #water supply; #public serv; #water & soil resource protect.<br>A(8,7) |  |
|  |   |  | #productivity of labor<br>A(9,1)   |   |  | #monality, fertility #welfare<br>A(9,2)   |   | HEALTH<br>A(9,3)  |  |
| #regulation on discharging of waste chem. #provision of special disposal sites for industrial solid waste<br>A(10,1) | #design reclamation guidelines<br>A(10,2) | #design policies encouraging small scale farmers for peri-urban fuelwood production<br>A(10,3) | #design policies to promote edu. campaign on benefits of crop rotation; #promotion of edu. on farming sys. & productivity; #design ext. serv. for soil conservation practices #property rights affect soil erosion and salinization<br>A(10,4) | #design policies for sustainable use of land; #promotion of agr. ed. services; #size of public sector influences soil fertility due to migration to rural areas; #well defined property rights<br>A(10,5) | #design policies for protection of fragile ecosystems<br>A(10,6)   | #nonformal education program to create awareness, impart knowledge, change negative habits<br>A(10,7) | #extension services for environmental awareness; #recycling incentives; #performance bonds<br>A(10,8)                                 | #preparation of public health & educ. programs; #regulation of sale of waste generating foods<br>A(10,9)    | ENVIRONMENTAL MGMT.<br>A(10,10)  |

#### 4. 2. Assessment of Environmental Interactions Between Sub-sectors

The policy matrix serves to categorize and suggest the cause and affect tendencies among the various entries, and to indicate those entries for which some information was or was not provided in the literature reviewed. For instance, the empty cells in Table 6 suggest that either information is missing, or that insufficient information precludes assessment of cause and affect. In other words, Table 6 summarizes the results of studies reviewed for this monograph and indicates where the existing studies have not addressed the environmental questions (the empty cells). The empty cells suggest that:

*In general, information is grossly lacking as to the effect of reform on incentives to increase the production of traded goods and how the response of agents to these incentives will impact on environmental and natural resource use. In particular, little information is available on the environmental influence of industry, mining, and energy. Determining those sub-sectors of the economy that are likely to be the major contributors to environmental degradation is clearly a prerequisite to sound environmental policy. The empty cells in Table 6 suggest those areas where information is wholly lacking.*

*Furthermore, the last column "environmental management" is empty. This suggests that little information is available on the structure and response of Ghanaian decision makers to policy reform on environmental and natural resource outcomes. Since the particular policies and policy instruments to address undesirable environmental outcomes in a socially profitable and cost-effectiveness way depends, as it does in all countries, on the capacity of government agencies and institutions to implement, monitor and attempt compliance, we suggest that future studies seek to identify, suggest and prioritize those policies and policy instruments that are likely to best meet this criterion.*

#### 4. 3. Fishery, Forestry, Salt Mining, and Commercial Agriculture

This section discusses potential environmental effects of activities in fishery, forestry, salt mining, and commercial agriculture sub-sectors. The product exports

from these sub-sectors are encouraged by TIP in order to diversify the source of export revenue. Possible environmental effects of export incentives outlined in TIP are presented and some protective and mitigative measures are proposed to avoid environmental side effect of private sector export-led policies.

*It may bear repeating that while the TIP seeks to accommodate and resolve the constraints that retard fundamental economic forces, effectively, permitting markets to function and respond to the new incentives, we were unable to find any economy wide studies that actually identify those sectors of the economy that are likely to experience growth relative to other sectors, nor is there any information on those resources, natural and otherwise, that are likely to become relatively more scarce. Hence, we recommend, as we have elsewhere, that consideration be given to better understanding these fundamental forces and the directional effects they are likely to have on the economy.*

#### Fishery

In spite of significant environmental endowments conducive to shrimp and prawn production (approximately 520 km<sup>2</sup>), Gordon's study<sup>17</sup> of the Ghanaian shrimp and prawn industry suggest that the industry is far from the world standards of particularly the Asian countries that specialize in this industry. Consequently, significant potential may exist to develop the industry, provided that its natural resource base is carefully husband and not over exploited as has happened twice in the past. While laws that seek to regulate the harvesting of this product exist, Gordon reports that they are seldom enforced, that foreign harvesters frequently encroach on coastal areas, and that smuggling as a way of avoiding harvesting controls are common.

The major environmental problem in shrimp farming is the destruction of coastal wetland habitat, as has happened in Ecuador. The coastal wetland harbors large numbers of birds and other vertebrates. Mangroves and lagoons act as an important breeding

<sup>17</sup>Gordon, Chris, an Overview of the Environmental Impact of the Shrimp and Prawn Industry in Ghana, paper in support of the TIP.

area for many species of commercially valuable fish, including shrimp and prawn. Two additional sources of potential harmful externalities include effluent discharges from gold mining and processing, and the disposal of human wastes since the coastal plain is the most densely populated area of the country. Effluents containing arsenic and cyanide from gold mining and processing in the west of the country flow into the Ankobr river and enter the sea in the area of the main shrimping grounds.

The overall legal policy agenda for these resources are reportedly being addressed by the government. However, the enforcement and observance of laws and regulations to husband and address the various externalities associated with this industry require institutional strengthening and education of the concerned groups. This includes public investments in human waste-sanitation facilities, regulation of the effluent discharge from gold mining and processing as well as regulation of the shrimp-prawn industry. This is a sizable task which will likely make sizable demands on fiscal and institution resources, and a task that is likely to require many years to implement.

*An important step in this regard may be the fostering of shrimp-prawn harvesters and processor's association. It is likely that for this industry to grow and prosper, the industry will need to lobby and inform government of the rules, and regulations needed to husband the sector's resources, while also serving as a self policing mechanism to "ration" access to what is otherwise an open access resource.*

### Forestry

Ghanaian forest resources total about over 238,000 km<sup>2</sup> (Eastin, Table 1), of which about 88,000km<sup>2</sup> are classified as the High Forest Zone, and 24,000 km<sup>2</sup> are Forest Reserves, over 3/5-ths of which are rainforest reserves. The rain forest zone in Ghana has decreased from about 88,000 km<sup>2</sup> at the beginning of the nineteenth century to about

19,000 km<sup>2</sup> today due largely to land clearing for commercial agriculture. A recent survey of forest resources suggests that the standing volume of merchantable timber in Ghana totals 188 million m<sup>3</sup>, located almost exclusively within the rain forest zone.

Ghana's Timber forest has been a source of exports revenues for many years. The lack of property rights, replanting regulations, and the presence of entry-exit barriers into the timber industry were main problems that Ghanaian forest sector has encountered. The timber industry is a very heterogeneous one in terms of firm sizes; and also entry and exit barriers within the industry are quite low particularly for the smaller, less capital intensive operations. The industry lacks investment in further processing facilities and equipment. The Ghanaian government has indicated that the export of unprocessed logs will eventually be banned completely. There is currently a ban on the export of 18 traditional timber species in log form. The aim of these policies is to encourage the further processing of the traditional timber species while providing an incentive to develop markets for the lesser-known timber species by exporting them in log form. The government has also imposed a 50% forest improvement levy on the export of sawn lumber from several traditional species.

Most Ghanaian exporters do not have a relationship with the end-user of their products. Rather, most timber from Ghana is imported into Europe by agents who then distribute these products to end-users. This method of distribution separates the producer from the end-user of his product and restricts his access to market information, reducing his ability to compete in these markets. As a result, Ghanaian producers have been unable to develop a thorough understanding of market conditions and the competitive forces in Europe. This leads to the industry monitored and regulated by two public entities (in 1991, the Forest Ordinance Law was passed giving the Forest Department the authority to establish forest reserves) to be ineffective in promoting the large number of lesser-known/lesser-used species found in the Ghanaian forest and

low marketing capability of the industry.

The efforts to manage forests in Ghana focus on sustainable use of the forest resources. TIP aiming at diversifying export base recognizes furniture industry as the one having the potential to increase exports.

*However, it is not likely that Ghana can compete in world furniture market. Timber may need to be primary export instead. The entry of multinational firms into the domestic market can increase over exploitation of timber forest. This brings about two issues: (i) protecting the existing timber forest by introducing a property rights system and (ii) replanting timber at a sustainable level by new enforcement mechanisms. To preclude the export of logs in the presence of a "wood industry" that cannot compete in world markets will tend to under value the forest stocks with the potential of lowering incentives to husband them.*

Timber concession policy is administered by both the Forestry Department and the Ministry of Lands and Natural Resources. The process of applying for a concession is extremely time consuming. Concession owners pay a variety of royalty and licensing fees to operate their concession. The recent study notes that 34% of timber concessions were inactive, 31% of concessionaires had not renewed their property marks, only 14% of timber mills possessed adequate concession holdings, many concessions had been awarded to people who did not possess harvesting equipment and, presumably, little harvesting experience. These inefficiencies also serve to under value forest stocks.

#### Salt Mining

Since salt production is a by product of natural process in the coastal and riverine lagoons, the direct impacts of salt mining may include the reduction of the importance of certain lagoons as sanctuaries for migratory birds. It may also result in a permanent imbalance of some natural lagoon ecosystem. The potential impacts of the development of the salt industry on the environment with particular reference to

the biological value of the coastal wetlands are discussed in TIP. Protective measures include restrictions on access to known best sites during the breeding season and educating salt pan workers. However, no information is available on the buffer capacity of harvesting sites to salt production, nor of course any benefit to cost estimates of the costs associated with this industry.

### Commercial Agriculture

The term "commercial agriculture" is used to refer to the cultivation of kola nuts, oil palm products, and rubber which have increasing importance as export commodities. It has been observed that many old cocoa farms have been converted to the cultivation of the kola tree. Increased production for export is not expected to have any adverse environmental impact. Palm oil became an alternative export commodity. It grows naturally in the closed forest. Therefore, the cultivation of oil palm could result in initial deforestation. Environmental protective measures include monitoring new plantations and training of extension agents to respond to the needs of farmers in such areas. Proper forest management should also be ensured by increasing the efficiency of enforcement mechanism. Again, information relating to current and potential production capacities and opportunity costs of alternative uses of resources are not available.

## **5. ENVIRONMENTAL AND MARKETING IMPLICATIONS OF ADJUSTMENT**

The structural adjustment program pursued in Ghana has been outlined in Section 1, while the Background Section of this monograph discussed a number of economy-wide issues relating to the environment and natural resource use. Here we note that as commercial agriculture more fully responds to incentives of economic reform, many environmental and natural resource outcomes will be exacerbated. It is for this reason that, as mentioned, efforts should be made at the outset to "internalize" the

externalities that can become more severe following reform. However, the "best" policy instruments to employ to correct for externalities tend to be dependent on culture and institutional characteristics of a country, and hence they tend to be country specific. That is, for any two countries facing the identically same environmental problem, the instruments they find "optimal" to use will likely be different depending upon the capacity to implement and enforce policy, as well as the role of interest groups that may prefer one set of instruments over another.

Among the "policy instrument" options are direct regulation, charges, taxes and subsidies, market creation, liability instruments, and incentive-based approaches (Eskeland and Jimenez (1992), World Bank (1992), and Graham-Tomasi, Mohtadi, and Roe (1992)). Direct regulation in a "command and control" type of context is normally the first step in developing any structure intended to improve environmental integrity. Charges, taxes and subsidies allow efficiency and feasibility considerations. Liability instruments, on the other hand, are efficient to manage environmental resources. All these different policy instruments exist since each environmental problem has their own unique property that the others do not.

*It is obvious that each macro policy package implies a specific pathway through which environment is influenced. In order to develop a sound environmental screening of macroeconomic policies, policy designers should address the questions of the following kind: what are the implications of macroeconomic policies for the resource allocation which indirectly influences individuals' health and productivity? What are the policy instruments to deal with the potential health-productivity problems?*

The World Bank (1992) recommends, for example, land tenure and capital market reforms in order to avoid deforestation and land degradation. Also, the environmental effects of mining and industrial sectors should be controlled by environmental quality

standards and reclamation guidelines; and water pollution and hazardous chemicals are controlled by various sanitary and waste disposal regulations. Under a high growth scenario, the above recommendations are augmented in accordance with sectoral targets and their indirect effects on environment and resource base of Ghana.

The direct and indirect effects on the environment of fiscal and monetary measures implemented under the structural adjustment program should be analyzed further to determine to what extent low interest rates lead to degradation of amenity resources through increasing investments in technologies used in the resource extraction, including circumstances where they are extracted for the purposes of earning or conserving foreign exchange. In general, there is a need for a sound environmental screening of macroeconomic policies which are complementary to environmental degradation Tomasi, Roe, and Mohtadi (1992) and Binswanger (1989). However, this requires knowledge of the magnitude - by sector - of the economy's response to reform and the extent to which natural resources are consumed in this response.

*Since Ghana is natural resource rich relative to many other countries, it is likely that natural resources will be relatively more important to its economic performance in general, and its foreign trade performance in particular. Hence, relative to many other countries, environmental and natural resource policy may be relatively more important to sustaining long-term economic growth. The experience of Indonesia, another natural resource rich country, may offer some lessons in this regard.*

In order to simplify the complex relations between, market reforms, marketing, and the environment, we introduce Table 7 in which the channels through which reforms affect marketing and environment are identified. The factors in the cell D(3,3) in Table 7 are the main reforms which can be grouped in three categories: liberalization, rehabilitation, and privatization. The factors placed in the cell D(3,1) in the same table are the reforms that influence environment, and likewise the factors in the cell

TABLE 7: A POLICY INTERACTION MATRIX OF AGRICULTURAL MARKETING AND ENVIRONMENT: ISSUES IDENTIFIED IN THE LITERATURE

|   |   |   |
|---|---|---|
| <p>ENVIRONMENT INCLUDES (i) HEALTH, (ii) AMENITIES, and (iii) NATURAL RESOURCES</p> <p>A. AMELIORATE</p> <p>1. Health (morbidity-mortality): # Embodied effects such as unsanitary water &amp; food, food residues, local air pollution, solid and hazardous waste</p> <p>2. Natural Resource Degradation: # High levels of CO<sub>2</sub>, NO<sub>x</sub>, SO<sub>x</sub> per capita GNP; # Tendency to over extract &amp; under price primary resources (metals, fossil fuels); # Land degradation, hill side farming</p> <p>B. EXACERBATE</p> <p>1. Health: # Disembodied effects such as suspended particulate matter; # Regional solid and hazardous waste</p> <p>2. Natural Resource Degradation: # Decrease husbandary of natural resources when property rights are ill defined; # Increase total emissions of CO<sub>2</sub>, NO<sub>x</sub>, SO<sub>x</sub></p> <p>3. Amenities: # Loss of scenic areas; # Loss of wild life and other biodiversity</p> <p>TRADE LIBERALIZATION POLICIES INFLUENCE</p> <p>1. Health through: # taxes/tariffs on exports/imports having embodied effects; # Internal standards of goods and factors having disembodied effects</p> <p>2. Amenities: # Compensatory payments to encourage resource transfers from rich countries to sustain amenities &amp; biodiversity</p> <p>3. Natural Resources: # Taxes/Quantitative controls on resources such as fishery, forest, and mineral &amp; energy resources</p> <p style="text-align: right;">D(1,1)</p> | <p># The use of resources such as forest, fishery, mineral &amp; energy</p> <p># Foreign and domestic firms' involvement in marketing</p> <p># Feeder road and transportation investments</p> <p># Supply of commodities whose production requires environment as an input</p> <p style="text-align: right;">D(1,2)</p>   | <p style="text-align: right;">D(1,3)</p>  |
| <p># Reorganizing credit institutions to provide small holders with credit</p> <p># Public sector's support to private marketing institutions and agents</p> <p># Public sector's agricultural R&amp;D activities</p> <p># Low interest rate providing small holders with access to new technology emerges the extension services on the use of new technology</p> <p># Administrative decentralization is efficient in addressing needy people in local rural areas, who are potential danger for forest, fishery resources</p> <p style="text-align: right;">D(2,1)</p>   | <p>AGRICULTURAL MARKETING SYSTEMS</p> <p>I. OPEN MARKETING SYSTEM:</p> <p># Middlemen buy, assemble, and transport the produce to wholesalers</p> <p>II. THE STATE CONTROLLED MARKETING SYSTEM:</p> <p># Ghana Cocoa Marketing Board: buys, processes, and market cocoa. Also, it supplies seeds and other inputs, quality control and extension.</p> <p># Ghana Food Distribution Corporation: purchases, exports, distributes foods and inputs. It purchases maize, rice, plantain, yam, and gar</p> <p># Grains Warehousing Company: purchases and stores cereals</p> <p># Ghana Natural Procurement Agency: imports and wholesale wheat, rice, sugar, maize</p> <p># Meat Marketing Board: distributes meat</p> <p style="text-align: right;">D(2,2)</p>  | <p style="text-align: right;">D(2,3)</p>  |
| <p># Flexible exchange rate policy;</p> <p># Decentralization of the authority to export commodities</p> <p># Privatize public input and output distribution channels, that is, privatize public marketing institutions;</p> <p># R&amp;D on new variety of crops and incentives for private R&amp;D;</p> <p># Reduction of tariffs and special incentives; # Develop financial market and restructure the banking sector</p> <p># Institutional arrangements such as a well defined property rights system; arrangements for monitoring quality standards;</p> <p># Rehabilitation of public sector such as develop feeder road, support small scale irrigation, help private and other commercial storage;</p> <p># Reform in land tenure system, land tiling;</p> <p># Elimination of subsidies;</p> <p># Elimination of dual pricing in transportation;</p> <p># Public sector's investment in infrastructure such as transportation and communication;</p> <p># Incentives for producers' of non-traditional export products</p> <p># Policy instruments to attain sustainable use of environment, i.e. regulations, fines, liability instruments, taxes and subsidies, and incentive-based instruments</p> <p># Redeployment of civil service staff</p> <p># Monetary and fiscal policy (interest rates, taxes)</p> <p style="text-align: right;">D(3,1)</p>  | <p># Reduce public sector role and increase private sector participation in commercial activities;</p> <p># Public sector support to private sector on weighing and grading facilities, feeder road network, lake transport, and local storage facilities for the various tiers of the marketing chain: on-farm, local and regional wholesale markets;</p> <p># Privatize imports and distribution of cocoa inputs;</p> <p># Strengthen small-scale agro-processing sub-sector includes promoting women's groups to achieve economies of scale, securing group credit, expanding their market outlets; for the large scale processing unit, options include liquidation of uneconomic enterprises and new technology and capital through joint ventures</p> <p># Improving supply of fertilizer and agro-chemicals</p> <p># Privatize the wholesale level</p> <p># Rationalize the role of public sector</p> <p># More efficient import substitution</p> <p># Grassroots organizations can play a major role in the privatization process and in strengthening rural financial systems</p> <p># Providing credit to small scale producers and traders to build their own facilities</p> <p># Provide incentives for efficient farm production through market oriented price setting mechanisms</p> <p># Relaxation of export restraint on maize</p> <p># Increase cocoa producer price through progressive tax reductions</p> <p># Eliminate subsidies on cocoa inputs</p> <p># Liberalize domestic cocoa marketing</p> <p># Monetary and fiscal policies (interest rates and taxes)</p> <p style="text-align: right;">D(3,2)</p> | <p>STRUCTURAL ADJUSTMENT PROGRAM</p> <p>1. LIBERALIZATION</p> <p># Reduce government intervention in the economic activities such as reducing fertilizer subsidy;</p> <p># Foreign exchange reform;</p> <p># Incentives to non-traditional exports;</p> <p># Simplifying export licencing system;</p> <p># Relaxing trade controls such as removal of quantitative import controls, reductions in tariffs and ban on food imports;</p> <p># Disseminating price information;</p> <p># Restructuring banking sector and developing a financial market;</p> <p># Providing incentives to cooperatives to participate in agricultural input markets</p> <p>2. REHABILITATION</p> <p># Concentration on infrastructure and provision of essential inputs to productive sectors</p> <p># Increase public sector support to private sector</p> <p># Improve the delivery of public services (i.e., public inputs such as new technology and extension services to farmers and private inputs such as fertilizers, improved seeds, and credit</p> <p>3. PRIVATIZATION</p> <p># Reduce public sector role and increase private sector participation in commercial activities</p> <p style="text-align: right;">D(3,3)</p> |

D(3,2) are the reforms that influence marketing. Similarly, the factors in the cell D(2,1) are the reforms through which marketing activities influence environment; and finally the factors in the cell D(1,2) are the reforms through which environment influences marketing. In other words, Table 7 outlines the channels that connect reforms with environment and marketing. Hence, this table establishes the structure of reform-marketing-environment nexus. The table suggests several possible interactions between the elements of this nexus. For example, one of the possible pathways through which privatization in the cell D(3,3) influences environment is that privatization of import and distribution channels affects marketing, which subsequently influences environment by increasing access to new technology. In the context of export-led policies, the challenge is to promote private sector investment without encouraging industrial pollution and environmental degradation Gaudet (1992). In his study, he addresses the environmental and economic sustainability of export-led growth. In this respect, the possible negative and positive environmental impacts of the TIP program promoting activities within NTE sector by creating enabling environment for the private sector export activities should be paid attention to ensure sustainability of export-led economic growth. Contrary to export-led policies, inward-oriented policies aiming at protecting domestic industries distort the economy and therefore lead to overuse of the environment and natural resource base. Some of health effects of inward-oriented policies include: (i) embodied effects are unsanitary water & food, food residues, local air pollution, solid and hazardous wastes and (ii) disembodied effects are suspended particulate matter, regional solid and hazardous waste. Indirect amenity effects include loss of scenic areas and wildlife and biodiversity. Indirect effects of these policies on natural resource include: (i) decreasing husbandry of natural resources (land degradation, hill side farming, excessive cropping and grazing), (ii) high levels of emissions, and (iii) over extraction of natural resources.

## 6. CONCLUSIONS AND DISCUSSION OF FUTURE RESEARCH

This monograph focuses on the effects of Ghanaian policy reform on the economy, and agricultural production-marketing and the environment in particular. The studies reviewed are divided into three parts. The first group of studies discussed, and to a lesser degree evaluated, focus on policy reform and their likely consequences. The second group focus on different aspects of agricultural production-marketing while the third group focus on the environment, with emphasis on the health and productivity effects of environmental degradation and their linkage to policy reform.

### Economic Reform

The consequences of Ghana's pre-1983 policies of import-substitution industrialization (ISI) and interventions by state enterprises into activities that are typically performed more efficiently by the market brought the economy to a near crisis. Some of general consequences of these policies include: (i) low returns to resources in the production of agricultural tradeables, (ii) a concentrated and capital-intensive industrial structure, (iii) narrow marketing margins that tended to discourage the private sector from agricultural marketing activities, (iv) rural-to-urban migration, (v) biasedness in the distribution of public goods between urban and rural sectors, and (vi) an inefficient industrial structure that also made an inefficient use of the country's environmental and natural resources. The distortions created in the economy by these policies led to additional government interventions. These interventions include subsidies, capital market controls, import quotas and numerous non-tariff barriers to foreign trade, and the expansion of state enterprises.

The challenge facing the reform program is essentially to undo the consequences of the previous policies. This is a difficult task because it entails the reallocation of resources among sectors of the economy when many forms of capital in plant and

equipment are relatively specific to a sector and not easily reallocated to more profitable alternatives. Likewise, the human capital of the nation's work force needs upgrading and to learn new skills in the production of goods and services of a quality and uniformity that make them competitive in world markets. As numerous country case studies and their syntheses reveal, and Ghana appears to be no exception, when governments pursue these inward-oriented policies, they almost always incur macro economic imbalances, and with few exceptions, under invest in the provision of public goods, i.e., they fail to intervene in areas where markets are *not* efficient in allocating resources (roads, infrastructure, education, rural electrification, agricultural research and extension). Moreover, they generally fail to develop the institutions and agencies necessary to support the efficient functioning of markets, such as the development of property rights, an efficient legal system to support the commitments made in privately agreed contracts, the development of efficient agencies to support well functioning capital markets and an efficient trade and payments regime, nor do they tend to develop policy and supporting bureaus to husband environmental and natural resources. Finally, the pursuit of reform needs to establish credibility so that domestic and foreign entrepreneurs face little risk that the new policy is only short lived and likely to return to the "old ways"<sup>18</sup>.

In this regard, Ghana has some distance left to travel. The TIP and IBRD documents note that the country continues to incur a trade imbalance in goods and services, an unacceptably high inflation rate, and concern with the capacity of domestic savings to meet investment needs commensurate with attaining real rates of per capita GNP growth in the neighborhood of 5 percent. The persistence of these macro

---

<sup>18</sup>See the special issue of *The North American Journal of Economics and Finance*, op cit for the strategies pursued by the Salinas administration to establish credibility in Mexico's reform program.

economic imbalances suggests that policy induced distortions remain which can threaten the credibility of the country's reform program, and its adjustment to a more balanced growth path. At this juncture however, the structural causes of these imbalances are poorly understood and in need of further study. Our review suggests that the country's trade imbalance and persistent inflation rates cannot be explained by the inflow of capital alone. Consequently, in real terms, the country's currency appears to be over valued which places implicit, but no less real, taxes on the country's capacity to compete in world markets. Further, both IBRD and USAID program documents fail, in our view, to adequately focus on ways to attract foreign enterprises and capital into the domestic economy. As the case of Mexico has clearly demonstrated, foreign capital inflows serve to decentralized investment decisions, place the responsibility of default on entrepreneurs as opposed to the government, and alleviates pressures for increasing domestic savings to finance investment needs commensurate with acceptable levels of real growth.

As we note elsewhere in this monograph, reform, if successful, will drastically alter incentives of what, where and when to produce and consume. While it is clear that reform will provide increased incentives for the traded goods sector of the economy (both for export and import competing goods, factors and services) to expand production relative to the home goods sector, it remains unclear which of the traded goods sectors, in relative terms, will expand and which will contract, which resources (including various human skills) will become relatively more scarce and hence act as a constraint to further expansion. Moreover, it is also clear that reform will alter the incidence of environmental and natural resource degradation. Since Ghana is relatively natural resource rich, a risk exists of over exploitation so that growth cannot be sustained without appropriate safe guards. Further, it is likely that the livelihood of the low income quartile of the population is more dependent on natural resources

than are those in higher income profiles<sup>19</sup>. It is also true in many other countries that the environmental impacts on health are more deleterious for low income households. An economy-wide analysis<sup>20</sup> of these key linkages are required to identify and guide domestic and supporting donor policy to deal with these key issues and bottlenecks to attaining a more efficient and sustainable growth path.

### **Agricultural Marketing**

The studies on the impacts of policy reforms on agricultural marketing focus on (i) prevailing marketing channels in input-output markets, (ii) linkages between the government and marketing institutions, (iii) spatial location of economic activities, (iv) vertical, temporal and spatial price transmission mechanisms, and (v) cost structures of farm product marketing.

The broad domain of the literature on market reforms and marketing seeks to address various aspects of the three fundamental functions performed by the market. These functions are the provision of time (e.g., storage), space (geographic location of economic activity), and form utility (input-output variety, quality and other user attributes) to final consumers. This monograph discusses the nature of the various constraints, market imperfections, and the public goods (education, information, extension, research to develop and adapt agricultural technology, and market infrastructure) needed to accommodate the fundamental economic forces that reform has unleashed.

Studies of output markets and marketing channels for food and cash crops are

---

<sup>19</sup>This result was found for Mexico and Costa Rica.

<sup>20</sup>Studies of this type are now fairly common. They draw upon the so called computable general equilibrium methodology, and a number are based on a country's "green accounts," i.e., national accounts that take into consideration a country's stock of natural resources and their rate of degradation.

needed because of their effect on nutrition and well-being of Ghanaians. Since food is a wage good<sup>21</sup> in Ghana, increases in the productivity of resources employed in food and cash crops production and marketing effectively releases resources for the development of other sectors of the economy. This is one of the major sources of agriculture's contribution to economic growth. Studies of this nature should cover the areas of (a) consumers' responses to changing prices of commodities such as estimating the degree to which consumers make substitution between commodities and changes in their consumption patterns to changes in income, and (b) producers' responses to changing production incentives such as removing institutional rigidities that inhibit producers access to markets, their ability to respond to market signals, and the sensitivity of supply response (and hence factor productivity) to the provision of rural public goods<sup>22</sup>. These two points are important in designing policies to make more efficient the transition to an open economy, in particular, to determining the areas where markets fail (e.g., credit, education, infrastructure, agricultural technology, property rights), thus impeding an efficient transition to policy reforms. Some of the policy issues implied by (a) and (b) include the deficiencies in marketing institutions such as government and private institutions participating in marketing activities and the

---

<sup>21</sup>Food is typically considered a wage good when food expenditures account for the major proportion of disposable household income (therefore, the weight attached to the price of food used in the computation of the consumers' price index is large relative to the weights attached to the prices of clothing, household durables etc.). In this case, an increase in the price of food lowers real wages. Or, real income can be increased by increasing the supply of food which, at the margin, increases the incentives for individuals to migrate to villages and cities, thus lowering population densities on land and encouraging capital deepening in land, equipment and livestock.

<sup>22</sup>See Binswanger, *op cit*, and Delgado, Christopher L. and John Mellor (1987), and Schiff, Maurice (1987) for a discussion of the role of public goods for countries in the process of reform.

rigidities of marketing agents in tackling such problems as storage needs, input supply decisions, credit, extension, and the provision of new technologies.

Prior to 1983, the agricultural sector experienced a serious decline in productivity. This experience drew attention to issues regarding the deficiencies in input markets and input marketing channels. Studies should be designed to estimate the impact of (a) factors influencing farmers' input demand decisions and (b) barriers to the adoption of new technologies. The areas to be addressed in this respect cover the use of new technology (improved seed varieties, extension service for input-specific techniques, improved farming techniques, appropriate use of fertilizers) in food grains, dry land and irrigated crops. Not surprisingly, we observe a huge gap in the area of (a) and (b). Future studies should be designed to address farm level problems to assess the effects of changes in (1) household consumption patterns, (2) farmers' risk taking behavior, (3) farmers' income sources, and (4) farmers' attitudes toward traditional/modern farming techniques on the decision to adopt and use new techniques and purchased inputs.

Another set of factors that affect agricultural productivity are related to the constraints that cause allocative inefficiencies in the supply of inputs. In this respect, insights are needed into the effect of changes in (1) financial soundness of input suppliers, (2) capital market structures to improve farmers' access to credit, and (3) government's investment in rural infrastructure including the provision of market information. These studies should particularly address such issues as the supply of credit to small holders, changing consumption-production-export taxes on producers' choice of technology and the allocation of resources to various crop and livestock activities, the need to up-grade and introduce new information and communication channels, and the provision of extension and related services.

Studies on the spatial location of economic activities aim at determining the

location of primary production by crop-livestock type, product assembly, processing activities, distribution, and product-factor input distribution networks that make the most efficient use of resources. Spatial location studies are particularly important because of the need to develop and sustain rural roads when fiscal resources are particularly scarce. For an isolated processing plant site, for instance, the costs of collection of inputs from scattered origins to the point of plant location, the costs of plant operation, and the costs of plant-to-market transportation are the factors that a producer should take into account in evaluating the efficiency of his production activities. Given that most of the processing plants are owned by the government, and incur relatively high unit processing transportation costs, the relative efficiency of these plants in terms of their size, location and market area needs to be scrutinized. This type of information is particularly important to the reallocation of resources that policy reform is attempting to achieve. These efforts may also entail cost efficiency analyses to evaluate the performance of publicly versus privately-owned processing plants to assess the plant capacities and ownership structures that are likely to yield low unit operating costs.

Mention was made of the special role of women in agricultural marketing and production activities, and the concern that policy reform and institutional development (e.g., of capital markets, credit and collateral requirements) may disenfranchise women from equal access to economic opportunities<sup>23</sup>. This issue is more than a question of fairness; it is a question of how a country can fully employ its resources. The literature reviewed provided little insight into how the reforms are affecting women

---

<sup>23</sup>Studies of the "Madam Shara" and her role in marketing activities in Haiti revealed that World Bank support for road and transport development during the late 1970s tended to focus on institutional arrangements that exclude women because their skills were in traditional marketing practices and their collateral capacities were of the form for which ownership and property rights were more obscure than for men. These types of errors should be avoided.

and whether they have equal access to education, training and other forms of human and physical capital.

### **Environment**

The studies covering environmental impacts of policy reforms address in various degrees of completeness (i) the identification of environmental problems resulting from some sub-sectoral production activities, (ii) the need for government interventions that lead to a more socially optimal allocation and degradation rates of environmental and natural resources, (iii) sectoral environmental screening of macroeconomic policies, and (iv) indirect health and labor productivity effects of reforms as they impact on nutrition and environmental impacts (e.g., sanitation, air pollution, effluents) on health.

The environment impacts on well-being through health, amenities and indirectly through the quantity and quality of natural resources. The decline in quantity and quality of natural resources is affected directly by poor husbandry and over exploitation, and indirectly by other externalities as exemplified by effluents from gold processing affecting the productivity of coastal resources to produce shrimp and prawn. Production activities, that in turn are driven by the "new" incentives of Ghana's policy reform program, affect the incidence and level of environmental impacts on well-being. In the absence of property rights and policies that appropriately price natural resources (and hence husband them), markets often fail in determining their level of use and rate of degradation (either positive or negatively) that is consistent with the well-being of current and future generations. Since Ghana is relatively well endowed with natural resources, which are a likely source of its comparative advantage in world markets, interventions designed to (i) correct for environmental externalities that unnecessarily impact on health, amenities, and natural resources and (ii)

strengthen contractual processes and provision of property rights required to attain economically and socially viable use of these resources are particularly critical to sustained long term economic growth. Studies concerned with environmental and natural resources that were reviewed for this monograph tend to focus on such aspects as environment linkages to farming systems, farming inputs, population growth, land tenure, land use practices, sequencing of macroeconomic policies, property rights, privatization, and foreign investment. However, most did not serve as an important guide to policy. While these studies describe some of the potential linkages between structural adjustment programs and environment-natural resource use, additional work is critically needed to achieve a more complete understanding of the environmental implications of adjustment policies in Ghana.

Some of the key points to be addressed in this regard include:

1. Spatial focus within sectors: An environmental screening of specific macroeconomic policies must be conducted to determine those policies that contribute the most to environmental degradation, as suggested by the World Bank (1992). The determination of those policies that have specific regional environmental effects are of crucial importance in designing environmentally safe policies. In the case of cocoa, for instance, *supply response* to changes in cocoa prices needs to be analyzed to identify the channels of environmental degradation. In Ghana, we observe that favorable changes in the world cocoa prices have negative effects on environment through intensive harvesting of cocoa in the forest zones, and a potential over exploitation of this resource.
2. Activity-specific analysis: Identifying technologies and practices employed in specific activities (such as gold processing, the harvest of timber, etc) that have potential for decreasing their negative environmental impacts in cost effective ways is important to the management of natural resources that affect the

productivity of other resources (labor, capital). In particular, since the activities in sub-sectors of the industrial sector such as mining and energy tend to be more environmentally harmful, policies should be designed to encourage the use of more environmentally friendly technologies. In order to conduct sub-sectoral analysis of environmental impacts, sector specific surveys will likely need to be designed to provide data on their potential to be environmentally degrading or saving.

3. The linkages between foreign aid and environment-resource use: Recently, donors have placed more emphasis on how the policies and programs they support influence environmental outcomes. Foreign aid, in this regard, influences environmental policy. Studies should focus on to what extent the foreign aid can be used for an environmental screening of domestic policies and how it might provide institutional support for implementing and managing environmental policy. However, a word of caution may be in order. Care should be exercised that the environmental reforms sought by donor countries and agencies reflect the benefit-cost (and hence preferences) of the recipient country, not the benefit-cost (and hence preferences) of the donor country unless it is understood that the donor country views its support as akin to compensatory payments for the preservation of resources (such as amenities and biodiversity) that it values more than the recipient country.
4. Institutional arrangements: Consideration needs to be given to the design of policy instruments and the institutions to implement and manage them that are "consistent" with the country's cultural and institutional endowments. Policy instruments (such as effluent charges, or marketable permits) may be "first best" in some countries but not appropriate or efficient in others.
5. Property rights: Open access to natural resources (e.g., land, forests, fisheries)

leads to their degradation and over exploitation in the absence of either formal or informal property rights. Studies need to be conducted on how the current institutions and legal structures need to be amended and reinforced so that these resources are husband in a more economically viable way.

6. National environmental policy and foreign enterprise: Future studies should investigate (1) whether Ghana's environmental policy induces specialization in those commodities which are relatively pollution-intensive in their production, (2) whether removal of barriers for foreign investment will have a tendency to over exploit natural resources, (3) whether there is a tendency for foreign enterprises to locate in Ghana that tend to be environmentally "dirty", and (4) to assess the types of special legal and policy provisions that might be enacted to balance, in a socially profitable way, the trade offs from the economic gains of foreign enterprise to the domestic economy with the environmental costs.
7. R&D Activities: The linkages between government and universities, and other research and information producing institutions-firms, should be strengthened, particularly in the provision of farming technologies and practices that save on the use of environmental resources at little cost to the returns to other variable inputs (family labor, purchased inputs). The areas in which universities and other research institutions (e.g., the CGIAR system) may help farmers choose more efficient farming systems require region specific studies to ascertain the potentials of each region and to establish where the gains to new technologies may be the highest.
8. Marketing activities and environment: Interestingly, there is no study investigating the linkages and impacts of marketing activities on environment and natural resources. Therefore, studies should be designed to identify the nature of interactions between marketing activities (the technologies and resources

allocated to the production of time, space and form services) and environment since increased market access will impact upon what, when and where of production and processing activities and the need for public investment in effluent, waste discharges and emission controls.

## REFERENCES

- Abakah, E. M. (1990). Real Incomes and the Consumption of Wood fuels in Ghana: An Analysis of Recent Trends. *Energy-Economics*; 12(3), 227-31.
- Abdulai, A., & Egger, U. (1992). Intra regional trade in West Africa: Impacts of Ghana's cocoa exports and economic growth. *Food Policy*, 17(4), 277-286.
- Addo, J. S. (1990). Exchange Rate Reforms under Ghana's Economic Recovery Program World-Bank. The long-term perspective study of sub-Saharan Africa: Background papers. Volume 2. Economic and sectoral policy issues. Washington, D.C.: 84-91.
- Adda, W. (1989). Privatization in Ghana. Ramanadham,-V.-V., ed. Privatization in developing countries. London and New York: Routledge, 303-21.
- Adei, S. (1987). Technology transfer and nationalization in Ghana. African Studies in Technology Policy, Technical Study series, no. 55e. Ottawa: International Development Research Centre, xiii, 113.
- Adholla, M. S., Hazell, P., Blarel, B., & Place, F. (1991). Indigenous land rights systems in Sub-Saharan Africa: A constraint on productivity? *The World Bank Economic Review*, 5(1), 155-175.
- Adzobu, D. C. (1992). Ghana: Trade and investment program (TIP). Accra, Ghana. Environmental Protection Council of Ghana.
- (1993). Ghana national environmental action plan (NEAP) (Informal Technical Paper). Accra, Ghana: Environmental Protection Council.
- Ahiakpor, J. C. W. (1989). Creating the Structures for an Efficient and Dynamic Economy: The Case of Ghana. Gemper,-Bodo-B., ed. The market system, structural change and efficient economies: The international trend towards indicative targeting. Reprint, New Brunswick, N.J. and London: Transaction, 189-202.
- (1986). The Profits of Foreign Firms in a Less Developed Country: Ghana. *Journal-of-Development-Economics*; 22(2), 321-35.
- (1986). The Capital Intensity of Foreign, Private Local and State Owned Firms in a Less Developed Country: Ghana. *Journal of Development Economics*, 20(1), 145-62.
- Akaah, I. P., Dadzie, K. Q., & Dunson, B. (1987). Formal financial institutions as savings mobilizing conduits in rural LDCs: An empirical assessment based on the bank savings behavior of Ghanaian farm households. *Savings and Development*, XI(2), 115-135.
- Alderman, H. (1992). Inter commodity price transmittal: Analysis of food markets in Ghana (Working Paper No. 884). Washington, D.C.: World Bank.

- (1991). Downturn and economic recovery in Ghana: Impacts on the poor (Monograph 10). Washington, D.C.: *Cornell Food and Nutrition Policy Program*.
- (1992). Incomes and food security in Ghana (Working Paper No. 26). Washington, D.C.: *Cornell Food and Nutrition Policy Program*.
- (1992). Food security and grain trade in Ghana (Working Paper No. 28). Washington, D.C.: *Cornell Food and Nutrition Policy Program*.
- , & Canagarajah, S., & Younger, S. S. (1993). Consequences of permanent lay-off from civil service: Results from a survey of retrenched workers in Ghana (Working Paper No. 35). *Cornell Food and Nutrition Policy Program*.
- , & Higgins, P. (1992). Food and nutritional adequacy in Ghana (Working Paper No. 27). Washington, D.C.: *Cornell Food and Nutrition Policy Program*.
- , & Shively, G. (1993). Markets, welfare, and economic reform in Ghana (Unpublished). Washington, D.C.: Policy Research Department, Poverty and Human Resource Division, World Bank.
- Alpine, W.L.R., & Pickett, J. (1993). Agriculture, liberalization and economic growth: In Ghana and Cote d'ivoire, 1960-1990. Paris, France: OECD Development Centre Studies.
- Amarteifio, O.J. (1985). Women in agriculture in Ghana. International Agriculture. Cornell University. (Sectoral Library World Bank).
- Ameyaw, S. (1990). The dynamics of female entrepreneurship and indigenous food markets: A case of techiman women, Ghana (Working Paper No. 205). Michigan State University.
- Annorbah, S.A.J., Essah, J., & et al. (1992). Marginal savings mobilization and credit for lowest income women in Ghana. Washington, D.C.: USAID Bureau for Africa Operations and New Initiatives Office.
- Armah, B. K. (1990). Foreign Trade Strategies, Employment and Income Distribution: The Case of Ghana 1960-1986. University of Notre Dame, Ph.D.
- Arthur, J. A. (1991). Inter regional Migration of Labor in Ghana, West Africa: Determinants, Consequences and Policy Intervention. *Review of Black Political Economy*, 20(2), 89-103.
- Aryeetey, E., & Gockel, F. (1991). Mobilizing domestic resources for capital formation in Ghana: The role of informal financial sectors (Research Paper No. 3). African Economic Research Consortium.
- Asabere, P. K., Sirmans, C. F., & Colwell, P. F. (1982). Intensity of Residential Land Use in Accra, Ghana. *Journal of Urban Economics*, 11(2), 190-98.

- Ashe, J., Hirschland, M., & et al. (1992). Access to credit for poor women : a scale - up study of projects carried out by Freedom from Hunger in Mali and Ghana. Washington, D.C.: USIAD Office of Private and Voluntary Cooperation (GEMINI Technical Report No. 33).
- Asiedu, S.K. (1989). Economic reform programs and agricultural development: Macro policy sequencing in Ghana 1983-88. *Food Policy*, 14(4), 359-370.
- Azam, J. P., & Besley, T. (1989). General Equilibrium with Parallel Markets for Goods and Foreign Exchange: Theory and Application to Ghana. *World Development*, 17(12), 1921-30.
- Anderson, D. (1992). Economic growth and the environment (Working Papers No. 979). Washington, D.C.: The World Bank.
- Ascher, W. (1992). Coping with the disappointing rates of return on development projects that affect the environment (Working Papers No. 965). Washington, D.C.: The World Bank.
- Baark, E. (1991). The Capital Goods Sector in Ghana: Options for Economic and Technological Development. *Industry and Development*, 0(29), 37-61.
- Baffoe, J. K. (1992). Income Distribution and Poverty Profile in Ghana 1987-88. *African Development Review*, 4(1), 1-28.
- Balassa, B. (1986). Policy Responses to Exogenous Shocks in Developing Countries. *American Economic Review*, 76(2), 244-248.
- Bateman, J.M., Meeraus, A., Newbery, M.D., Okyere, A.W., & O'Mara, T.G. (1987). Ghana's cocoa pricing policy (Policy Research Working Paper No. 429). Washington, D.C.: World Bank.
- Baum, K. (1990). Ghana MTR. Washington, D.C.
- Bell, C. (1990). Interactions between institutional and informal credit agencies in rural India. *The World Bank Economic Review*, 4(3), 297-328.
- Bequele, A. (1980). Poverty, inequality, and stagnation: The Ghanaian experience (World Employment Program Research Working Paper No. WEP 10-6/WP33). Geneva, ILO.
- Besley, T. (1993). Property rights and investment incentives: Theory and micro-evidence from Ghana (Discussion Paper No. 170). Princeton, NJ: Woodrow Wilson School of Public and International Affairs, Princeton University.
- Binswanger, H. (1989a). Brazilian policies that encourage deforestation in the Amazon (Working Paper No. 16). Washington, D.C.: The World Bank, Environment Department.
- (1989b). "The Policy Response of Agriculture," in *Proceedings of the World Bank Annual Conference on Development Economics*, 1989, Washington DC, World Bank.

- , Deininger, K., & Feder, G. (1992). Power, distribution and reform in agricultural land markets. *Handbook of Development Economics, III, Forthcoming*.
- Blarel, B., Hazell, P., Place, F., & Quiggin, J. (1992). The economics of farm fragmentation: Evidence from Ghana and Rwanda. *The World Bank Economic Review, 6*(2), 233-254.
- Boadu, O. F. (1992). Contingent valuation for household water in rural Ghana. *Journal of Agricultural Economics, 43*(3), 458-465.
- (1992). The Efficiency of Share Contracts in Ghana's Cocoa. *Journal of Development Studies, 29*(1), 108-20.
- Boateng, M., Ratchford, C.B., & Blase, M. (1987). Profitability analysis of a farming system in Africa. *Agricultural System, 24*, 81-93.
- , Ewusi, R. K., & McKay, A. (1990). A poverty profile for Ghana, 1987-1988. Social dimensions of adjustment in Sub-Saharan (Africa Working Paper No. 5). Washington, D.C.: World Bank.
- Bond, E. M. (1983). Agricultural responses to prices in Sub-Saharan African countries. *IMF Staff Papers, 30*(4), 703-726.
- Borish, M. (1992). Recommendations for improved agricultural input distribution via increased private sector involvement (Working Paper No. ???). Washington, D.C.: World Bank.
- , Grossman, M., & et al. (1991). MAPS Ghana : Non-traditional export survey results 1991. Washington, D.C.: USAID Bureau for Private Enterprise.
- Baumal, J. W., & Oates, C.W. (1988). *The Theory of Environmental Policy*. Cambridge University Press (2nd Edition).
- Braverman, A. & Kanbur, R. (1987). Urban Bias and the Political Economy of Agricultural Reform. *World Development, 15*(9), 1179-1187.
- Bromley, D. W. (1991). *Environment and economy: Property rights and public policy*. Oxford and Cambridge: Blackwell.
- Brooks, M. K. (1993). Property rights in land. In A. Braverman., K. M. Brooks., & C. Csaki, (Eds.). *The agricultural and eastern Europe and the former USSR*, 125-136). Washington, D.C.: A World Bank Symposium.
- Brown, C.K. (Ed.). (1986). *Rural development in Ghana*. Accra, Ghana: Ghana Universities Press.
- Bunn, A. J. (1994). The Economic Dynamics of cropping system choice and land degradation in semi-arid rainfed agriculture. Macalester College. Unpublished.
- Barrera, A. (1990a). The role of maternal schooling and its interaction with public health programs in child health production. *Journal of Development Economics, 32*, 69-91.

- Behrman, R. J., & Wolfe, L. B. (1987b). How does mother's schooling affect family health, nutrition, medical care usage, and household sanitation. *Journal of Econometrics*, 36, 185-204.
- Behrman, J. R., & Deolalikar, A. B. (1989). Seasonal demands for nutrient intakes and health status in rural south India. In Sahn, D. E. (ed.). *Causes and implications of seasonal variability in household food security*, Baltimore: The Johns Hopkins University Press, 66-78.
- Blitzer, R. C., Eckaus, R. S., Lahiri, S., & Meeraus, A. (1992). How restricting carbon dioxide and methane emissions would affect the Indian economy (Working Papers No. 978). Washington, D.C.: The World Bank.
- (1992). Growth and welfare losses from carbon emissions restrictions: A general equilibrium analysis for Egypt (Working Papers No. 963). Washington, D.C.: The World Bank.
- Boulier, B. L., & Paqueo, B. V. (1987). On the theory and measurement of the determinants of mortality. *Demography*, 25(2), 249-263.
- Braverman, A., & Kanbur, R. (1985). Urban Bias and the Political Economy of Agricultural Reform. *World Development*, 15, 1179-1187.
- Catsambas, T., & Pigato, M. (1992). The consistency of government deficits with macro economic adjustment: An application to Kenya and Ghana (Policy Research Working Paper No. 287). Washington, D.C.: World Bank.
- Chand, S. K., & van-Til, R. (1988). Ghana: Toward Successful Stabilization and Recovery. *Finance-and-Development*; 25(1), 32-35.
- Chapman, D. (1993). Environment, income, and development in South Africa: An analysis of the interaction of environmental and macro economics (No. 7). Idaho: Cornell Institute for Social & Economic Research, Cornell University.
- Chhibber, A., & Shafik, N. (1990). Exchange reform, parallel markets, and inflation in Africa: The case of Ghana (Policy Research Working Paper No. 427). Washington, D.C.: World Bank.
- (1992). Devaluation and Inflation with Parallel Markets: An Application to Ghana. *Journal of African Finance and Economic Development*, 1(1), 107-33.
- Clark, J. L., & Lofchie, F.M. (1993). *The political economy of structural adjustment in Ghana*. In Bates, H.R., & Krueger, O.A. Political and Economic Interactions in Economic Policy Reform. Oxford, UK: Blackwell Publishers.
- Cleaver, K. M. (1985). The impact of price and exchange rate policies on agriculture in Sub-Saharan Africa. Staff Working Paper No. 728. World Bank, Washington, D.C.
- Commander, S., Howell, J., and Sieni, W. (1989). Ghana, 1983-89. In S. Commander (ed.), *Structural adjustment and agriculture; theory and practice in Africa and Latin America*. London: Curry/Hineman, 107-126.

- Conservation Monitoring Centre. (1988). Ghana: Conservation of biological diversity. Cambridge.
- Cohen, N. B. (1988). Correcting for heterogeneity in a household production function: Issues and evidence from Sudan. Berkeley, CA: University of California, mimeo.
- Cook, P., & Stevens, J. (1992). An end-user approach to the measurement of performance of capital in an environmental context in Asia. *World Development*, 20(4), 541-55.
- Crosson, P. (1993). Sustainable Agricultural Development in Africa. Washington, D.C.: Resources for the Future.
- Dapath, K.S., & Oteng, S. (1991). Draft final report on essential government policies for an effective agricultural research system in Ghana (Report prepared for National Agricultural Research Project as part of the National Agricultural Research Plan).
- Desai, B.M. (1980). Group lending experiences in reaching small farmers. Columbus: ESO Ohio State University, Department of Agricultural and Rural Sociology, No. 875.
- Due, J. M. (1969). What has happened to the Ghanaian state farms? *Illionis Agricultural Economics*, 25-35.
- Duerksen, J. C. (1983). *Environmental regulation of industrial plant siting: How to make it work better*. Washington, D.C.: The Conservation Foundation.
- Duncan, A., & Howell, J. (eds.). (1992). *Structural adjustment and the African farmer*. London, United Kingdom: James Currey, Ltd.
- Dasgupta, P., & Maler, K.G. (1991). The environment and emerging development issues. *Proceedings of the World Bank Annual Conference on Development Economics 1990*. Washington, D.C.: The World Bank.
- Dean, M. J. (1992). Trade and the environment: A survey of the literature (Working Papers No. 966). Washington, D.C.: The World Bank.
- Delgado, C.L., & John, M. (1987). Structural View of Policy Issues in African Agricultural Development: Reply. *AJAE*, May.
- Deolalikar, A. B. (1988). Nutrition and labor productivity in agriculture: Estimates for rural south India. *Review of Economics and Statistics*, 70(3), 406-413.
- Eboe, H. (1989). From revolution to monetarism: The economics and politics of the adjustment program in Ghana. In Campbell, B. K., and Loxley, J. (Eds.). *Structural adjustment in Africa*. International Political Economy Series. New York: St. Martin's Press, 92-131.
- Edward, M. A. (1990). Real incomes and the consumption of wood fuels in Ghana: An analysis of recent trends. *Energy Economics*, 12(3), 227-231.
- Eskeland, G. S., & Jimenez, E. (1992). Policy instruments for pollution control in developing countries. *World Bank Research Observer*, 7(2), 145-169.

- Feder, G., & Feeny, D. (1991). Land tenure and property rights: Theory and implications for development policy. *The World Bank Economic Review*, 5(1), 135-153.
- Fiadjoe, F., Green, D., & et al. (1992). Decentralization : improving governance in sub-Saharan Africa -- Ghana case study. Syracuse: Syracuse University, Maxwell School of Citizenship and Public Affairs (USAID Bureau for Africa, Washington, DC (Sponsor)).
- Fischer, Q. G. (1990). Small Enterprises for the Needs of the People? Ghana's "Small-Scale Industrial 'Take-Off.'" Research-Group-on-African-Development-Perspectives. Human dimensions of adjustment. Yearbook on African Development Perspectives, vol. 1, Berlin: Schelzky and Jeep, 233-47.
- Forsyth, D. J. C., & Solomon, R. F. (1978). Restrictions on Foreign Ownership of Manufacturing Industry in a Less Developed Country: The Case of Ghana. *Journal of Developing Areas*, 12(3), 281-96.
- Franco, G. R. (1979). Domestic Credit and the Balance of Payments in Ghana. *Journal of Development Studies*, 15(2), 202-15.
- \_\_\_\_\_. (1981). The optimal producer price of cocoa in Ghana. *Journal of Development Economics*, 8(1), 77-92.
- Finance & Development (September 1993). A Quarterly Publication of the IMF and the World Bank.
- Gabianu, A. S. (1990). The Susu Credit System: An Ingenious Way of Financing Business Outside the Formal Banking System. World-Bank. The long-term perspective study of sub-Saharan Africa: Background papers. Volume 2. Economic and sectoral policy issues. Washington, D.C.: 122-28.
- Gaudet, J. (1992). Sustainability of Trade and Investment Programs in Africa. A Case Study Presented at the Agricultural Marketing and Agribusiness in Africa Conference. Washinton, D.C.
- Gersovitz, M. (1987). Agricultural pricing systems and transportation policy in Africa. (Policy Research Working Paper No. 774). Washington, D.C.: World Bank.
- Government of Ghana. (1993). Ghana: Trade and investment program (TIP). Accra, Ghana.
- Ghartey, E. E., & Rao, U. L. G. (1990). A Short-run Forecasting Model of Ghana. *Economic-Modeling*; 7(3), 291-308.
- Gladwin, N. T., & Walter, I. (1976). Multinational enterprise, social responsiveness, and pollution control. *Journal of International Business Studies*, Fall/Winter, 57-74.
- Glewwe, P., & Twum-Baah, K.A. (1991). The distribution of welfare in Ghana, 1987-88 (Living Standards Measurement Study Working Paper No. 75). Washington, D.C.: World Bank.

- Goldman, R., Roemer, M., & et al. (1992). Ghana's development : strategic lessons from Asia. Cambridge, MA: Harvard Institute for International Development (USAID Office of Policy Analysis and Resources (sponsored)).
- Graham-Tomasi, T., Mohtadi, H., & Roe, L. T. (1992). Macroeconomic policies, economic performance and natural resources: A discussion of key issues. Washington, D.C.: MUCIA\EPAT.
- Grayson, L. E. (1973). The Role of Suppliers' Credits in the Industrialization of Ghana. *Economic Development and Cultural Change*, 21(3), 477-99.
- Gronau, R. (1991). Are Ghana's roads paying their way? Assessing road use cost and user charges in Ghana (Policy Research Working Paper No. 773). Washington, D.C.: World Bank.
- Guinnane, W. T., & Miller, I. R. (1993). The limits to land reform: The land acts in Ireland, 1870-1909 (Discussion Paper No. 169). Princeton: Princeton University, Research Program in Development Studies.
- Gyimah, B.K. (1991). Effects of Exchange Controls on Black Market Exchange Rate in a Less Developed Country. *Journal of International Economics*, 5(1), 63-78.
- Gertler, P., & Gaag, V. D. J. (1990). *The willingness to pay for medical care*. Baltimore: The Johns Hopkins University Press, 11.
- Grubler, A., & Nakicenovic, N. (1992). International burden sharing in greenhouse gas reduction (Environment Working Paper No. 55). Washington, D.C.: Environment Department, TheWorld Bank.
- Haessel, W., & Vickery, E. (1975). The Social Profitability of Subsidies for Agricultural Exports: The Case of Ghana. *American Journal of Agricultural Economics*, 57(1), 11-20.
- (1976). The demand for agriculture commodities in Ghana: An application of nonlinear two-stage estimates with prior information. *American Journal of Agricultural Economics*, 58(2), 341-345.
- Harma, R. (1989). Ghana: Irrigation and water resource management (Working Paper No. 6). Washington, D.C.: World Bank.
- Harvey, C. (1991). On the perverse effects of financial sector reform in Anglophone Africa. *South African Journal of Economics*, 59(3), 258-286.
- (1993). The role of commercial banking in recovery from economic disaster in Ghana, Tanzania, Uganda, and Zambia (Discussion Paper No. 325). Institute of Development Studies, The University of Sussex, England, Brighton.
- Herman, L., & Barlow, R. (1990). The impact of agricultural policy reforms on the output of selected crops in Niger (Discussion Paper No. 126). Ann Arbor, MI: Center for Research on Economic Development, The University of Michigan.

- Horstmann, J. I., & Markusen, R. J. (1990). Endogenous market structures in international trade (Working Paper No. 3283). NBER.
- Hutchful, E. (1985). IMF adjustment policies in Ghana since 1966. *African Development*, X(1 and 2), 122-136.
- (1989). From 'Revolution' to Monetarism: The Economics and Politics of the Adjustment Program in Ghana. Campbell, B.K., Loxley, J. (Eds.). *Structural adjustment in Africa*. International Political Economy Series, New York: St. Martin's Press, 92-131.
- Heller, S. P., & Drake, D. W. (1978). Malnutrition, child morbidity and the family decision process. *Journal of Development Economics*, 6, 203-235.
- Horatio, F. (1994). SG 2000 policy brief for Ghana. Minneapolis, MN: Humphery Institute, University of Minnesota.
- Hudson, J. A. (1992). *Rock engineering systems: Theory and practice*. London: Ellis Horwood Limited, Chichester, U.K.
- International Labor Organization. (1989). Control and management of technology by rural women of Ghana (Project ILO/NETH/80/GHA/1). Accra, Ghana: National Council on Women and Development.
- IMF. (1991). Ghana: Adjustment and growth, 1983-91 (IMF Occasional Paper No. 86).
- IMF and World Bank. (1993). Health: What governments can do. *Finance and Development*, September.
- Intal., P. Jr. and John H. Power. (1991). "The Philippines," in A. Krueger, M. Schiff and A. Valdes eds., The Political Economy of Agricultural Pricing Policy, Vol. 1: Aisa.
- Islam, R., & Wetzal, L.D. (1987). The macroeconomics of public sector deficits: The case of Ghana (Policy Research Working Paper No. 672). Washington, D.C.: World Bank.
- Jebuni, C.D., Sowa, N.K., & Tutu, K.A. (1991). Exchange rate policy and macroeconomic performance in Ghana (Research Paper No. 6). African Economic Research Consortium.
- Jebuni, C.D., & Seini, W. (1992). Agricultural input policies under structural adjustment : Their distributional implications (CFNPP Cornell Food and Nutrition Policy Program Working Paper No. 31). Cornell University Division of Nutritional Sciences (USAID Bureau for Africa (Sponsor)).
- Johnson, R. R. (1988). Fundamental market-oriented agricultural reform: Is it desirable? Is it achievable? In Helmuth, J. W., & Johnson, S. R. (Eds.). 1988 World Food Conference Proceedings. Volume 1, 207-219.
- Jamison, D. T. (1986). Child malnutrition and school performance in China. *Journal of Development Economics*, 20(2), 299-310.

- (1992). Global warming: Key issues for the Bank (Working Papers No. 1992-36). Washington, D.C.: Environmental Policy and Research Division, The World Bank.
- Kapur, I. et-al. (1991). Ghana: Adjustment and growth, 1983-91 (Occasional Paper No. 86). Washington, D.C.: International Monetary Fund.
- Killick, T. (1978). *Development economics in action: A study of economic policies in Ghana*. London, Heinemann.
- Kingsbury, D.S. (1992). Compensatory social programs and structural adjustment : A review of experience. Development Alternatives, Inc., Bethesda (USAID Bureau for Program and Policy Coordination, Office of Economic Affairs (Sponsor)).
- Kohls, L.R., & Uhl, N.J. (1990). *Marketing of agricultural products*. New York: Macmillan Publishing Company.
- Konings, P. (1986). *The state and rural class formation in Ghana: A comparative analysis*. London: African Studies Center, Leiden.
- Koo, Y.C.A. (1973). Land tenancy and reform. *Quarterly Journal of Economics*, LXXXVII(4), 567-580.
- Kraus, J. (1979). The political economy of industrial relations in Ghana. In Ukandi, D., Seibel, D., & Trachtmen, L. (eds.). *Industrial relations in Africa*. London: Macmillan.
- (1986). The political economy of agrarian regression in Ghana. In Commins, S., Lofchie, M., & Payne, R. (eds.). *African agrarian crisis: Theroots of Famine*. Boulder, CO: Lynne Rienner Publishers.
- (1988). The political economy of food in Ghana. In Chazan, N., & Shaw, T.(Eds.). *Coping with Africa's food crisis*. Boulder, CO: Lynne Rienner Publishers.
- Kyereme, S. S., & Thorbecke, E. (1987). Food Poverty Profile and Decomposition Applied to Ghana. *World Development*, 15(9), 1189-99.
- Kyereme, S. S. (1991). Exchange Rate, Price, and Output Inter-relationships in Ghana: Evidence from Vector Autoregressions. *Applied Economics*, 23(12), 1801-10.
- Leechor, C., & Warner, R. (1989). Equity in unequal deductions: Implications of income tax rules in Ghana and Nigeria (Working Paper No. 198). Washington, D.C.: World Bank, Western Africa Department.
- Leite, S. P. (1982). Interest rate policies in West Africa. *IMF Staff Papers*, 29(1), 48-76.
- Leith, C. (1974). *Foreign trade regimes and economic development: Ghana*. New York: Columbia University Press.
- Leonard, J. H., & Duerksen, J. C. (1980). Environmental regulations and the location of industry: An international perspective. *The Columbia Journal of World Business*, XV(2), 52-68.

- Loxley, J. (1988). Ghana: Economic crisis and the long road to recovery. Ottawa: North-South Institute, ix, 64.
- Lucas, E. B. R. (1992). Toxic releases by manufacturing: World patterns and trade policies (Working Papers No. 964). Washington, D.C.: The World Bank.
- Lutz, E., & Young, M. (1992). Integration of Environmental Concerns into Agricultural Policies of Industrial and Developing Countries. World Bank; Commonwealth Scientific & Industrial Organization, Lyneham, Australia, *World-Development*; 20(2), 241-53.
- Manu, A.F. (1992). The state and marketing in African countries: A case study of Ghana. *Journal of International Food and Agribusiness Marketing*, 4(2), 67-82.
- Markusen, R.J., Morey, R.E., & Olewiler, N. (1991). Environmental policy when market structure and plant locations are endogenous (Working Paper Series No. 3671). Cambridge, MA: National Bureau of Economic Research.
- May, E. (1985). Exchange controls and parallel market economies in Sub-Saharan Africa: Focus on Ghana. *Staff Working Paper 711*. Washington, D.C.: World Bank.
- McCalla, F.A., & Josling, E.T. (Eds.). (1981). *Imperfect markets in agricultural trade*.
- Merrick, T. W. (1985). The effect of piped water on early child mortality in urban Brazil, 1970 to 1976. *Demography*, 22(1), 1-24.
- Meyer, M. S. (1992). Environmentalism and economic prosperity: Testing the environmental impact hypothesis (Mimeo). Massachusetts Institute of Technology, Project on Environmental Politics and Policy.
- Migot, A. S. E., Benneh, G., & Atsu, S. (1990). Land use rights and agricultural productivity of Ghanaian farmers. Washington, D.C.: World Bank.
- Mink, S. (1989). Ghana: Policy and performance in the agricultural sector during the economic recovery program. Washington, D.C.: World Bank.
- Ministry of Agriculture. (1990). Ghana's medium term agricultural development programme: An agenda for sustained agricultural growth and development (1991-2000). Ghana: Republic of Ghana, Ministry of Agriculture.
- Ministry of Agriculture. (1991). The Sasakawa-Global 2000 project in Ghana: An evaluation. Ghana: Republic of Ghana, Ministry of Agriculture.
- Ministry of Agriculture. (1993). Ghana marketing margin study. Unpublished.
- Moock, P. R., & Leslie, J. (1986). Childhood malnutrition and schooling in the Terai region of Nepal. *Journal of Development Economics*, 20(1), 33-52.
- Morna, L. C. (1988). The privatization drive. *Africa Report*, November-December, 60-62.
- Merrick, T. W. (1985). The effect of piped water on early child mortality in urban Brazil, 1970 to 1976. *Demography*, 22(1), 1-24.

- Moock, P. R., & Leslie, J. (1986). Childhood malnutrition and schooling in the Terai region of Nepal. *Journal of Development Economics*, 20(1), 33-52.
- Munasinghe, M., Cruz, W., & Warford, J. (September 1993). Are economy wide policies good for the environment? *Finance and Development*, Quarterly Publication of IMF and World Bank, 40-43
- Nweke, F. I. (1978). Agricultural Credit in Ghana: Priorities and Needs for Domestic Food Production. *Canadian Journal of Agricultural Economics*, 26(3), 38-46.
- Okyere, W. A. (1989). The effects of domestic policies on exportable primary commodities: The case of Ghana and cocoa (Research Report No. 1). Ghana: African Rural Social Science Series, The University of Ghana.
- \_\_\_\_\_. (1990). The Response of Farmers to Ghana's Adjustment Policies World-Bank. The long-term perspective study of sub-Saharan Africa: Backgroundpapers. Volume 2. Economic and sectoral policy issues. Washington, D.C.: 74-83.
- Page, M. J. (1978). Economics of scale, income distribution, and small-enterprise promotion in Ghana's timber industry. *Food Research Institute Studies*, XVI(3), 159-182.
- Page, M. J., Pearson, R. S., & Leland, E. H. (1978). Capturing economic rent from Ghanaian timber. *Food Research Institute Studies*, XV(1), 25-51.
- Panin, A. (1986). A comparative socio-economic analysis of hoe and bullock farming systems in northern Ghana (Unpublished dissertation). Goettingen: Department of Agricultural Economics, The George-August University Goettingen.
- Paul, S. (1990). Assessment of the private sector: A case study and its methodological implications (World Bank Discussion Paper No.93). World Bank.
- Pearce, R. (1992). Ghana. In Duncan, A. & Howell, J (Eds.). *Structural adjustment & the African farmer*. Overseas Development Institute. London.
- Perroni, C., & Wigle, M.R. (1992). Modeling the linkages between international trade and the environment (Working Paper Series No. 2002). Waterloo: Department of Economics, Wilfrid Laurier University.
- Pethig, R. (1976). Pollution, welfare, and environmental policy in the theory of comparative advantage. *Journal of Environmental Economics and Management*, 2(3), 160-169.
- Pinto, B. (1989). Black Market Premia, Exchange Rate Unification, and Inflation in Sub-Saharan Africa. *World Bank Economic Review*, 3(3), 321-38.
- \_\_\_\_\_. (1984). Black Markets for foreign exchange, real exchange rates, and inflation: Overnight versus gradual reform in Sub-Saharan Africa (Policy Research Working Paper No. 84). Washington, D.C.: World Bank.

- Pitt, M. M., & Rosenzweig, R. M. (1985). Health and nutrient consumption across and within farm households. *Review of Economics and Statistics*, 67(2), 212-223.
- Pohlmeier, L., & Thillairajah, S. (1989). Review of rural financial services in Sub-Saharan Africa. Agriculture Division, Africa Technical Department, The World Bank, Washington, D.C.
- Prudencio, Y.C., Orkwor, C.G., & Kissiedu, K.A.F. (1992). The relationships between cassava variety set characteristics, farmers' food security objectives, environmental and socio-economic conditions in Africa. *Agricultural System*, 39, 387-406.
- Pitt, M. M., & Rosenzweig, R. M. (1985). Health and nutrient consumption across and within farm households. *Review of Economics and Statistics*, 67(2), 212-223.
- Puttock, G. D., Sabourin, M., & Meilke, D. K. (1993). International trade in forest products: An overview (Working Paper No. 93-4). Toronto, Canada: International Agricultural Trade Research Consortium, University of Toronto.
- Robertson, A. F. (1987). *The dynamics of productive relationships: African share contracts in comparative perspective*. Cambridge: Cambridge University Press.
- Roe, A. (1987). *Structural adjustment in Ghana*. London: OECD.
- Roe, L. T. (1979). An economic evaluation of the Haitian agricultural marketing system. Unpublished.
- Roe, L. T. (1993). Land reform, privatization, and development: Discussion. *American Journal of Agricultural Economics*, 1260-1262.
- Resenzweig, R. M., & Wolpin, I. K. (1982). Governmental interventions and household behavior in a developing country. *Journal of Development Economics*, 10, 209-225.
- Rosenzweig, R. M., & Schultz, P.T. (1982). Child mortality and fertility in Colombia: Individual and community effects. *Health Policy and Education*, 2, 305-348.
- \_\_\_\_ (1983). Estimating a household production function: Heterogeneity, the demand for health inputs, and their effects on birth weight. *Journal of Political Economy*, 91(5), 723-746.
- Runge, C. F. (1993). Trade, pollution, and environmental protection (Staff Paper No. P93-20). St. Paul, MN: Department of Agricultural and Applied Economics, University of Minnesota.
- Salami, K. A. (1988). Impact of Formal Agricultural Credit on Small Farm Development in the Ashanti Region of Ghana. *Eastern Africa Economic Review*, 4(2), 1-8.
- Salazar, A. P., & Brandao and Jose L. Carvalho. (1991). "Brazil" in A.Krueger, M. Schiff and A. Valdes eds., The Political Economy of Agricultural Pricing Policy. Vol. 1: Latin America.

- Salih, A. S. (1992). Managing renewable natural capital in Africa (Working Paper No. 97). Helsinki: World Institute for Development Economics Research of the United Nations University.
- Samba, I. (1994). Implementation of the Environmental Monitoring, Evaluation and Mitigation Plan of the Trade and Investment Program of Ghana (EMEMP). Ghana: USAID/REDSO/WCA.
- Samuel, P. (1990). Assessment of the private sector: A case study and its methodological implications (World Bank Discussion Paper No. 93). Washington, D.C.: World Bank.
- (1991). Private sector assessment: A pilot exercise in Ghana (World Bank Discussion Paper No. 199). Washington, D.C.: World Bank.
- Sarris, H.A. (1992a). Option for public intervention to enhance food security in Ghana. (Monograph No. 14). Cornell Food and Nutrition Policy Program.
- (1992). Household welfare during crisis and adjustment in Ghana (Working Paper No. 33). Cornell Food and Nutrition Policy Program.
- Sarris, H.A., & Shamas, H. (1991). *Ghana under structural adjustment: The impact on agriculture and the rural poor*. New York: New York University Press.
- Schiff, M. (1987). A Structural View of Policy Issues in African Agricultural Development: Comment. *AJAE*, May (1987):384-391.
- Schuh, E., Roe, L. T., & Godoy, R. (1994). Policies for sustainable rural development in Bolivia (Report prepared for UDAPSO). Minneapolis, MN: University of Minnesota.
- Schultz, P. T., & Tansel, A. (1992). Measurement of returns to adult health: Morbidity effects on wage rates in Cote D'ivoire and Ghana (Discussion Paper No. 663). New Haven: Economic Growth Center, Yale University.
- Sedjo, A. R., & Bowes, M. (1991). Toward a worldwide system of tradeable forest protection and management obligations (ENR 91-16). Washington, D.C.: Resources for the Future.
- Sherbourne, Lynn. (1986). Macroeconomic policies and agricultural performance, Ghana. Unpublished report.
- Sirleaf, J.E., & Nyirjesy, F. (1990). The outlook for commercial bank lending to Sub-Saharan Africa (Policy Research Working Paper No. 720). Washington, D.C.: World Bank.
- Smale, M., & Ruttan, V. (1994). Cultural endowments, institutional renovation, and technical innovation: The *Groupements Naam* of Yatenga, Burkino Faso (Staff Paper No. \*\*\*). St. Paul, MN: University of Minnesota, Department of Agricultural and Applied Economics.

- Songsore, J. (1985). Intra-regional commodity flows within a center-periphery structure: The case of WA town and north-western Ghana (Occasional Paper No. 19). Swansea, Norwick: Center for Development Studies, University College.
- (1992). Review of household environmental problems in the Accra metropolitan area, Ghana (Working Paper). Stockholm Environment Institute, International Institute for Environmental Technology and Management.
- Sosnick, S. H. (1964). Operational criteria for evaluating market performance. In *Market Structure Research: Theory and Practice in Agricultural Economics*, P.L. Farris (ed.). Ames: Iowa State University Press. pp. 88-125.
- Southworth, R. V., Jones, O. W., & Pearson, R. S. (1979). Food crop marketing in Atebubu district: Ghana. *Food Research Institute Studies*, XVII(2), 157-159.
- Steel, F. W., & Webster, M. L. (1992). How small enterprises in Ghana have responded to adjustment. *The World Bank Economic Review*, 6(3), 423-438.
- Steel, W. F. (1972). Import Substitution and Excess Capacity in Ghana. *Oxford Economic Papers*, 24(2), 212-40.
- Stephen, R. W. (1990). Structural adjustment in Africa: Insights from the experience of Ghana and Senegal. *World Development*, 18(12), 1621-1634.
- Steven, T. R., Papafio, H. K. Q., & Haizel, K. A. (1993). Ghana: Structural adjustment and its impact on agricultural research (Briefing Paper No. 3). *International Service for National Agricultural Research*.
- Strauss, J. (1986). Does better nutrition raise farm productivity? *Journal of Political Economy*, 94, 297-320.
- Stryker, J. D. (1991). Ghana. In Krueger, A. O., Schiff, M., & Valdes, A. (Eds.). *The political economy of agricultural pricing policy*, vol. III: Africa and the Mediterranean. A World bank Comparative Study, Baltimore, Maryland: The Johns Hopkins University Press, 79-121.
- (1990). Trade, exchange rate, and agricultural pricing policies in Ghana. With the assistance of Emmanuel Dumeau et al. World Bank Comparative Studies. *Political Economy of Agricultural Pricing Policy* series. Washington, D.C.: World Bank, xi, 363.
- Stryker, J.D., Rogers, B. (1992). Cooperative agreement AFR-0000-A-00-8045-00, policy reform and poverty project 698-0519: Evaluation report. Cambridge, MA: Harvard Institute for International Development, (USAID Bureau for Africa Office of Analysis (Sponsor)).
- Sebastian, I. (1990). Issues in urban air pollution: Ankara diagnostic report Environment Working Paper No. 38). Washington, D.C.: Environment Department, The World Bank.
- Shah, A., & Larsen, B. (1992). Carbo taxes, the greenhouse effect, and developing countries (Working Papers No. 957). Washington, D.C.: The World Bank.

- Sun, P. (1989). Land and water resource management in Asia (An EDI Policy Seminar Report No. 20). Washington, D.C.: The World Bank.
- Tabatabai, H. (1986). Economic decline, access to food and structural adjustment in Ghana (Working Paper No. WEP 10-6/WP80). World Employment Program Research, Geneva, ILO.
- Teal, F., & Giwa, Y. M. (1985). Domestic Credit and the Balance of Payments in Ghana: A Comment. *Journal-of-Development-Studies*; 21(4), 548-61.
- Temel, T., & Smale, M. (1994). A game theoretic approach to modeling the evolution of cultural endowments. University of Minnesota, Department of Agricultural and Applied Economics. Unpublished.
- Temel, T., Hudson, J., & Roe, L. T. (1994). A structure for the lobbying economy model. St. Paul, MN: University of Minnesota, Department of Agricultural and Applied Economics. Unpublished.
- Tobey, J. (1990). The effects of domestic environmental policies on patterns of world trade: An empirical test. *Kyklos*, 43(2), 191-209.
- Thomas, D., Strauss, J., & Henriques, M. H. (1990a). How does mother's education affect child height? *The Journal of Human Resources*, XXVI(2), 183-211.
- Tomasi, T.G., Roe, T., & Mohtadi, H. (1992). Macroeconomic policy, economic performance and natural resources: A discussion of key issues. Washington, D.C.: EPAT/MUCIA.
- United Nations Conference on Environment and Development (UNCED). (1991). Environment and development in Ghana. Ghana National Report 1991. Accra, Ghana.
- USAID. (1991a). A strategic framework for promoting agricultural marketing and agribusiness development in Sub-Saharan Africa (Publication Series No. 91-1). Washington, D.C.: Agriculture and Natural Resources Division, Office of Technical Resources, AFR/TR.
- \_\_\_\_\_. (1993h). USAID Conference on Agricultural Marketing and Agribusiness in Africa (Technical Paper No. 7). Washington, D.C.: An ARTS Publication, Bureau for Africa.
- \_\_\_\_\_. (1991k). Ghana: Country Program Strategic Plan (1992-1996). Washington, D.C.
- \_\_\_\_\_. (1991z). Ghana Trade and Investment Program (TIP). Washington, D.C.
- \_\_\_\_\_. (1991z). "Annex U: Environmental Impacts Review of the Non-Traditional Agricultural Export Sector in Ghana". In *Ghana Trade and Investment Program (TIP)*. Washington, D.C.

- \_\_\_\_\_. (1991z). "Annex O: Initial Environmental Examination (IEE) and Environmental Monitoring, Evaluation, and Mitigation Plan". In *Ghana Trade and Investment Program (TIP)*. Washington, D.C.
- \_\_\_\_\_. (1991z). "Annex X: An Overview of the Environmental impact of the Shrimp and Prawn Industry in Ghana". In *Ghana Trade and Investment Program (TIP)*. Washington, D.C.
- \_\_\_\_\_. (1991z). "Annex Y: An Assessment of the Ghanaian Forest Sector". In *Ghana Trade and Investment Program (TIP)*. Washington, D.C.
- \_\_\_\_\_. (1991b). *Ghana: Country Program Strategic Plan (1992-1996)*. Washington, D.C.
- \_\_\_\_\_. (1992a). *Ghana: Assessment of program impact fiscal year 1992*. Washington, D.C.: USAID.
- \_\_\_\_\_. (1992b). *Agricultural productivity promotion program*. Washington, D.C.
- \_\_\_\_\_. (1993). *Outlook of cocoa and food crops*. Washington, D.C.
- \_\_\_\_\_. (1990). *Recommendations: Designing performance indicators for monitoring the agricultural sector adjustment credit to Ghana*. Economic Research Service. Unpublished.
- U.S. House of Representatives. (1989). *Structural adjustment in Africa: Insights from the experiences of Ghana and Senegal* (Report No. 94-977). Washington, D.C.: U.S. Government Printing.
- Varanis, P., Akiyama, T., & Thigpen, E. (1987). *Recent developments in marketing and pricing systems for agricultural export commodities in Sub-Saharan Africa* (Policy Research Working Paper No. 431). Washington, D.C.: World Bank.
- Vordzorgbe, S. (1986). *Agricultural development in Ghana under the economic recovery program*. Accra: USAID.
- Wachter, D. (1992). *Land titling for land conservation in developing countries?* (Divisional Working Paper No. 1992-28). Washington, D.C.: Environment Department, The World Bank.
- Walter, I. (1982). *Environmentally induced industrial relocation to developing countries*. In S. J. Rubin & T. R. Graham (Eds.), *Environment and trade* (pp.67-101). Great Britain.
- Weissman, S. R. (1990). *Structural Adjustment in Africa: Insights from the Experiences of Ghana and Senegal*. *World-Development*; 18(12), 1621-34.
- World Bank. (1989a). *Ghana: Structural adjustment for growth*. Washington, D.C.: World Bank.
- \_\_\_\_\_. (1989b). *Ghana: Policies and issues of structural adjustment*. Washington, D.C.: World Bank.
- \_\_\_\_\_. (1989c). *Review of rural financial services in Sub-Saharan Africa*. Agriculture

Division, Africa Technical Department, The World Bank, Washington, D.C.

\_\_\_\_\_. (1991a). Ghana: Progress on adjustment. Africa Region, The World Bank, Washington, D.C.

\_\_\_\_\_. (1991b). Ghana: Medium Term Agricultural Development Strategy. The World Bank, Washington, D.C.

\_\_\_\_\_. (1992a). The World Bank and the environment. Washington, D.C.: World Bank.

\_\_\_\_\_. (1992b). Ghana 2000 and beyond: Setting the stage for accelerated growth and poverty reduction. Washington, D.C.: African Regional Office, Western Africa Department.

\_\_\_\_\_. (1992c). Ghana: Environmental aspects of accelerated economic growth. Industry and Energy Operations, Western Africa Department.

\_\_\_\_\_. (1992d). World Development Report. Oxford University Press.

\_\_\_\_\_. (1993). Ghana 2000 and beyond: Setting the stage for accelerated growth and poverty reduction. Washington, D.C.: African Regional Office, Western Africa Department.

\_\_\_\_\_. (1992). Ghana: Environmental aspects of accelerated economic growth. Washington, D.C.: Industry and Energy Operations, Western Africa Department.

\_\_\_\_\_. (1993). Ghana 2000 and beyond: Setting the stage for accelerated growth and poverty reduction. Washington, D.C.: Africa Regional Office, Western Africa Department.

\_\_\_\_\_. (1990a). Ghana: Proposed agricultural sector adjustment credit program (ASAC) Review of Pre-Mission Draft of the initiating memorandum. Washington, D.C.

\_\_\_\_\_. (1990b). Ghana: Medium Term Agricultural Development Program: An agenda for sustained growth and development (1991-2000). Washington, D.C.: Agricultural Operations Division, Western Africa Department, Africa Region.

\_\_\_\_\_. (1989). Ghana: Environmental Action Plan (Full Report on Completion of Phase II. Washington, D.C.: World Bank. (by Cynthia Cook).

\_\_\_\_ and the UNDP. (1989). Africa's adjustment and growth in the 1980s. World Bank.

\_\_\_\_\_. (1992). World Development Report. Oxford University Press.

World Health Organization. (1991). Health dimensions of economic reform: Background document for the international forum on "Health: A conditionality for economic development". Accra, Ghana.

- Wachter, D. (1992). Land titling for land conservation in developing countries? (Divisional Working Paper No. 1992-28). Washington, D.C.: Environment Department, The World Bank.
- Wolfe, L. B., & Behrman, R. J. (1982a). Determinants of child mortality, health, and nutrition in a developing country. *Journal of Development Economics*, 11, 163-193.
- Yankson, P. W. K. (1986). Small-Scale Industries in the Implementation of a Growth Center Strategy of Regional Development: A Case-Study in Ghana. *Industry-and-Development*; 0(17), 65-89.
- Younger, D.S. (1993). Exchange rate management in Ghana (Working Paper No. 38). Cornell Food and Nutrition Policy Program.
- Yudelman, M., Coulter, J. K., Goffin, P., McCune, D., & Ocloo, E. (1991). The Sasakawa-global 2000 project in Ghana: An evaluation (Report of the Review Mission, Sasakawa-Global 2000, Atlanta, Georgia.

**APPENDIX I**

**A SURVEY OF THE LITERATURE:  
THE IMPACTS OF ADJUSTMENT POLICIES  
ON AGRICULTURAL MARKETING AND ENVIRONMENT IN GHANA**

## TABLE OF CONTENTS

- 1 INTRODUCTION
- 2 BACKGROUND
  - 2.1 Key Features of the Ghanaian Economy Prior to 1983
    - 2.1.1 Macroeconomic Policies
    - 2.1.2 Sectoral Developments
- 3 APPROACHES TO EVALUATE MARKET PERFORMANCE
  - 3.1 Traditional Approaches
  - 3.2 Neo-Classical Approach
  - 3.3 Dimensions of Market Structure
  - 3.4 Classification by Market
- 4 STRUCTURAL ADJUSTMENT
  - 4.1 Classification of Key Policy Issues
- 5 AGRICULTURAL MARKETS
  - 5.1 Input Markets
    - 5.1.1 Institutions of Agricultural Marketing System
    - 5.1.2 Credit Markets
    - 5.1.3 Infrastructure
    - 5.1.4 Scale and Efficiency
    - 5.1.5 Time/Spatial/Quality and Variety
  - 5.2 Output Markets
    - 5.2.1 Time/Spatial/Form of Markets
  - 5.3 Imports and Exports
- 6 ENVIRONMENTAL IMPACTS
  - 6.1 Resource Degradation
  - 6.2 Environment, Health, and Productivity
  - 6.3 Recommended Policy Instruments

## 1. INTRODUCTION

In Ghana, the agricultural sector dominates the whole span of economic activities even after market reforms in 1983. In order to improve the productivity of this sector, the authorities took measures aiming at either deepening or diversifying specific agricultural activities. The main purposes of these reforms were to open the Ghanaian economy to the world market, to bolster the competitiveness, and to increase the efficiency of domestic economic activities by introducing new institutions and reorganizing the existing ones. Policy reforms regarding the efficient production, processing, and marketing of agricultural commodities aimed at increasing productivity through the adoption of new technologies, the provision of efficient and reliable financial services, and rehabilitation of infrastructure. Other objectives of these reforms include raising rural incomes, improving efficiency in resource use, promoting food security, increasing export revenues, and reducing balance of payments and budget deficits. The measures to achieve these objectives included trade liberalization, removing restrictions on internal trade, disseminating price information, restructuring public and banking sectors, encouraging cooperatives to participate in agricultural input markets, reducing input subsidies, and simplifying the export licensing system.

Appendix I surveys the literature on how the aforementioned policy reforms pursued in 1983s impacted the production, processing, and marketing of agricultural commodities through changes in the relationship between agents and marketing institutions. The survey is based on official documents and academic studies on financial markets, input and output markets, institutional reforms that help contribute to the efficiency of marketing activities, and the effects of fiscal and monetary policy reforms on the performance of the agricultural sector and its indirect effects on the environment. It also identifies areas that lack additional research.

Appendix I is divided into six sections. Following introduction and background,

Section 3 presents a conceptual framework summarizing the traditional and neo-classical approaches to market performance. Section 4 outlines the overall policy issues that structural adjustment program has been designed for. Section 5 analyzes the impacts of the adjustment program on the agricultural input and output markets. Finally, Section 6 outlines the direct and indirect environmental effects of agricultural market reforms.

## **2. BACKGROUND**

Here we highlight key features of the Ghanaian economy before the market reforms in 1983. Conceptual frameworks commonly used in analyzing the performance of agricultural marketing system are briefly summarized. Our framework is based on the main guidelines of the traditional and neo-classical approaches to market performance and market structure.

### **2.1. Key Features of the Ghanaian Economy Prior to 1983**

The main features of the Ghanaian economy before 1983 can be summarized as follows. First, import-substitution strategy for industrialization involving terminal stage processing for a small internal market was implemented. This type of industrialization strategy was based on imported inputs. Second, there was a substantial state investment and entrepreneurship in industry and large-scale agriculture. Third, these investments were financed through increasing foreign borrowing. Fourth, not surprisingly, domestic agriculture was neglected and separated from industry. Fifth, little attempt was made to develop a complementary export strategy or to expand the traditional export base (Tabatabai (1986) and Hutchful (1985)). Following the import-oriented economic policies adopted before 1983, the Ghanaian economy experienced large fiscal deficits which were primarily financed by

borrowing from the domestic banking system. This in turn gave rise to high rates of inflation and an increasingly over valued exchange rate. Export earnings fell sharply and external financing virtually dried up. The government was overwhelmingly intervening in the economy through price, distribution, and import controls, and at the same time, the public sector was increasingly growing. The main domestic real resources to finance this strategy came from mineral and cocoa exports. Therefore, any domestic policy changes regarding the prices of these products first influence the incentives for the producers and then affects the government revenue and so government expenditure, in particular the provision of public services. In addition to the above economic structure, the Ghanaian economy was dominated by agricultural sector whose activities were subject to climatic conditions, such as droughts, and swings in international commodity prices, particularly for cocoa, which was the main agricultural export.

*It is important to note that the heavy dependence of the Ghanaian economy on export revenues from few products makes the whole economy fragile and extremely sensitive to external shocks. The introduction of non-traditional exports discussed more detail in the TIP is considered as one of the alternative strategies to reduce the risk of specializing only on one product. Furthermore, over valued exchange rate increases the premium of the black market, which eventually encourages smuggling of the main export products and reduces foreign exchange earnings. Hence, the government turns to the domestic sources of revenues to finance its growing expenditures.*

### **2.1.1. Macroeconomic Policies**

Prior to 1983, large fiscal deficits, financed by borrowing from the domestic banking system, led to an acceleration in inflation and an over valued exchange rate. Furthermore, government intervention severely distorted economic incentives. These developments induced a shift of economic activity to informal markets due to the

increasing premium of the black market, which acts as an implicit tax on exports. By 1983, Ghana's tax revenue declined substantially to be only 4.6 percent of GDP. Ghana's fiscal policy since 1983 has been directed toward correcting the fiscal imbalances by reforming the tax system so as to increase public savings. High rates of growth of domestic credit and broad money increased inflation and widened the spread between official and parallel market exchange rates. Monetary policies since 1983 have initially focused on quantitative credit controls. For most of the period since 1983 the growth in broad money has remained high and the process in absorbing the excess liquidity has been slow. Therefore, inflation has remained at high levels and real interest rates have been virtually negative which in turn led to a weak banking system. Furthermore, developments in consumer prices appear to be influenced by exogenous shocks in the domestic food supply, domestic and external cost-push factors, and demand-pull factors (IMF, Occasional Paper No. 86).

*Before 1983, food prices were higher than nonfood prices, implying that the domestic terms of trade was in favor of agricultural sector. After 1983, domestic terms of trade were in favor of non-agricultural products, which was expected to stimulate the production of non-agricultural products. It also caused resources to be allocated for the production of non-agricultural products. In particular, policies that encourage the production in non-agricultural sector favors the urban sector in the distribution of public goods.*

In an economy where the import-substitution policy is implemented, the increase in reserves leads an increase in imports of inputs through which the production in export sector increases. However, over valued exchange rate leads to smuggling of export products.

The government revenue depended mostly on the export revenue from regulated cocoa and mineral exports. In a regulated market system favorable world market prices may

not be passed on to the producer. For cocoa, the marketing board prices may not reflect an improvement in the world market price. The cocoa result also suggests that exchange rate depreciation which is not passed on as higher producer prices may actually have a contractionary effect on output. Since the liberalization of the exchange rate and trade systems are key elements of Ghana's structural adjustment program, this suggests the following implication

*The existence of marketing board monopoly does not fit into the liberalization policy package since in a regulated market system favorable world market prices may not be passed on to the producer. This contradiction brings up the issue of a need for new institutions or decentralization of existing institutions.*

### **2.1.2. Sectoral Developments**

Ghana is well endowed with a broad range of natural resources, such as arable land, forests, and sizable deposits of gold, diamonds, bauxite, and manganese, as well as a considerable potential for hydroelectric power. The economy has depended to a high degree on primary (agricultural as well as mineral) production and exports. Exports of cocoa, gold, and timber still account for the bulk of total merchandise exports, with respective shares of 43 percent, 24 percent, and 11 percent. Together with forestry and fishing, the agricultural sector employs about two thirds of the labor force and accounts for about half of total output. Agricultural production, which is primarily small scale, consists mainly of cocoa and staple food crops. Ghana ranks among the world's largest producers and exporters of cocoa, even though its relative position has recently dropped from a long-held first place to third. Transport and trade sectors, which are keys for the marketing of agricultural and manufacturing output, significantly contribute to the growth of agricultural sector. The resource endowment consists of a wooded savanna and a forest zone occupying roughly

one-third of the country. The soils in Ghana are of generally poor quality and easily become exhausted. In some areas, growing population density necessitates shortening of fallow, leading to a loss of nutrients and possibility of erosion. Subsistence farming of maize, cassava, and ground nuts is done in the coastal savanna area. Fishing is an important activity in the Volta Lake Region.

The industrial sector, which accounts for the remaining 14 percent of GDP, is relatively diverse and well developed compared with other sub-Saharan African countries. Survey results, however, show that industrial sector suffers from the lack of insufficient communications and transport infrastructure. Furthermore, the channels through which information flows between the government authorities and businessmen need to be improved to help political and economic markets work efficiently. An interesting observation about the activities of foreign firms in Ghana is that the rates of profit for mixed private, local-foreign and private local firms were higher than those of private foreign, mixed-state foreign, and wholly state owned firms. This ranking would seem to be explained more by the fact that while foreign firms tended to enjoy tax holidays on profits as well as subsidies on rents from the government, the same incentives were not generally available to private local firms (Ahiakpor, 1986). After 1983, activity in the industrial sector is boosted by the removal of price distortions, the increased availability of foreign exchange and imported inputs, and foreign investment in Ghana's mining sector World Bank (1991).

Services comprise the second largest sector in the economy, accounting for an increasing share in real GDP. The growth of the trade sector contributed to the growth of the services sector. The expansion in the share of the services sector emanated largely from government services.

### **3. APPROACHES TO EVALUATE MARKET PERFORMANCE**

In this section, the main features of traditional and neo-classical approaches to market performance are summarized to provide a better picture of marketing process. Under the light of lessons learned from traditional and neo-classical approaches, the functions of institutions and the roles of "middlemen" in marketing activities are described.

#### **3.1. Traditional Approaches**

The marketing process is defined as a series of actions and events that take place in some sequence and some form of coordination. There are three traditional marketing approaches: (1) functional approach, (2) institutional approach, and (3) behavioral systems approach. The main issue that all these approaches address is determining the factors influencing market performance, that is, the degree of efficiency of the market participants. The industrial organization paradigm asserts that market structure (i.e., number and kind of market participants) strongly influences market conduct (i.e., the behavior of market participants in assigning values to products) which determines market performance. Given a specific level of technology and specific type of infrastructure, efficiency criteria used in measuring market performance are price efficiency, technical efficiency, and economic efficiency (the combined influence of price and technical efficiencies). Therefore, analyzing the real costs of marketing functions which will be summarized below will be best in evaluating market performance.

"The functional approach" is used in classifying the events and activities that occur in the marketing processes. In order to evaluate market performance, this approach breaks down the processes into the following functions: (1) exchange functions which include buying (assembling) and selling, (2) physical functions which include storage, transportation, and processing raw materials into finished products, (3)

facilitating functions which include standardization, financing, risk bearing, and market intelligence. The buying function can be either the assembling of the raw products from the production areas or the assembling of finished products into the hands of other middlemen in order to meet the demands of the final consumer. The selling function includes activities such as advertising. The physical function includes handling, movement, and physical change of the actual commodity itself. The storage function is primarily concerned with making goods available at the desired time. The transportation function is primarily concerned with making goods available at the proper place. The processing function is essentially a form-changing activity. The standardization functions deals with the establishment and maintenance of uniform measurements while financing function is concerned with the use of money to carry on the various aspects of marketing. The marketing intelligence function primarily deals with informing sellers and buyers about the availability and efficiency of aforementioned functions such as storage availability, an efficient transportation, and standardization. There are two important characteristics of these marketing functions. First, these functions affect the cost of marketing and therefore, the value of products. For example, processing, transportation, and storage provide form, space, and time utility for consumers. Second, the cost of performing a marketing function can be reduced by eliminating the middlemen, but the function cannot be eliminated from the marketing process. For example, a consumer can eliminate the food retailer by purchasing from wholesale food stores.

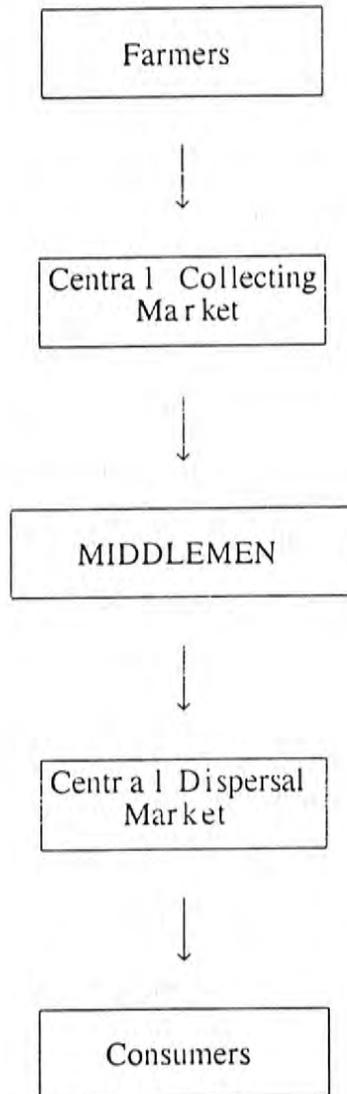
The second approach is called the "institutional approach" which focuses attention on the "Who". It emphasizes agricultural marketing as a process in which inputs are delivered to farmers, output is collected from farmers, and commodities are transformed before being delivered to consumers. In other words, it considers the nature and character of the various middlemen, related agencies, and marketing organizations. The

middlemen playing the role in the marketing process are: (1) merchant middlemen which include retailers and wholesalers, (2) agent middlemen which include brokers and commission men, (3) speculative middlemen, (4) processors and manufacturers, and (5) facilitative organizations. This approach is helpful in understanding why there are specialized middlemen in the marketing process. The rationale behind the existence of the middlemen is that these specialized firms often can perform the marketing functions more efficiently than either producers or consumers.

The third approach is called the "behavioral systems approach" that views a marketing firm or an organization of firms as a system of behavior. It attempts to understand possible changes in the functional combinations of a marketing process by classifying problem solving or decision making behaviors of marketing organizations (Sosnick (1964), Kohls and Uhl (1990), USAID (1991)). Given the above theoretical presentation of different approaches to market performance, Figure 1 helps us see some of the more pertinent aspects of this marketing process and Figure 2 shows the intermediary functions of middlemen.



Figure 2: Functions of Middlemen



Source: Kohls and Uhl (1990).

### 3.2. Neo-Classical Approach

In order to evaluate market performance referring to the real impacts of market structure and conduct as measured in terms of variables such as prices, costs, and volume of output, neo-classical approach takes into account the fact that prices are interrelated through space by transfer costs, through form by costs of production, and through time by the cost of storage. In this approach, the price dimensions of market performance refer to price levels and adjustments over time, space, and form. Regarding these price dimensions, there are three different markets: (1) markets in form, (2) markets in space, and (3) markets in time. Markets in form are related to the alternative uses of a raw material. How pricing policy affects the form of a product is important in evaluating the sensitivity of the equilibrium form of a raw material. Further, just as with spatially separated markets, arbitrage between different forms of a raw material is the equilibrium mechanism. Here arbitrage takes place in relation to alternative product forms. Markets in space basically deals with transfer costs which include not only the cost of transfer from one place to another but also the cost of transformation or processing. In this way, arbitrage defined as an activity of individuals who buy in one market in expectation of selling in another market at a profit is the mechanism that determines optimum locations for processing. This is the effective mechanism that brings consistency to market prices through space. Markets in time refer to the following cases: (i) there is a time lag between production and consumption and (ii) the creation of time utility in bridging this gap is a productive activity (storage) that can be accomplished only at a cost in terms of resources. In addition to the direct costs of storage, changes in product characteristics during storage must be considered as a cost in terms of depreciated product values. The effective mechanism that brings consistency to markets in time is

speculation used to describe arbitrage between markets in time. Thus, through the speculative actions of market participants, prices through time are interrelated by storage costs.

Neo-classical approach emphasizes the interrelationships between institutions and agents to define a *complete* marketing system. In this respect, it is a broader approach than the traditional approaches since it treats all the entities in the economy as a part of the whole and tries to identify them.

### **3.3. Dimensions of Market Structure**

Market structure refers in a descriptive way to the physical dimensions involved: that is, the definitions of markets, the number of firms in the market, the distribution of firms or plants by various measures of size and concentration, the descriptions of products and product differentiation, and the conditions of entry. For instance, a market can be structured on the basis of the nature of products. These products can be classified as follows: traded, non traded, perishable, and staple products. Each of these products reflects a different dimension of the marketing system in terms of relationships among market participants. Each of these products imply (i) a different *marketing channel* through which products are made available to consumers and (ii) different *organizational activities*.

### **3.4. Classification by Market**

Classification of agricultural markets on the basis of their structural attributes provides a simplified picture of the complex relations between the government policy and the nature of markets. In light of this approach, McCalla and Josling (1981) classify (1) agricultural markets as competitive and noncompetitive and (2) government policies as passive and active. They then analyze the impacts of a specific government

policy applied in competitive and noncompetitive markets for the functions and institutions of marketing (see Figure 3).

Figure 3: Classification of Agricultural Markets

| Market Structure  |  |  |
|-------------------|--|--|
| Government Policy | Competitive                                  | Noncompetitive   |
| Passive           | No govt. domination                          | No govt. domination but noncompetitive elements exist  |
| Active            | Govt. domination and markets are competitive | Both govt. dominates and noncompetitive elements exist |

Source: McCalla and Josling (1981).

Moreover, the ownership structure of an organization engaging in the activities and events in the marketing process might be a criterion in classifying the functional characteristics of marketing. Ownership-based classification of marketing process is as follows: Public ownership, private ownership, mixed ownership, and cooperative.

#### 4. STRUCTURAL ADJUSTMENT

##### 4.1. Classification of Key Policy Issues

The Ghanaian economy which experienced a serious decline in the productivity of every sector had to take serious steps towards promoting the productivity through the liberalization of markets. The policy reforms included (a) exchange rate reforms and (b) reforms in agriculture (export crops, food crops). As in every agrarian economy, reforms regarding the ill-developments in agricultural sector were the core of the efforts in revitalizing the whole economy. In particular, these reforms include raising producers' prices, liberalizing marketing and pricing systems (World Bank and

the UNDP (1989)). In addition to the declining productivity, other policy issues that lead to market reforms include increasing trade deficit and external debt, declining food security, increasing unemployment, lack of industrial competitiveness, collapse of essential export infrastructure, and low level of foreign investment. Given these domestic issues, the Ghanaian economy also deteriorated significantly during the period 1970-83 due to a combination of adverse external terms of trade shocks and domestic economic mismanagement. Between the year 1970 and 1982, real gross domestic product declined by 0.5 percent per annum, total export earnings fell from 21 to 4 percent of GDP, food availability fell by about 30 percent, and inflation reached triple-digit levels. Foreign exchange was insufficient to meet import requirements. Increasing number of skilled Ghanaians left the country as the economy imploded. As exports fell, so did the government revenues. As the budget deficit widened and inflation accelerated, the government responded by rationing the meager supplies of foreign exchange to protect official reserves.

Agriculture, particularly the cocoa sub-sector, was heavily taxed to finance less productive public expenditure. Cash crops (cocoa, cotton, tobacco, especially cocoa) benefited from the economic recovery program (ERP) at the expense of food crops (cereals, roots/tubers).

With the above picture of the Ghanaian economy in mind, the designers of the ERP were aiming at removing the distortions in the economy, rehabilitating the industrial, agricultural, and mining sectors, repairing and restoring the infrastructural base of the economy, implementing sound fiscal and monetary policies to achieve and sustain reasonable economic growth (Srtryker et al. (1990) and UNCED (1991)). In order to achieve these objectives, the following package of reforms has been implemented. First, fiscal measures were used to restore a balanced budget and increase public investment in economic infrastructure and social services. Fiscal discipline was a

major component of the stabilization program. This was to be achieved in the short run by curtailing the government's resource to the banking system and through large expenditure cuts. Second, money supply was tightened to reduce inflation. Third, capital controls were reduced to establish market-based pricing and allocation of foreign exchange. Fourth, public sector activities were reduced by corporatization of public enterprises and promotion of more efficient public-sector management by reducing over staffing. Fifth, export promotion programs based on public investments in traditional export sector to increase the country's capacity to earn foreign exchange and improve its allocation, cost reducing trade reforms, and exchange rate realignment were designed. Finally, attempts were made to reverse the decline in the agricultural productivity through restoration of incentives and rehabilitation of the physical infrastructure and transport facilities (IMF Occasional Paper 86).

The program consisted of three phases. The first phase is a *stabilization phase* in which prices are realigned to improve production incentives for exportables and move towards free market exchange rate regime. The second phase is a *rehabilitation phase* with a concentration on infrastructure and provision of essential inputs to productive sectors. The third phase is a *liberalization and growth phase* designed to assure sustained economic growth by relaxing trade controls such as removal of quantitative import controls, reductions in tariff and ban on food imports (wheat, rice, maize); and to reduce government intervention in the economic activities such as reducing fertilizer subsidy (Tabatabai (1986)). All these phases definitely require institutional changes like the abolition of commodity marketing boards and withdrawal of government from direct agricultural production.

The review of the literature regarding the impacts of policy reforms on the economic activities includes the following studies. Goldman, Roemer and et al. (1992) derive lessons from the experience of the East and Southeast Asian economies and

suggest a similar liberalization package to be an essential part of Ghana's development strategy. This package should include increasing savings rate, reforming financial markets, removing trade barriers and adoption of managed floating foreign exchange policy, and adhering to credible government policies. Younger (1993) emphasizes that liberalization of exchange rate and reductions in trade restrictions are not consistent with a reluctance to open the capital account. He favors a managed floating exchange rate policy in which the exchange rates are regularly adjusted on the basis of changes in their long-run fundamental determinants. Jebuni, Sowa, and Tutu (1991) examine the relationship between exchange rate policies and certain macroeconomic aggregates within the context of the current economic recovery program. They find that (i) real devaluation had an expansionary effect on GDP, (ii) the accompanying capital inflow led to an increase in imports, (iii) growth in GDP is positively influenced by imports, and (iv) real devaluation had a positive effect on imports and exports. They claim that in an import-compressed economy the ensuing inflow of external resources can be expected to lead to a positive relationship between imports and devaluation. Also there was a significant feedback effect of imports on exports. They also find that domestic prices are significant in the export equations when they are used instead of world export prices. This suggests that in a regulated market system favorable world market prices may not be passed on to the producer. For cocoa, the marketing board prices may not reflect an improvement in the world market price. The cocoa result also suggests that exchange rate depreciation, which is not passed on as higher producer prices, may actually have a contractionary effect on output and government revenue USAID (1993). In his study on the distribution of total income generated by the reforms implemented after 1983, Sarris (1992) measures the changes in the household welfare and finds that contrary to popular hypotheses, it is not likely that incomes of the poor in Ghana have deteriorated after the Economic Recovery Program (ERP).

Kyereme (1991) uses time series data and vector autoregression model to study the interrelationship between exchange rate, prices, and output. Impulse responses suggest that significant dynamic interrelationships exist between the cedi per dollar rate and inflation. Variance decomposition suggests that (1) the cedi per dollar exchange rate and factors influencing it account for most of its forecast error, followed by real output, and the price level, (2) the cedi per dollar rate is the most important determinant of price inflation. Productive constraints induce stagnation in domestic real output growth. This forces policy makers to depend more and more on imports of capital inputs and essential consumer goods. He claims that since the relationship between interest rate and money does not work like in a developed country, monetary policy relying solely on interest rates may not work. The main reason for this is the lack of access of major rural population to bank credit. Most of rural population depend upon the informal sector for scarce credit which they obtain at very high interest rates.

Ghartey (1987) examines whether or not devaluation could be relied upon as a means for correcting the balance of payments deficits in Ghana. He performs some estimations using data covering the period 1959-76. The major conclusions are: (a) prices do play an important role in the determination of volumes of both imports and exports, (b) the estimated price elasticities of imports were found to be fairly high, but the price elasticities of exports were found to be fairly low, and (c) income is a significant explanatory variable in both export and import functions. He concludes that devaluation policy is an effective tool for correcting Ghana's persistent balance of payments deficits. Overtaxing cocoa farmers should be avoided since it does not only discourage new entrants to the industry, but also discourage those who are already in the industry. Ghartey and Rao (1990) presents a short-run forecasting model of Ghana. The results highlight the fact that relative price and income elasticities of both

exports and imports are very low. The estimated price elasticities of all the other disaggregated imports are less than unity. This implies that a policy of devaluation can not be relied upon to redress the balance of payments problems.

Islam and Wetzel (1987) regard the reduction of public sector deficits as a key element of stabilization and adjustment programs. They examine the ways Ghana chose to finance its deficits and how these affected the financial side of the economy. They find that before implementing reforms in 1983, the government relied mainly on money creation for financing, though this was more by default than by choice since external lending was unavailable until 1984. This policy led to high inflation (tax on money), negative real interest rates, an over valued currency (i.e., high premium in the black market which implies high tax on exports), and the emergence of black markets. These forces further eroded the tax base and ultimately increased the deficit. They find that the fiscal deficit has had only little effect on private consumption, which implies that the government did not try to balance its budget through tax increases. Public sector investment was substituted for private investment due to increases in interest rates. The fiscal deficit had a negative effect on the external side through appreciating official real exchange rate which worsened the trade balance. Also, the black market premium rose. Pinto (1989) and Sherbourne (1986) analyze the implications of the unification of black and official exchange markets for the export sector. Since the black market premium on foreign exchange is an implicit tax on exporters, eliminating the gap between the official and black market exchange rates without rising taxes or cutting government spending could raise inflation substantially. That exchange rate reform is motivated by the allocative goal of stimulating exports through real depreciation is equivalent to reducing the premium (i.e., reducing the implicit tax on exports) or unification of official and black market exchange rates. Unification also has fiscal implications. Since the government is a net buyer of

foreign exchange from the private sector, there is a trade off between the premium (tax on exports) and inflation (tax on domestic money) in financing the deficit. Therefore, unification can raise inflation substantially as the loss revenue due to decreasing gap between black market and official market exchange rates is replaced with a higher tax on money. Pinto (1984) argues that inflation could rise permanently and substantially as a result of unifying official and black market exchange rates, even if real government spending remains constant. The black market foreign exchange premium is an important implicit tax on exports, creating a conflict between the fiscal goal of financing government spending with a limited menu of tax instruments.

Catsambas and Pigato (1992) analyze the relationship between the fiscal deficit, the real interest rate, the real growth rate, and the real exchange rate to find the conditions under which Ghana's debt-to-GDP ratio is stabilized. They develop an analytical model that takes into account (1) the unification of accounts of the government and the central bank to ensure that some components are not shifted from one to the other and (2) the government's fiscal stance in relation to stabilization objectives. Their results show that, in Ghana, average fiscal performance between 1980 and 1987 was only slightly weaker than it should have been. Projections for 1988-89 suggest that the government has substantial room for maneuver in its stabilization goals. Sherbourne (1986) also attributes the large fiscal deficits to the government policy of taxing cocoa sector and over valuing exchange rate. This policy eventually reduces the government's own revenue while keeping its spending growing.

Chhibber and Shafik (1990) present a model and show that in the presence of an active parallel market, official devaluation (reductions in the black market premium or reductions in implicit export tax) does not cause inflation because prices have already adjusted to the parallel exchange rate. Inflation in Ghana has been primarily a monetary phenomenon and the weakness in the financial system in recent years. They

also conclude that official devaluation had a positive effect on Ghana's budget. Revenue improvements came from three channels: (1) the higher grant aid disbursed at a more depreciated exchange rate, (2) a reduction in subsidies, and (3) an increase in export taxes as cocoa farmers increasingly marketed their output through official channels. The devaluation therefore did not produce higher budget deficits.

In their analysis of consumer prices between 1984 and 1987, Sarris and Shamas (1991) show that the rural food terms of trade (the ratio of the rural food price index to the rural non-food price index used as a proxy for the price terms of trade for rural food producers) dramatically declined after 1984. This development, mainly due to sharp increases in the prices of beverages, tobacco, clothing, footwear, fuel, power, furniture, and furnishings (mainly imported), is attributed to the 1983 reforms.

Ahiakpor (1986) argues that equality of the rates of profit among firms of different ownerships is what economic theory of the firm leads us to expect. He tests if multinational corporations located in LDCs make more profit than do local firms. Using the ratio of non-wage value added to the value of total capital as an estimate of a firm's rate of profit, he could not confirm the hypothesis that foreign firms in Ghana (1970) made excessive profits as compared with four other ownership groups of firms. Instead, the general tendency of the data is to rank the rates of profit for mixed private, local-foreign and private local firms higher than those of private foreign, mixed-state foreign, and wholly state owned firms. This ranking would seem to be explained more by the fact that while foreign firms tended to enjoy tax holidays on profits as well as subsidies on rents from the government, the same incentives were not generally available to private local firms.

*Reductions in the subsidies due to market reforms induced foreign and local firms to be more competitive. Free entry equalized rates of profits across foreign and local firms. However, the lack of regulations that protect environmental*

*amenities might be one of the reasons why foreign firms are attracted to Ghana. In this respect, it is worthwhile to examine the nature of foreign firms that started to operate in Ghana after 1983.*

Alderman, Canagarajah, and Younger (1993) address the problem of over staffing in the civil service. The government had the following concerns about the redeployment: (1) redeployed workers would present political problems, and (2) they would add significantly to the ranks of the unemployed. These two concerns were proven unfounded. Most of redeployees chose to migrate from urban to rural areas, and many of them are now farming. One of the benefits of the redeployment for the government is that it reduced the wage obligations of the central government.

*Reductions in the size of the public sector decreased wage obligations of the central government. However, redeployees migrated to rural areas and put pressure on the use of land. This pressure possibly led to deforestation and reduction in fallow periods and hence reduction in soil fertility. This shows that in designing policies environmental issues have been ignored.*

## **5. AGRICULTURAL MARKETS**

### **5.1. Input Markets**

U.S. House of Representatives (1989) states that Ghanaian industrialists indicated that the "auction" system for valuing and distributing foreign exchange has enabled them to acquire needed foreign inputs and thereby double capacity utilization. Also, intensifying food production and developing storage were two issues that need to be addressed to mitigate the effects on the economy of uncertainties pertaining to conditions and changes in the world prices. Furthermore, improved cocoa and maize processing and the lack of efficient transportation systems and of other infrastructure investments should be addressed. The report also discusses the negative effects of

certain structural adjustment policies such as dramatic devaluations, which raised the prices of consumer goods and agricultural inputs, and tightened credit restrictions. Regarding the latter, there has been a sharp increase in nominal interest rates, a decline in the value of real lending by the rural banks away from agricultural activities towards trade. The credit squeeze was a major obstacle to provision of tractor and Bullock services (a cultivation method) and to efforts to encourage cooperative storage. Structural adjustment program was partly successful in attempting to privatize or restructure the inefficient government fertilizer and seed companies. This study stresses the fact that until recently there has been no study to address the food production problem as: inadequate supply of productive technologies, weak credit systems and insufficient overall credit, lack of storage and effective price stabilization, the special problems of women i.e., lack of access to credit and extension services, and an absence of local and regional market development.

Asiedu (1989) examines the importance of macro policy sequencing and harmonization of the activities of external aid agencies as they affect the agricultural sector. Agricultural policy under the ERP has been one of encouraging and sustaining growth and development in both food and cash crop sectors to reverse low productivity levels of labor and land. The major policy instruments for achieving these objectives include: (a) improved input delivery, (b) price incentives, (c) better marketing and storage opportunities (for example, extensive feeder road program which helps open up food and cash crop producing areas increases farmers' market accessibility), and (d) transmission of proven technologies and other extension activities. The author also investigates if the sequencing of macro policies in the liberalization package matters in increasing productivity levels of labor and land. For example, the objective of increasing productivity can be achieved by first the privatization of the importation and distribution of agricultural inputs and second increasing farmers' accessibility to

credit through the establishment of autonomous rural banks in producing areas. This sequence is one of the alternatives that the Ghanaian authorities have. In this sequencing, the privatization is used as a source of financing to improve the marketing facilities such as transportation, storage, and credit. An alternative sequencing in achieving the same goal might be relying upon exchange rate liberalization and a complete transmission of favorable world cocoa prices to its producers. This policy also requires institutional changes to increase the efficiency of channels through which favorable world prices are transmitted. In this scenario, we see that priority is given to price incentives and the source of financing is shifted from the privatization to increasing cocoa revenue. Hence, it is very much likely that agents in the economy will be affected in a different way through different relationships among market participants.

Sarris and Shamas (1991) and Sherbourne (1986) focus on agricultural pricing policy that aims at reforming prices and restoring production incentives (i.e., restore relative price increases for the key export crops such as cocoa, timber, and minerals to favor production). The Ghana Cocoa Marketing Board (GCMB) adjusted the price paid to cocoa farmers (cotton, tobacco, and coffee prices have also been raised) to encourage farmers to increase their production. Ghana agricultural policy aims at (i) self-sufficiency in production of cereals, starchy staples and animal protein foods, with priority for maize, rice, and cassava, (ii) self sufficiency in production of industrial raw materials - cotton, oil-palm, tobacco, ground nut, (iii) increasing production of exportable crops - cocoa, pineapple, coffee, shea-nuts, ginger, and kola, (iv) improving storage, processing, and distribution systems to minimize post-harvest losses, (v) improving existing institutions and facilities, such as the agricultural research center, credit institutions, marketing facilities, and (vi) ensuring adequate returns to farmers, fishermen, distributors and processors to promote efficient

production and processing, and distribution of agricultural and other food items.

*Self-sufficiency in production of food crops and export crops and reforming marketing institutions are the main focus of the agricultural pricing policy adopted after 1983.*

They highlight the major constraints to the long-term development of sustainable agriculture: (1) insufficient flow of institutional credit, (2) inadequate supply and distribution of inputs, and (3) inadequate storage and marketing facilities. The policy measures to remove these constraints are: (a) monetary policy to direct the flow of institutional credit to the agricultural sector, (b) modernizing the distribution of agricultural inputs and privatizing them so as to ensure efficiency as well as accessibility to farmers, (c) the promotion and provision of improved on-farm storage facilities for small-scale farmers and improved processing of agricultural produce, (d) encouraging farmers at the village level to organize themselves into local cooperatives or other groups so as to gain formal recognition and access to institutional credit, input supply, and extension services. They discuss the main impacts of structural adjustment on long-term development of sustainable agriculture by emphasizing the implications of these reforms for farm size and distribution channels of products (agriculture is predominantly on a small holder basis although there are some large farms and plantations for rubber, oil-palm, coconut and rice), input cost, labor market, credit market, and marketing. They also analyze sectoral policies that affect small holders through their links with the money economy in the following ways: (i) by sale of marketable surplus, (ii) by purchase of agricultural inputs, (iii) by incomes generated through the sale of labor to rural or urban areas, and (iv) by purchase of consumer goods. Regarding the assessment of the supply and distribution of inputs, Borish (1991) examines private sector agricultural input distribution capabilities in

Ghana. He focuses on (i) progress made by private sector fertilizer dealers, (ii) the role of the government of Ghana in fertilizer distribution, and (iii) recommendations to increase private sector participation in agricultural input distribution. He finds that private retail fertilizer dealers are directly burdened by (a) poor infrastructure and (b) liquidity and marketing constraints, and lack of organization. Furthermore, he highlights the following points important in increasing the efficiency gain due to coordinating public and private sector activities for increasing agricultural productivity and value. These include the following (i) increasing tax and other incentives for investment in rural infrastructure, (ii) issuing agricultural development bonds, (iii) establishing a national credit watch system to protect banks and other creditors from bad debt before issuing loans, (iv) forming a private and independent movement of farmers' associations, (v) developing privatization and commercialization of intermediate technology transfer units to encourage greater distribution and use of technologies, and (vi) improving coordination efforts with research and extension.

After 1983, agricultural prices were in part freely changing. Because of the huge difference between official and parallel market rates, the cocoa smuggling was increasing, therefore, devaluation reversed negative effects of fixed exchange rate policy on cocoa producers. On the other hand, exchange rate alignments and the removal of subsidy increased input prices paid by farmers. This increase has been sharp between 1983 and 1987 especially for the improved and advanced techniques. The seasonal shortages of labor, which is a structural problem resulting from the unfavorable and unpredictable climatic conditions, caused increases in wages of hired labor, especially small farmers are induced to substitute more family labor for hired labor. Nominal returns per-man day of family labor in all traditional technologies and all three products (maize, rice, cassava) between 1984 and 1987 decreased as the

returns in the non-traditional technologies increased.

*Migration of the hired labor influences female-headed rural small holders which do not have any spare family labor. These small holders suffer from the relatively high cost of labor, which in fact induce them to use non-traditional technologies whose productivity increases. Therefore, they will substitute expensive labor with improved techniques (induced innovation hypothesis). It is likely to see these small holders leading the use of improved techniques. In order to increase the adoption of non-traditional technologies, special attention should be paid to the leaders of new technology user by providing them credit to increase accessibility to the new technology. As a result, migration of hired labor and inefficiency of existing borrowing-lending institutions will accelerate the worsening of small holders' welfare.*

Pearce (1992) addresses (1) the links between product-factor markets (labor, capital, and land) and socio-economic infrastructure, (2) marketing institutions that are concerned with the supply of inputs and with produce evacuation and scale, (3) issues in agricultural production such as population pressure on land availability and soil fertility (i.e., reduction of fallow periods which implies reduction in soil fertility), mixed cropping, managing the relative price of tradeable and non-tradeable commodities to allocate the scarce factors between the two types of commodity production, (4) the capital market, credit systems, and institutional changes, (5) product markets and marketing institutions, and (6) issues in factor markets such as increasing labor cost due to the scarcity of labor, the effects of external aid on the amount of formal credit for agriculture. Because of the lack of accessibility to credit institutions by small holders, they could not benefit from the credit expansion between 1983 and 1987 due to external aid. Therefore, small farmers outside the cocoa sector suffered from the lack of financial sources to cover the cost of borrowing. The only option for these small farmers was the credit obtained from informal credit market. Their cost of financing was high due to high interest rates. Monopolistic

position of the lender, real risks, and transaction costs were the reasons for this high interest rate. He points out an important implication of increasing population for new developments in land market.

*Population pressure and scarcity of land cause the price of land and the number of landless people to go up. Therefore, land rental and land sale markets emerge endogenously and urge an institutional change in the operation of capital markets to tackle the constraints in land rental and sale markets such as caretaker farmers and visiting tenants.*

In this respect, Koo (1973) and Feder, Feeny (1991), and Guinnane and Miller (1993) assert that land reforms will not be successful unless there is an institutional change in the operation of capital markets. Binswanger, Deininger, and Feder (1992) argue that, given the inverse relationship between farm size and farm productivity, redistributive land reform could increase efficiency since market forces would not typically generate an ownership structure whereby the large owners will break their holdings to sell to small holders. Given the results of these studies, the key issue in increasing the agricultural productivity in Ghana is to redistribute large farming lands to small holders.

*The objective of increasing the productivity of land requires a careful ranking of criteria which have positive and negative impacts on the land itself. In the case of cassava, for example, the government can provide incentives to producers of technologically improved varieties of cassava seeds that save land. However, agricultural market reforms directly affect the supply of agricultural inputs used in producing technologically improved variety of cassava. Therefore, the supply of new varieties is affected by developments in input markets. This implies that policy reforms should be started from the sources of distortions.*

*Redistributive land reforms are expected to increase agricultural productivity.*

*Given the scarcity of land and low productivity in agriculture, techniques that save land should be developed by public agricultural research centers and the use of intensive agriculture should be encouraged by the authorities. Developing new techniques brings up the issue of small holders' limited accessibility to the new technique.*

Regarding the productivity of land, research done by Sirleaf and Nyirjesy (1990) emphasize protection of rights-properties as a main criterion in private sector's investment decision. In other words, a positive link between property rights and investment decisions is investigated. In this connection, the effects of indigenous land rights system and land consolidation on productivity in Ghana are investigated. In doing this, special emphasis is given to the effect of commercialization and population pressure on the property rights system.

The fact that production in main sectors depends on imported inputs and the scarcity of foreign exchange urges the management of input supply let small holders have access to limited resources. Declining imports of fertilizer after 1984 can be attributed to the exchange rate devaluation and inadequacy of the resources allocated for their import. A devaluation of cedi dramatically increased the cost of imported inputs, especially chemical fertilizers, used by farmers. This impacted the output of small farmers and drew upon policy makers' attention to the fact that small farmers' income would decrease, implying a serious need for a technical package like SG 2000 aiming at raising small farmers' income Yudelman, Coulter, Goffin, McCune, and Ocloo (1991). The ongoing privatization of fertilizer importation and its distribution could have serious consequences for rural small-scale producers due to increasing prices.

*Increasing cost of labor induces producers to save labor through the access to labor saving technology which is mainly imported. Therefore, high devaluation will increase the burden on labor saving technology importers. In particular, the*

*questions to be addressed: (1) what are the impacts of devaluation upon the agricultural production that intensively utilize imported fertilizer? (2) what are the effects of exchange rationing on the import of fertilizer? (3) what are the impacts of fertilizer rationing on small scale producers?*

Jebuni and Seini (1992) study the privatization of markets for agricultural inputs, especially fertilizer, and the consequent removal of subsidies for these inputs. They examine (1) fertilizer availability and distribution, including trends in fertilizer prices and the demand for fertilizer; (2) experiences of the privatization program to date; pesticides, seeds, and machinery; and (3) statistical analyses of the distributive consequences of privatization. The study found that the benefits of the fertilizer subsidy were equally distributed to households across all income levels. However, small, low-income farmers in more remote areas that were more likely to get fertilizer through the official system would stand to lose, in the short-term, from privatization, suggesting the need for special programs to compensate them for their losses. It was also found, however, that the special programs operated by NGO's to distribute low-cost fertilizer and/or provide cheap credit impeded the development of a private market, as private traders simply could not compete. The report prepared by World Bank (1990b) on medium term agricultural development program (MTADP) in Ghana emphasizes the importance of private sector activities in agricultural marketing process. The main ingredient of MTADP is the greater reliance on the private sector for the provision of services and a corresponding reduction of the role of the public sector. In marketing activities, the major constraints were lack of suitable storage for the various tiers of the marketing chain: on-farm, and local and regional wholesale markets, inadequate weighing and grading facilities in agricultural produce markets administered by district councils in many rural towns. Under the medium term strategy, it is recommended that government of Ghana freezes its storage construction program and

prepares a private sector strategy for increasing farm and local level storage.

Agricultural input marketing involves the buying and selling, transportation and storage of items such as seeds, fertilizers, agricultural instruments and equipment, pesticides and herbicides. After 1984, the responsibility for providing inputs was shifted to Crown Agents which are indirectly financed by the World Bank. Under the World Bank-financed reconstruction import credits, the private sector's involvement in input supply has become stronger. Nevertheless, under present arrangements the major input items - fertilizers and seeds - are largely controlled by the public sector. And their supply has proven very unsatisfactory. There are a number of inefficiencies in input markets. Four of them are the following (1) subsidy insulates inputs/commodities from market signals and distorts trade. Subsidization of production inputs (fertilizers, insecticides, and agricultural machinery and equipment) encourages their enhanced use due to lower effective prices and has direct and indirect negative environmental effects (Stryker (1990)). (2) Shortages of manufactured goods (consumer goods and inputs to the agricultural sector) that affect agricultural performance are the unintended result of development policies giving priority to industrialization. (3) Weaknesses in the credit and input delivery system suggest that farm associations and cooperatives should actively participate in the creation of a sound banking system for credit delivery. In addition to the informal credit network, agricultural credit in Ghana was formally provided by commercial banks, the Agricultural Development Bank, and the National Investment Bank. The main problem was that input subsidies and cheap credit never effectively reached the smaller farmers who were responsible for most of the nation's agricultural output due to the lack of high levels of managerial skills. Overall, prior to 1983, less than 10 percent of farmers in Ghana received institutional credit (Stryker (1990)). (4) R&D has traditionally been the responsibility of the universities in Ghana, however, the researches done by these universities were ignored

by the authorities.

Amarteifio (1985) briefly summarizes the role women play in food production, processing, and marketing. Food processing is mainly done by women who have always dominated the market economy of Ghana. Several attempts have been made by various governments to remove their strong grip from the market economy but all have failed. For example, 80% of all traders are women in southern Ghana. Women usually combine the functions of farming, food processing and marketing with domestic duties such as cooking and child care. Ameyaw (1990) examines the characteristics of market women, patterns of entrepreneurship, and indigenous food market in Ghana. The paper suggests an important conceptual link between rural food production, marketing, and the growth of towns. It finds that market women's contribution to the rural economy, especially to the food marketing industry, has motivated local women to seek full and part time employment in trading. In recent years, a new wave of local young women between 15-25 years of age (often called business women) have assumed a key role in traveling to different locations to bring food crops to the market. Future policies toward women must explore areas such as food processing industries, mechanized agriculture, and higher education.

*In some small towns, market women as a middlemen connect farmers and central markets in small scale trade. Also, they are actively involved in food processing and marketing activities.*

Sarris and Shamas (1991) classify the distributors of input supply on the basis of ownership: private and public sector. Private sector is involved in such activities as manufacturing (cutlasses, hoes, some agricultural processing machinery), importing, and distributing of inputs. The government institutions are involved in the same activities as private sector, with only one exception: the government has the complete

control over the sources of foreign exchange. Because of changes in the system of foreign exchange allocation, the private sector involvement in input distribution has varied. Prior to the structural adjustment, private sector's involvement in input supply was low since it competed for limited foreign exchange (foreign exchange rationing) by which one could make large profits owing to the difference between official and parallel market rates. Most of the agricultural inputs were being financed by officially released foreign exchange.

*Even though the government was implicitly dominating in input markets by controlling the allocation of foreign exchange, private sector (acting mostly as middlemen) found it profitable to operate in input markets to fill the gaps between farmers and central markets.*

The policy objective was to privatize major input distribution. The success of privatizing the distribution of fertilizers depends on the success of other privatization policies since fertilizers require storage and a network of trained dealers to handle them. Also there is a risk element as fertilizers have peak demand periods and any unsold stock is carried over for at least six months at high interest charges. The decision to get into fertilizers depends on the performance of the sectors that intensively use it. Price incentives for the sector that use fertilizers will increase the demand for it and therefore the distributors will take into account this incentive in their decision.

*The success of privatization of fertilizer distribution depends on other infrastructure facilities, for example storage, mostly provided by the government. Therefore, the private and public sectors should be working cooperatively to minimize the loss of fertilizer due to the lack of enough storage facilities.*

The segregation of women labor from the facilities provided by the government has

an important implication for the productivity of agricultural sector. Sarris and Shamas (1991) address this segregation problem by laying out the losses the Ghanaian economy experiences due to the lack of efforts to make women labor as a part of the whole. The policy issues to be addressed in this respect include accessibility to mechanization, inputs such as fertilizer, land, and credit. Interestingly, the Agricultural Development Bank whose main purpose is to provide credit to needy farmers did not do much business with women farmers. This caused women farmers to look for credit in informal credit market. Annorbah-Sarpei et al. (1992) examined the savings patterns of the lowest-income women in Ghana. The study focused on lowest-income women in three settlement areas -- a district capital (Offinso), a regional capital (Tamale), and the national capital (Accra) -- and collected data on the relative advantages and disadvantages of informal (susu) and formal financial systems. The study found that the flexible and convenient susu system is the preferred mode of savings among lowest-income women. Major recommendations are to strengthen the susu system and to revise the savings and lending procedures of formal financial institutions to suit lowest-income women's needs and lifestyles.

*Both declining economic activities and cultural endowments that influence the interrelationships between men and women and between women and institutions pushed women labor into areas where rate of returns is low. In order to remedy this biasedness inherited in the cultural endowments, women form groups of farmers for the purpose of reducing the risk of not getting credit since credit institution favor larger farmers.*

#### **5.1.1. Institutions of Agricultural Marketing System**

Under the light of our criterion in section 3.3.1 that presents a classification scheme for markets, we can examine the agricultural marketing institutions under two broad categories: public and private institutions. Regarding this classification,

Sarris and Shamas (1991) summarize the activities of institutions that play major roles in agricultural marketing in Ghana. The institutions of markets are classified under two groups. The first group is public institutions of marketing which includes Ghana Cocoa Marketing Board (GCMB), Ghana Food Distribution Corporation (GFDC), Grains Warehousing Company (GWC), Ghana National Procurement Agency (GNPA), and Meat Marketing Board (MMB). The main purpose of GCMB is to buy, process, and market cocoa. Direct functions of this board include supply of seeds and other inputs, quality control and extension. GFDC was established to purchase, export and distribute foods. It was also empowered to distribute inputs. Its main function is the purchase of domestic crops such as maize, rice, plantain, yam, coco yam, and gari. GWC was formed to store cereals such as maize, rice, wheat, and sorghum, but recently entered into grain purchasing. GNPA acts as an importer and wholesaler for a wide range of commodities including wheat, rice, sugar, maize, and vegetable oils. MMB is a government distributor of meat. The second group of marketing institutions is controlled by the private sector. Their main activities include the marketing of food crops, meat, and fish. In food crops, there are three main types of middlemen: traders (itinerant), market-based, and food contractors. Itinerant traders operate in a geographical area by establishing contact and offering services to maintain this relationship. They buy, assemble and transport the produce to wholesalers at the consuming centers. The market-based traders are wholesalers. They have formed loosely based associations led by "market queens" (the head of an association). Each market queen specializes in a commodity and, although the linkages between "market queens" are not known to exist, she acts as an important link between wholesalers and retailers in an individual markets. After itinerant traders transport the procure to wholesalers, a market queen regulates supply and demand to ensure certain price levels. The last group, the food contractors, supply food to various institutions.

*Dominant ownership structure in marketing determines the performance of individual crop market (for example, in food crop sector 95 per cent of the trade is controlled by the private sector and in the industrial and export crop sub-sectors by parastatal). However, the structure of a market itself is influenced by both the government policy such as saving environment and the nature of the product. For example, the degree of perishability of a product affects the storage technology mostly provided by the government due to the high level of investment expenditure that private sector is not willing to make. Therefore, market structure is endogenously determined by the nature of the product of interest. This endogeneity leads to product specific government policies.*

Heavy central decisions usually are very difficult to carry on at local level due to central governments' insensitivity to local needs. For this reason, many governments put the decentralization efforts into effect to increase the productivity at the district level. In their study, Fiadjoe, Green, and at. al. (1992) evaluate the impact of administrative decentralization on rural population in Ghana and conclude that Ghana's program of decentralization has not gone far enough in delegating true authority to rural populations. Due to a lack of resources and authority, district governments are currently incapable of delivering goods and services to needy people. This chaos virtually disconnects farmers from markets. In order to redress the situation, the districts promote local self-governing village institutions.

*The failure of decentralization efforts leads the districts to develop local institutions, therefore, it is easy to observe separated markets which operate in different structures even for the same product.*

Many of the problems addressed by reform efforts include the problems that emerge due to the inefficient institutional setting. For example, reform efforts in Ghana are attempts to reduce overall employment in the state enterprise sector and to restructure

work forces at the enterprise level. In order to achieve these goals, attempts are made to introduce a more market-oriented discipline into the structure and management of the work force in state enterprises. The factors that affect the success of reforms are public marketing institutions, rural infrastructure, and the level of private sector development.

Robertson (1987) analyzes the impact of *Abusa*, a productive relationship, meaning "one-third" on the supply of food crops. This specifically denotes a crop-sharing arrangement where the supplier of labor and other inputs (the "abusa man") receives from his partnership with a farm owner a third of the cocoa produced. Share cropping in Ghana is not confined to cocoa.

#### **5.1.2. Credit Markets**

Many studies have described the institutions comprising the credit system in Ghana. They analyze the characteristics of borrowers and outstanding loans at the farm lending institutions. Misdirection of loans to non farmers was main difficulties in Ghana where a strong informal credit market exists. The impact of reforms was negligible on the behavior of private sector that prefers to make transactions in informal credit markets. Aryeetey and Gockel (1991) examine the factors that motivate the private sector of the Ghanaian economy to conduct financial transactions in the informal financial sectors, in spite of the fact that the number of formal financial institutions was increasing as well as the financial instruments traded in. Expansionary monetary policy and inappropriate fiscal policies as well as repressive financial policies, such as controls in pricing, distribution and exchange rate management might be the reasons why financial-asset holdings declined since the mid-1970s. Banks responded to the government's financial policies by raising the level of securities, which created excess cash holdings that could neither be channeled into

productive activity nor used as raw material for the production of credit. The above factors led to the emergence of an informal financial sector.

There are a number of studies that examine the problems of credit institutions in Ghana. Some of these studies focus on the reasons why Ghanaian farmers are willing to save with formal banking institutions. Others examine such factors as interest on savings, deposits, attitudes of bank employees, and confidentiality of bank records to account for the savings behavior of farmers. Since the Ghanaian financial system is predominantly publicly owned and dominated by a relatively small number of banks, restructuring was chosen instead of liquidation. In this respect, more serious consideration is given to the Ghanaian commercial banks to design financial packages following the "integrated funding approach" to financing agribusiness activities, from production to marketing.

Aryeetey and Gockel (1991) study the effects of financial dualism on the entire financial system, for example allocative effects, dynamic effects and the effects on macro-management through money creation. It also analyzes the role of the financial sector in the mobilization of domestic resources for capital formation in Ghana. Further, the rationale for the existence of an informal financial sector is discussed. This is accompanied by an estimation of the size of the market and a detailed description of its operations. They discuss the nature of the demand that is common to formal and informal sectors and the size of the demand for this non-specific demand depends on the degree of complementarity and substitutability between these sectors. They propose that demand in the formal market would have a greater proportion of non-specificity in view of the relative ease with which urban dwellers and other users of the sector can switch from one to the other. Their estimation shows that the informal financial sector serves both as a complement and substitute to formal savings and lending facilities. The increased resort to informal markets has taken place in spite

of the increase in the number of formal financial institutions, as well as the financial instruments traded in. The declining importance of the formal financial sector has the following implications: (1) institutional credit can not go to productive private sectors and (2) monetary policy tools of the central bank have been made ineffective. Furthermore, Brown (1986) investigates the relationship between the lack of credit facilities for land development and the nature of property rights. Furthermore, he urges credit program to cover input supply, marketing, processing, and storage activities as well as consumption and production credits.

Ashe, Jeffrey, Hirschland, Madeline, et al. (1992) investigate the role of credit expansion in such women issues as income increase, self-confidence, health, and nutrition. Freedom From Hunger (FFH) has adopted the village bank methodology developed by the Foundation for International Community Assistance (FINCA) in Latin America to design a credit program for poor rural women in Mali and Ghana. Harvey (1993) discusses the problem that the commercial banks face in Ghana where the commercial bank sector has deteriorated to the extent where it cannot perform its most basic functions: provision of a payments mechanism and financial intermediation. Even more seriously, some commercial banks have been extremely bad at directing credit to those producers who can make efficient use of it. The point is that the reform of commercial banks must include reform of their management of lending, as well as the writing off of bad debts and recapitalization. The composition of banks is worth to analyze since the dominance of foreign banks have implications for the emerging banking laws and regulations and the allocation of credit. Since the access to the official credit was a problem for a small-scale business, the government created new 100 per cent government-owned commercial banks. This was hazardous for the whole system because the new banks were pushed into the riskier and more marginal lending business.

Sarris and Shamas (1991) discuss the links between agricultural credit and access

to new technology and institutional changes that make credits available for small farmers.

*The supply of new technology brings up the problem of a new source of credit to be extended to potential users of the technology. One of the main barriers to technology adoption in Ghana is the lack of financial sources and institutions that organize the distribution of credit.*

Creditors were careful about the risk of extending credit to small farmers therefore they preferred to extend credit to carefully formed groups of small farmers to reduce their risk. In a way, extending credit to individuals were more risky than groups, therefore, group lending was applied (Desai, (1980)).

*Credit Rationing is an activity of a lender to minimize the risk. Generally, credit is rationed in the sense that you cannot buy as much credit as you want at the given market price. One observes that banks try to expand their credits, not by offering more credit to a particular applicant, but trying to attract more borrowers. The asymmetric information between lender and borrower is the main reason for rationing. When a bank gives a loan, all it obtains is a promise of reimbursement from the borrower. But it has no way of evaluating the quality of this promise with certainty.*

*One of the main problems regarding the productivity of agricultural sector was the lack of credit. Small holders held the largest market share and also they were suffering from either the lack of financial support or the lack of accessibility to improved technology and lender institutions. They needed credit to help improve their marketing activities. For example, after the harvest they needed credit to rent storage near the field to minimize the loss of crop or to rent a storage in an urban area to reduce the transportation cost. Risk diversification efforts of lending institutions were practically not possible due to the fact that large farmers were the only ones who had access to these lending institutions. Therefore, credit rationing was not possible due to the segregation of agents who are ought to be connected to each other by intermediary institutions. This segregation caused small holders to barrow from informal markets at a high rate of interest.*

Paul (1990) reports the findings of an assessment of the constraints on the private sector and the directional changes required for its development in Ghana. The most severe constraint on the private sector in Ghana pertains to credit availability and allocation to the formal manufacturing sector. He emphasizes the fact that the first priority structural adjustment program should give is to reform the financial institutions and credit policy so as to augment the supply of resources for long term investment and production. And small scale industries should be encouraged to establish their own association to reveal their preferences to the government, which indirectly implies the lack of institutional communication between government and small scale industries which are the core of the whole development.

### **5.1.3. Infrastructure**

There is a widespread concern that marketing costs are high regardless of the distribution efficiency of the various distribution systems (public or private). High costs are due to poor transport facilities, poor roads which lead to high transport costs and poor storage. Sherbourne (1986) emphasizes the fact that reducing incentives for cocoa producers decreased the cocoa production and the government revenue. The declining government revenue especially deteriorated the infrastructure investments (transportation) which causes an even more reduction in government revenue due to the fact that low volumes of exports were able to reach the ports. Furthermore, deterioration in the transport system has prevented efficient delivery of these inputs to the farmers. Therefore, only large farmers who have access to transport benefited from these inputs. Manu (1992) reviews policies and regulations concerning the marketing of food and other consumer items in Ghana for the period 1970-85. He finds that the main problem was the inefficiency of traditional and private distribution systems. The effects of government interventions on the pricing and distribution

system are also discussed. Brown (Ed.) (1986) emphasizes the importance of "feeder road" , any road serving a group of settlements from the trunk or secondary road, in rural development.

*Subsidized inputs were not effectively delivered to small farmers due to a deteriorating transportation system. Therefore, subsidizing inputs together with a government's transportation service are complementary policies. Decreasing the government revenue with subsidized of inputs only benefit large farmers who have access to transport.*

*Timing for the distribution of the subsidized inputs is a vital factor in productivity. The cheaper private price of transportation service caused the government to use private transport system during the peak season for input demands. The differentiating prices are one of the reasons for the delay in delivering the inputs to small farmers. Therefore, relying only on the private transportation system will increase the cost of subsidized inputs, eventually the whole policy of subsidized inputs will be ineffective.*

Gronau (1991) studied how much road damage contributes to road use costs in Ghana and how the marginal social costs should be recovered. He finds that to bridge the gap between road-user costs and charges, the annual fee for heavy trucks should be raised tenfold since fuel taxes alone are not adequate to distinguish fully the large difference in road damage costs incurred by heavy trucks and private cars. If raising the licensing fee for heavy trucks is not feasible, certainly they should not be exempted from import duties.

*Price increases in one of the transportation modes (i.e., trucks) might cause a substitution effect in the short run, however, in the long run we can easily observe a change in common mode of transportation like a switch from highway to railroads.*

Gersovitz (1987) examines the effect of agricultural production tax on the rest of

the economy. He discusses the effect of agricultural production taxes on the system of producer prices, transport logistic, and decisions on investments in transport for exports. Marketing boards are the tools for taxing the export crops. They purchase crops at depots established near areas of cultivation at prices that yield a profit to the board. They also provide transport and processing facilities. He suggests that if the state taxes the crop, then the best policy is to provide a partial subsidy of transport. The worst policy is to pay the same price per unit irrespective of depots, an implicit 100 percent subsidy of transport from depot to port (named as pan-territorial pricing policy). A pure export tax (farmer transports crop to port at own cost) is only slightly better. The deadweight loss from pan-territorial pricing increases with the supply elasticity of the crop. He also examines different patterns of depot location. He finds that unless depots are densely spaced, farmers may deliver their crops to the depot nearest to them but not nearest to the port. He also finds that evacuating crops in an irrational order - from the furthest depots first, and the closest depots last - tends to increase post harvest losses and to engender inefficient use of and investment in transport. Returns (in terms of producer surplus) to transport investments (lower transport cost) are largest under pan-territorial pricing (implicit 100 percent subsidy of transport from depot to port), lower under optimal pricing (a partial subsidy of transport), and least under a pure export tax (no subsidy).

#### **5.1.4. Scale and Efficiency**

The relationship between scale of operation and efficiency is an important one in determining a firm's performance relative to firms in its size group. Technological change and efficiency is related to the supply of new techniques which are products of R&D activities. The relationship between the scale of operation of a firm and its

tendency towards adopting new technologies is crucial for the provision of publicly produced techniques. Knowing the size of an average firm in an industry is an important piece of information for the provider of the new technology in determining the optimal techniques that firms will benefit the most.

From the International Labor Organization (ILO) household survey, it was clear that women could benefit from technologies introduced into food processing and home-based industries. Specifically, the following five processing activities were selected: fish processing, cassava processing to gari, coconut oil processing, palm oil processing, and soap making (Project No. ILO/NETH/80/GHA/1 (1989)). The survey investigated existing credit practices because lack of capital often presents an obstacle to women who want to adopt new technology. For example, Kokrobite fish smokers felt hampered by lack of capital, but the need for capital for buying fish overwhelmed that for technical innovation (USAID/Ghana (1992)).

Sarris and Shamas (1991) discusses the availability of technology and improved planting material for forest, transitional and Savannah zones and improved cultivators of cassava. In general, the production of inputs takes place in large plants where the competitive market structures are such that there are only a few large firms. It is these firms, that particularly involve in the production of fertilizer and agrochemicals, that have made technological improvements in the inputs.

Panin (1986) focuses on the problem of low productivity. In order to increase the productivity, the Bullock traction method is analyzed. The Bullock traction technology is an innovation considered to be capable of increasing food production in the dry land areas, while at the same time raising the productivity of factors of production and the income of the peasant farmers. Compared to other forms of innovation, for example, tractor mechanization, the Bullock traction technology is a small scale innovation with low level investment cost and also this technology can easily be handled by illiterate

farmers. This system may be a tentative remedy for the labor shortage that the Ghanaian rural economy suffers from. The effects of Bullock traction technology on labor can therefore take the form of (1) the reduction of labor input at a given output level, (2) the intensification of labor use to raise the output level. The major finding of the analysis of the Bullock farming technique is that Bullock farmers are better equipped with land and labor capacity.

*In an economy where population pressure on land degrades the environment and the shortage of labor becomes a constraint on the economy, Bullock technology might partially reduce labor shortages from which the agricultural sector suffers.*

The paper also studies micro-economic effects of the use of Bullock traction as a technical progress. It discusses micro-economic advantages and disadvantages of the Bullock technology. It increases the production through (1) improved soil and seed bed preparation, (2) optimum timing for cultivation (land preparation, planting), (3) intensification of land use, (4) possible changes in crop rotation, (5) expansion of cultivated area. On the other hand, the use of the Bullock technology increases the demand for a set of new capital inputs, consequently, the Bullock farmer faces a greater financial burden.

#### **5.1.5 Time/Spatial/Quality and Variety**

Alderman and Shively (1993) focus on the performance of agricultural markets. They are concerned with the impact of economic reform programs on commodity prices. They investigate how successful economic reforms have been in improving the performance of markets and welfare of consumers. In other words, they investigate how successful economic reforms were in getting the prices right or in providing an environment in which price information flows freely. Their question is whether or not markets

transmit information successfully. They specifically addressed (1) Did the economic reforms of the 1980s have a significant impact on the levels of food prices?, (2) Were these prices effectively transmitted across regions and commodities?, and (3) Have internal patterns of agricultural trade contributed to increased price volatility?

Songsore (1985) emphasizes the organization of marketing within a sub-regional framework. It adopts the center-periphery model as the organizing framework for the analysis of intra-regional commodity flow relationship between WA and the Northwest. This is followed by the analysis of the patterns of marketing for agricultural products and manufactured goods. His analysis is a demand-driven analysis since the improvement and the use of improved technologies in agriculture is totally a function of the aggregate demand generated by the center. One negative effect of creating centers is that, in a country which does not have a sufficient level of infrastructure by which centers will be connected to each other, trade centers distinct from each other will likely cause a huge price differences. This study also recognizes the fact that even if inputs were available, many farmers could not invest in them due to the lack of financial credit and skilled labor that new technology requires. An interesting issue in this center-periphery framework is to analyze the possible marketing structure implied by marketing reforms.

Sarris and Shamas (1991) analyze market performance under "spatial" and "temporal dimensions". Spatial integration of marketing system implies the converging prices in various geographical regions. In Ghana, the various markets are geographically quite close, hence, one would expect that prices in major marketing centers should not move independently. To test this hypothesis, monthly wholesale price data in several rural producing and urban consuming markets for 1982-1986 (excluding data in 1984) for maize, rice, yam and cassava (the most widely consumed staples) are used. The results show that markets for staple food crops are not very well integrated spatially. Staple food

markets in Ghana exhibit very substantial intra-seasonal price variation within each marketing season. In particular, the results indicate that for maize in most years the prices in the lean season are more than 100 percent higher than prices at harvest time. Though no detailed analysis of storage costs was undertaken, from the above analysis it appears that in almost all years there is a price incentive to store cereal grains from harvest until the lean season. In order to understand the reasons of storing crops, they emphasize the difference between storage and interest costs and inflation rate. In their example, 20 per cent storage losses, 20 per cent interest rate, and 20 per cent inflation and a price difference of 100 per cent between the harvest and lean seasons imply a reasonable real profit of 10 percent.

*In general, a careful examination of storage costs, interest rates and inflation rates gives a rough idea about the motivation behind the storage of staple crops.*

## **5.2. Output Markets**

### **5.2.1. Time/Spatial/Form of Market**

Agricultural output marketing include activities of the buying and selling, and transportation, storage, grading and sorting, transformation, and packaging. Agricultural marketing reforms aim at enhancing agricultural incentives through such direct actions as raising producer prices especially for cocoa, liberalizing marketing, and pricing systems especially for food crops. Pearce (1992) focuses on the impacts of these reforms on activities in output markets by grouping the crops by the type of producers. His classification includes: (1) market oriented-producers (export/industrial and food), (2) subsistence-oriented producers (dry land farming and mixed cropping), and (3) producers/laborers (dry land and mixed cropping areas). The main agricultural commodities produced by small holders are maize, rice, sorghum and

millet among the cereal staples, starchy crops such as cassava, yam, coco yam and planting and cocoa as the main non-food commodity and principal export earner. Along the line of the widespread belief (see, e.g., Killick, (1978) and Bequele, (1983)) that the economic retrogression in Ghana is directly traceable to the decline of the agricultural sector, Tabatabai (1986) examines the principal causes of the decline of the agricultural sector as well as the impact of this decline on people's access to food before the ERP. He sees a drought in the mid-1970s and 1982-83, a poor transportation network, insufficient fuel, and lack of spare parts as possible reasons for the decline of the agricultural sector. After 1983, activity in transport and trade sectors, which are key for the marketing of agricultural and manufacturing output, became the driving force of growth of agricultural sector. Transport and trade activities, which are closely linked to developments in agriculture and manufacturing, recorded growth during the period 1984-1992. Economic activity in the transport sector was boosted by rehabilitation programs for the railways and the road network. A poor transport system and state-controlled domestic and international trade in foodstuffs are common themes. This poor transport system is a main factor that influences prices paid by rural consumers.

*The main efforts inherited in output market reforms focused on the need for spatial integration of markets by infrastructure investments (transportation).*

Alderman (1992) addresses the problem of stabilizing food prices between seasons and across years. These policies range from income support and employment generation programs to improving marketing infrastructure. Another option is the possibility of government intervention in inter- and intra- year storage. The effectiveness of the government interventions to guarantee food security depends on knowing which market

channels operate effectively. For example, improving the linkages between the markets with food surplus and deficit are important in smoothing the consumption across regions and food prices. Other issue to be addressed in this respect is to improve the channels of transmittal of information across commodities and markets such as investing on communication channels. Another important aspect of investing on the linkages among markets is that the nature of commodities marketed should be known so that priority should be given to link market with substitutable goods to increase competitiveness and consumers' welfare.

*From an industrial organization point of view, consumers' welfare and changing market structure should be addressed in the context of marketing complementary goods. For example, the two firms producing complementary goods would be better off if they operate in the same market since the demand for the commodity produced by a firm creates demand for other firm's output. In this case, we usually observe horizontal integration of firms.*

He empirically shows that long-run price transmittal in the maize market is compatible with competitive assumptions, a one to one transmittal to other commodities is only one of many empirical possibilities consistent with competitive assumptions and cross-price response. He also concludes that traders set prices for other coarse grains in response to maize price information.

*Timing and storage factors are vital in the case of surplus in market A and deficit in market B. Transportation and information channels should be improved to increase the flow of commodities between the two markets. Absolute liberalization of marketing and pricing system without considering the deficiencies in the information channels that connect markets to each other will increase the profits from commodity arbitrage.*

World Bank (1990b) also emphasizes the need for new roads telecommunications, and

information network to spatially integrate markets. It is the fact that the biggest part of marketing cost comes from transportation inefficiencies. Therefore, policy reforms regarding the efficiency of the marketing activities should include policies that (i) enable new transport infrastructure, especially feeder roads, and communications facilities for the dissemination of the market information vital in integrating markets, (ii) promote efficient financial markets to support commodity markets, through the increased availability of credit to traders, transporters, and wholesalers, and (iii) establish legal and institutional mechanisms for the standardization of weights and measures and guarantees of free entry into markets.

### **5.3. Imports and Exports**

Pearce (1992), Chhibber and Shafik (1990), Sarris and Shamas (1991), Sherbourne (1986) Catsambas and Pigato (1992), Bateman, Meeraus, Newberg, Okyere, and O'Mara (1987) discuss the reasons why Ghana's cocoa production was declining. They stress the negative effect of over valued domestic currency on cocoa exports. By keeping the premium of parallel market at a positive level, the cocoa export sector was implicitly being taxed. In addition to that, the favorable world prices for cocoa producers were not passed due to institutional rigidities. Bateman, Meeraus, Newberg, Okyere, and O'Mara suggest shifting tax burden of cocoa producers onto the shoulders of consumers. An alternative policy to protect cocoa producers is a variable rate tax on cocoa that changes with the world price. Also, the authors discuss that COCOBOD should terminate its marketing activities for coffee and all taxes on coffee exports should cease. Even with heavy taxation, net revenue from coffee is negative to the government under the current arrangement. Stopping coffee taxes would give coffee producers a stronger incentive to expand production. Pearce (1992) analyzes market structures of main commodities under three groupings: (1) exportables, (2) importables, and (3) non-

tradeables. No internal market exists for cocoa beans, similarly, no external market exists for the starchy staples. Importables mainly include maize and rice. Non-tradeables are the starchy crops such as cassava, yam, coco yam, plantain. Agricultural reforms covered the three main policy areas: trade liberalization, domestic price liberalization (removal of subsidies and price distortions), and institutional reform. The first phase consisting of policies such as removal of import subsidies and reduction of tariffs addressed the cocoa sector. The second phase includes policies such as freeing food crop market through price increases and minimum price supports. The products under minimum price support are maize, rice, oil palm, cotton and tobacco. Interestingly, the main industrial crops such as oil palm, cotton and tobacco were kept partially subsidized. The basic institutional change was that cocoa sector was brought under the umbrella of the Ghana Cocoa Marketing Board.

*How did producers of food crops and cash crops respond to these reforms? Was there a substitution between the crops? If there was, to what extent the availability and suitability of land affected this substitution.*

Sarris and Shamas (1991) and Boateng, Ratchford, and Blase (1987) conclude that cash crops especially cocoa benefited from the aforementioned reforms at the expense of food crops which were the most profitable before 1983. For food crop producers, the land availability was not a constraint. However, reduction in bush-fallow period due to high population pressure caused the land suitability to be a serious problem, which eventually affected the rate of substitution of income sources from food crop to cash crop production activities.

Varanis, Akiyama, and Thigpen (1987) discuss privatization of marketing and the adoption of free-market pricing are easier under the caisse system than under monopolistic marketing board system (boards act like "buyers of last resort"). A

progressive export tax system can ease the transition from a fixed producer pricing system to a free-market pricing system. They conclude that the path a country should take toward more private sector participation depends heavily on the form of marketing and pricing system that exists and the time needed to develop needed skills in the private sector. Boateng, Ratchford, and Blase (1987) question the assumptions that in a traditional farming system food production is primarily for home consumption and is not competitive with export crop (cocoa) production. The analysis indicates why farmers were devoting scarce resources, particularly labor, to producing food crops which were the most profitable in 1981. Recent research has attributed the decline in cocoa production to the price paid to the farmers, the land tenure system, and smuggling of cocoa across the borders. Regarding the effect of land tenure system on the agricultural productivity in general, Migot, Benneh, and Atsu (1990) found no evidence of land tenure insecurity contributing to agricultural inefficiency. Findings of the ongoing Bank study on land tenure in Ghana suggest that the issue is not gross inequality, but the extent to which indigenous land rights systems may be a constraint on agricultural development. The major constraints that the present land tenure system imposes on growth are (i) it limits access to credit, (ii) it discourages replanting of tree crops because most farm operators tend to be sharecroppers, and (iii) it discourages land improvements. The objective of the study by Boateng, Ratchford, and Blase (1987) is to gain insight into why cocoa farmers have reduced cocoa production. The unique feature of this study is determining the crops that compete with cocoa in the traditional farming system and the extent to which competition is determined by relative profitability. Furthermore, they analyze the cropping systems to determine the most profitable one. Three of the cropping systems are: (1) cocoa inter cropped with plantain and coco yam is the traditional way of establishing a cocoa farm, (2) plantain-coco yam mix is one alternative way of utilizing land suitable for cocoa

production, and (3) cassava-corn mix.

*Profitability of crops also depends on the cropping system used. The cropping systems are the usual alternative ways of utilizing the same land. Profitability analysis of crops competing with cocoa indicate that, on the basis of net present value estimates calculated for the three farming systems, (1) plantain-coco yam mixed is the most profitable system, (2) followed by the cassava-corn mixed system, and (3) cocoa inter cropped with plantain was clearly the least profitable.*

Abdulai and Egger (1992) investigate import demand functions of certain food items (bovine cattle, wheat and rice) for Ghana. Cocoa export revenue variable has been used as a proxy for export earnings in the estimated import demand function (OLS) since it accounts for about two-thirds of the country's export earnings. Estimation results show that (1) Ghanaian imports of bovine cattle increases significantly when bovine import prices fall, when income rises, when domestic production deteriorates and when cocoa export revenue increases. This study indicates that (1) the deterioration of the cocoa sector also adversely affected imports of bovine cattle, (2) the rice import demand response also shows that import prices, income, and real exchange rate are statistically significant. Before 1980s, imports of rice and wheat increased due to over valued Ghanaian currency, after 1980s, rice and wheat imports did not decrease even though there was a high devaluation. The reason for this was low world prices for rice and wheat. The third result of the estimates for wheat import demand function shows that national income does not significantly influence imports of wheat.

*This study covers before- and after-reform periods. Therefore, we can not derive results related to the impact of structural adjustment program on the import demand functions. Using data after 1983 and showing that the cocoa export revenue in the import demand functions does not behave like total export earnings will prove that reforms (1) decreased the feedback effect of cocoa export on imports and (2) did help reduce the risk due to depending on revenues only from cocoa export.*

Borish, Grossman and et al (1991) conduct a study to establish a private sector strategy for Ghana. Their study includes 75 Ghanaian non traditional export (NTE) firms. The study focused on: (1) firm structure; (2) perceptions regarding the policy environment and the avenues of future growth; (3) resource constraints; and (4) the role and effectiveness of supporting institutions, especially the Ghana Export Promotion Council (GEPC). Major conclusions are as follows. (1) NTE firms, particularly those in the industrial and fish export sectors, tend to employ more people than the average Ghanaian enterprise. (2) Firm ownership tends to be local (90%), male (93%), and private (99%). Location is rarely outside Greater Accra, and, except for industrial exporters, sales are predominantly to domestic markets. (3) Though optimistic about the future, most exporters operate at relatively low capacity, and production costs are rising due to the high cost of raw materials. (4) Most NTE firms believe that government policy has had a positive effect on business and are satisfied with export procedures (except for customs). They also view the GEPC as helpful for export development, although they believe it must improve its marketing assistance programs. (5) NTE firms are generally dissatisfied with Ghana's infrastructure; freight and telecommunications services are expensive and inadequate land transport constrains exports. However, access to credit, mainly working capital, is identified as the primary constraint to expansion.

Adzobu (1992) and GOG (1993) outline main components of Trade and Investment Program (TIP) designed to stimulate greater production and marketing of private sector non-traditional exports. TIP responds to the need to both increase and diversify export growth. The three constraints having the greatest restraining impact on non-traditional export growth are : (i) the enabling environment; (ii) the present production and marketing capacity and capability of existing export firms; (iii) the limited financing available to exporters. Policy reforms to support non-traditional

export sector are expected to have some impact on (i) the forms of land tenure; (ii) land use; (iii) structures for marketing and pricing agricultural products; (iv) trade policy and the terms of trade between agriculture and industry; (v) import pricing, subsidies, quotas, tariffs, and other trade policy tools; and (vi) exchange rates.

## **6. ENVIRONMENTAL IMPACTS**

The negative impacts on the environment of policy reform to increase market efficiency and permit world market prices to prevail in the economy has emerged as a major concern in many countries. Include among these concerns are: air and water pollution generated by industry and urban developments, wastewater disposal, and the degradation of natural resources that can occur when reform out-paces the development of property rights and other social structures to ration and appropriately price resources prone to open access. In general, possible indirect environmental impacts of policy reforms might be summarized as follows: (1) switching to a flexible exchange rate regime tends to promote exports relative to imports, therefore, natural resources associated with export activities may become over exploited (e.g., cocoa and timber), while the creation of more industrial jobs will tend to have the beneficial affect of reducing population pressures on land resources, (2) agricultural intensification in the production of export crops can increase crop yields, and foreign exchange earnings, but it can also increase the possibility of the overuse of fertilizers and chemicals; resettlement programs for new areas can absorb more rural labor, diminish the migration to and population pressures on more ecologically fragile areas, (3) reduction of tariffs and special incentives (e.g., import quotas, other non-tariff barriers) can promote competition and efficiency, the adoption of less pollution-prone technologies in many industries, but it can also lead to an influx from abroad of industries with hazardous solid and affluent discharge, and (4) changes in rules and

regulations facilitate entry of foreign companies, which can increase the rate at which natural capital stocks-minerals and timber are exhausted.

In the following section we summarize the findings of other studies. The focus will be on the impacts of these policy reforms on health and morbidity, labor productivity, and resource degradation. We classify the effects of environmental transformation on human health as embodied and disembodied. Embodied effects are directly linked to individual consumption which include the unhealthy residues and contaminants on food, contaminated drinking water, unsanitary disposal of household wastes, and indoor air pollution caused by the use of wood, straw or dung that is commonly used in cooking fires. Disembodied effects come about from the total consumption and/or production of goods and services that harms individual health. Examples are ozone depletion from the consumption and production of goods and services (air conditioning, refrigeration) that use chlorofluorocarbons (CFCs), sulfur dioxide and particulate matter from the burning of fossil fuels, toxic effects of effluent discharges from industrial process that utilize heavy metals and other hazardous wastes. The reason for this distinction is that the embodied effects tend to ameliorate as development occurs, while the disembodied effects tend to worsen.

### **6.1. Resource Degradation**

In their analysis, Sarris and Shamas (1991) discuss the effects of block farming technique on the environmental degradation. Block farming is characterized by using large contiguous blocks of land. This farming technique is alleged to have two advantages over the other techniques. First, it serves as a source of employment, and second it introduces new farm technologies to other farmers. Modern and improved farming inputs such as seed, fertilizers and chemicals were distributed to farmers. However, farmers faced diminishing yields due to losses of soil fertility, and clear

felling of forest areas causes an irreversible change in soil structure and fertility. Also changing soil nutrition levels due to the overuse of fertilizers and chemicals indirectly affects the health of farmers and land productivity (World Bank, (1989, 1991b, 1992, 1992a, 1992c, 1992d, 1992, 1990a, 1990b), World Health Organization (1991), Wachter (1992), Wolfe and Behrman (1982a)). Further, in localized, highly populated districts of the more forested and transitional zones, Tabatabai (1986) notes that population pressures tend to be increasing, thus contributing to a shortening of the bush-fallow period. He points out that population growth has contributed to the overall deterioration of the quality of labor and land. As a result, environmental degradation has occurred in the forms of reduced vegetative cover, loss of soil fertility and soil erosion; both of which tend to increase the land area needed to sustain a family.

*Decreasing size of suitable land for certain kinds of crops due to environmental degradation, and agricultural reforms that make those crops more profitable will accelerate their intensive farming. Given low literacy levels among farmers in Ghana, extension services should be provided to avoid inefficient use of improved seeds, fertilizers and particularly hazardous chemicals.*

In his report, Adzobu (1993) emphasizes the importance of the incorporation of environmental considerations into the structural adjustment program. He highlights the fact that there is the need for a national environmental policy that requires sub-sectoral analysis of environmental degradation. In particular, a set of policy actions, related investments, and legal and institutional activities for an environmentally sustainable growth strategy should be identified. He also recognizes that ranking the sectors in terms of priorities for intervention and the associated costs imposed on the economy if there is no action is an indispensable step in

developing a national policy. For this purpose, he gives an approximate annual costs incurred by the Ghanaian economy as a result of environmental degradation. Some of the sub-sectors in which costs appear are agriculture (crop, grazing), forestry, tourism, hunting, property damage, health, industry, and mining. It is also suggested that land tenure system should be reviewed as a first step towards the introduction of land reform legislation. On the side of human resource development, non-formal education programs should be used to create awareness and change negative attitudes and habits.

Songsore (1992) provides analytical support for strategies to improve urban environments. Some of the problem poor households face are: inadequate and imputable water, unsanitary conditions, insect infection, uncollected garbage, food contamination, and smoky kitchen. The study emphasizes a critical need for an improved understanding of the environmental and institutional dimensions to these problems. Kingsbury (1992) discusses different policies to assure people's access to social services (health, education, and community development) as a way of mitigating these effects. The study concludes that many of the programs are really aimed at alleviating poverty and should be designed and evaluated as such.

*The reforms emphasized the importance of transportation and communication networks for the agricultural marketing process. Ghanaian feeder road construction was accelerated which impacted negatively on the environment. Any favorable change in the world prices of cocoa deteriorates the quality of environment through increasing supply of cocoa which is intensively harvested in the forest zones (Conservation Monitoring Center (1988)). Also, the industrial plantations tend to destroy the forest zone, in particular the natural forest base.*

Sub-Saharan Africa's demographic, agricultural, and environmental problems are closely linked. Key elements of this "nexus" are found in traditional crop production and livestock husbandry methods, land tenure systems and land use practices, the

responsibilities of women for rural food production and household maintenance, and traditional methods of utilizing dry land and forest resources. Traditional land use and forest exploitation practices have become direct causes of environmental degradation and resource depletion. Rapidly increasing poor rural populations degrade and mine natural resources to ensure day-to-day survival. Furthermore, continuing rapid population growth ties up scarce resources in order to meet current survival and consumption needs (World Bank (1992)) as opposed to the making of environmental and natural resource investments (e.g., through better husbandry) for future sustainability. Among many other factors affecting the environmental degradation, poor rural infrastructure, and lack of private investment in agricultural marketing and processing are felt to be important. The inappropriate price, exchange rate, and fiscal policies pursued by the government have reduced the profitability. In societies where women participate in farm production and marketing activities, the World Bank suggests that reforms to overcome the problems of agricultural stagnation and environmental degradation must be particularly oriented toward women. The bank suggests a hierarchy of measures to deal with the environmental effects of economic reform: (a) market reform, associated especially with increases in energy prices, (b) economic and industrial restructuring, (c) specific environmental policies, and (d) targeted environmental expenditures in sectors where the other measures are not effective.

Prudencio, Orkwor, and Kissiedu (1992) study how farmers' cassava variety selection criteria is affected by various environmental and socio-economic conditions. Cassava is important to counter downward cycles in farm food supplies. The characteristics of the cassava varieties depend mainly on production objectives which are mostly dictated by environmental and socio-economic conditions. Good ground storability is the main criterion used in choosing a cassava variety. This

characteristic is important to farmers in low population density areas of the humid forest zones because of the need to compete effectively with weeds. The authors classify the food security characteristics of cassava into three parts: (1) to bridge seasonal food gaps (if this is the objective, then selection criteria should follow the following order, early maturity, good ground storability, high yield, pest disease/drought resistance) and (2) to backstop food reserves (good ground storability, pest disease/drought resistance, high yield, early maturity). There are various kinds of cassava each of which has different effects on soil durability which is a serious consideration in designing environmental policies. Therefore, if our objective is to save the environmental assets, then we have to develop other selection criteria that save environmental assets. The following are some of the environmental and socio-economic factors that influence cassava variety set characteristics: (a) climate, (b) length of the hungry season, (c) environmental risk (ground storability), (d) population density (the higher the population density, the lower the age of harvest, namely, increasing early maturing), and (e) market accessibility (the higher the market accessibility, the greater the proportion of early maturing varieties, the lower the ground stability). Given these factors potential pressure on the environment, improved cassava varieties designed for especially to save environment contribute to slowing down the environmental degradation.

Sarris and Shamas (1991) emphasize the environmental implications of current cultivation practices in Ghana. For example, shifting cultivation (e.g., bush fallow) helps to decrease land degradation. Problems of environmental degradation became apparent when the bush fallow cycle is altered, either by shortening the regeneration phase or by changes in land clearing methods. Fertilizer application can alleviate the reduction in crop yields associated with reduced soil fertility from continuous cropping. The report prepared by World Bank (1990b) emphasizes the need for further

work on development of rotations suitable for savanna soils and more particularly, for use in the forest zone. Perennial crops are more able to tolerate the low fertility of many soils of the forest zone because their greater root network enables the plant to tap reserves of nutrients not available to annual crops. By stabilizing the soil surface, tree crops do much to reduce the degradation of soil's physical properties. Furthermore, the report emphasizes that a high priority must be given to completing the necessary climatic analyses to develop techniques of moisture conservation.

The ERP has revitalized agricultural production, but evidence also suggests that the program increased the exploitation of forest resources, especially for timber. The main form of the environmental degradation was the depletion of the forest resources through logging, fires, fuel wood extraction, charcoal production. Unsustainable agricultural practices have also contributed to land degradation, desertification and the loss of biological diversity. However, price liberalization is preferred to the subsidization program pursued prior to reform. Input subsidies were found to distort relative output prices and induce environmental stress through reduced production diversity ( e.g., the emphasis placed on cocoa production which accounts for two-third of total export revenue). Also, relative output subsidies tend to create incentives for a higher spatial concentration of specific crops.

Unfortunately, the linkages between market reforms that encouraged foreign investment and their affects on environmental and natural resources have not been investigated. Removal of foreign investment barriers will likely affect plant-location, and the nature and level of production with numerous environmental implications. Studies focusing on environmentally induced industrial relocation questions include those of Markusen, Morey, and Olewiler (1991), Horstmann and Markusen (1990), Tobey (1990), Walter (1982), Leonard and Duerksen (1980), and Duerksen (1983). Some find evidence supporting the view that "dirty" industries tend to move to

countries with less ridged environmental policies, while others find that environmental standards appear to be only a minor consideration in foreign investors' decisions to relocate or invest. Since reform is expected to attract foreign capital to Ghana, studies should be undertaken to help develop and guide policy that seeks to monitor, measure and evaluate the environmental affects of capital inflows.

Agricultural sector productivity can be increased through improved literacy of producers. Greater literacy also improves husbandry of environmental and natural resources. The need for both the development of environmentally safe techniques and extension services on the efficient use of these techniques is emphasized by the Bank. Findings of the World Bank (1990b) and Dapath and Oteng (1991) show that agricultural research suffers from the lack of R&D funding activities and from not taking advantage of the considerable body of information and expertise available in the Ghanaian Universities. Priorities should be given to such research activities as developing and adaptation improved planting materials and techniques for maintenance of soil fertility. The country should increase its capacity to draw upon the knowledge and expertise available at many of the International Centers organized under the CGIAR. Furthermore, the linkages between Universities and government institutions should be strengthened to enable a wide use of existing techniques by farmers. The Bank sees the linkages between research and extension workers as a vital step in efficient production, and tries to replace the present informal links by formal institutional arrangements to (i) provide research workers with information concerning the immediate needs of farmers and (ii) enable research staff to participate in the periodic training. The husbandry of soil and other natural resources should receive particular attention.

Yudelman, Coulter, Goffin, McCune, and Ocloo (1991) emphasize the importance of the resource base consisting mainly of rainfall and soils for the agricultural

productivity. The low inherent fertility of many Ghanaian soils is a major problem. Therefore farming systems and new technologies to increase soil productivity should receive particular attention. In addition to the effects of farming systems and technology on environment, inputs such as seed, fertilizers, and mechanization directly affect the quality of land. Since the fertility of many Ghanaian soils is fragile relative to heavier clay based soils in many other regions of the world, soil husbandry through the judicious use of purchased inputs, crop rotations and so on must be based upon as effective agricultural research and extension services. The "social profitability" of these services will almost surely rise as policy reforms lead to a more efficient allocation of the country's resources.

The World Bank (1992) investigates some of the key issues in the relationship between growth and environmental integrity. A key premise of this study is that growth is neither inherently bad nor inherently good for environmental quality. Issues investigated include: (a) potential for achieving an environmentally friendly growth strategy; (b) key environmental problems in Ghana and how they relate to the sectoral distribution and timing of growth; and (c) the role of supportive and mitigative policies for promoting environmental integrity. The general issue relates to the type of technology used within each sector since a high priority in any environmentally friendly growth strategy is to identify and implement environmentally appropriate technologies. As a main component of growth strategy, Ghana's trade and investment program (TIP) is not expected to have a direct significant impact on threatened or endangered species or critical habitat, but the overall objective to provide the support for a rapid expansion of non-traditional exports, is liable to have long-term impacts (positive or negative) on the natural resource base. The principal objective of TIP is to stimulate greater production and marketing of a number of non-traditional export commodities such as pineapples, salt, prawns and shrimps, furniture and other

wood products. This program indirectly impacts forestry, in particular commercial agriculture which has long-term effect on soil fertility and soil erosion due to increased cultivation of non-traditional crops for exports Adzobu (1992, 1993).

## **6.2. Environment, Health, and Productivity**

In this section, we explore the relations between the environmental degradation, human health and labor productivity by examining patterns of environmental transformation in Ghana. Since empirical evidence supports the notion that human health as a "luxury good" - for which households' demand increases in greater proportion to income growth - implies that the environmental impacts on health in Ghana will become increasingly important as policy reforms lead to higher growth in incomes. Here we address the questions of (i) the choice of the appropriate instrument that helps mitigate the impacts of the environmental degradation on human health and therefore labor productivity and (ii) how macro economic policies affect environment, health, and labor productivity.

The World Bank (1992) classifies environmental degradation in Ghana as: (i) deforestation caused by land conversion to agricultural uses, inappropriate timber harvesting policies, indiscriminate fuel wood harvesting; (ii) degradation or complete soil loss caused by over-grazing, inappropriate soil conservation practices in farming, soil contamination from industrial activity, inappropriate reclamation after open cast mining; (iii) water pollution caused by domestic and industrial wastes, domestic and municipal wastes, and agricultural wastes; and (iv) air pollution caused by the deposition of acidifying or poisonous agents such as oil refinery and cement-asbestos product plants. Among some of the common health effects of the above types of environmental degradation are

- i. illnesses due to water pollution and water scarcity;

- ii. acute and chronic health impacts of air pollution; for example, premature deaths among children and adults suffering from lung ailments that are exacerbated by high levels of suspended urban particulate matter; This includes women and children in poor rural areas that are affected by smoky indoor air pollution such as smoke and fumes from indoor use of biomass fuel (wood, straw, and dung);
- iii. diseases spread by garbage, and unsanitary disposal of wastes, and
- iv. reduced nutrition for low income farmers living on depleted soils.

These observations suggest that environmental impacts of carbon emissions that stem from the burning of biomass, industrial based air pollution, and land degradation on health are particularly deleterious since the resulting impaired health will further lower human productivity and hence income. These health-productivity effects of degradation are expected to be more pronounced in low income regions of the country where people are less well nourished. The World Development Report (1992) notes that in poor countries, diarrhea type diseases that result from contaminated water kill about 2 million children and cause about 900 million episodes of illness each year.

Not surprisingly, access to clean water and to adequate sanitation are environmental problems that tend to be partially internalized by individuals as their incomes grow. In the case of water, private benefits to supplies of potable water is high while the social costs of provision tend to be fairly low (Shafik and Bandyopadhyay 1992). Therefore, individuals are willing to spend a greater proportion of their rising incomes on securing better quality water. In fact, this difference between private benefit and social cost of provision of clean water induces individuals to internalize the quality of water they use. Nevertheless, the government involvement is required to provide water quality standards and the infrastructure needed in communities and areas of high population density.

The literature supporting environment-health linkages is fairly vast. In their study, Grossman and Krueger (1991) find that economic growth tends to alleviate air pollution problems once a country's per capita income reaches about \$4,000 to \$5,000 U.S. dollars. Shafik and Bandyopadhyay (1992) and Anderson (1992), on the other hand, find that some environmental indicators (e.g., water and sanitation) improve with rising income, while others such as particulates and sulfur oxides worsen and then improve later. However, some pollutants, such as dissolved oxygen in rivers, municipal solid wastes, and carbon emissions steadily worsen with income growth. These patterns reflect social choices about environmental quality at different income levels. They find that most environmental indicators initially deteriorate with rising incomes, with the exception of access to safe water and urban sanitation.

Recent studies of the affect of the environment on health show that the mother plays the central role. How well a mother mitigates the affects of health borne environmental factors depends strongly on her schooling. For example, Pitt and Rosenzweig (1985) find that the incidence of illness in a household is strongly associated with the average per capita consumption of nine nutrients, the source of drinking water, and the ages and levels of schooling of the husband and the wife. The same kind of analysis for Ghana important to determining the income loss due to environmental factors affecting health, and indirectly, labor productivity.

Cohen (1988) estimates the reduced form demand relation for recent child illness for 600 urban Sudanese children under five. He finds maternal schooling as well as piped water and housing as a significant factor affecting child illness. Rosenzweig and Wolpin (1982) study the joint effects of governmental health, education, and family planning programs on fertility, child mortality, and schooling. The results suggest that reductions in the costs of medical services, contraceptives and schooling, and the improvement of water quality are mutually reinforcing alternatives for implementing the

joint policy goals of reduced population growth and increased human capital formation. Thomas, Strauss, and Henriques (1990a, 1990b), Barrera (1990), Boulier and Paqueo (1988) and Rosenzweig and Schultz (1982) reach the same conclusion that the education of a mother is strongly and positively correlated with the survival rate of her children. In addition, Rosenzweig and Schultz confirm that in urban areas the availability of medical services, family planning activities, transportation infrastructure and climate, in addition to mother's education are associated with child mortality ratios and fertility within a birth cohort of mothers. Behrman and Wolfe (1987b, 1982a) also confirm that a mother's education affects positively her own and her children's health and nutrition in developing countries. In still another study, Ana and Senaur (1993) find that the health in Brazil is strongly associated with piped water, control of human wastes, electricity, and paved streets as a general indicator of infrastructure. However, controlling for these factors, they find that urbanization has a negative effect due to density of population and communicable diseases. Preschoolers are found to be healthier when household capital in the form of water and sanitation facilities represented by water filters and toilets, and refrigerators are present.

The indirect effect of environmental degradation on health also occurs by first impacting on health, which impacts on productivity, which impacts on income which in turn decreases incentives to mitigate health effects. A growing literature related to this indirect effect of the environment on health and nutrition and labor productivity includes the following studies. Strauss (1986) estimates the effect of a family's average intake of calories per adult consumer equivalent on the productivity of on-farm family labor in Sierra Leonean agriculture. He finds a link between agricultural labor productivity and calorie consumption per consumer-equivalent. Deolalikar (1988) investigates the impact of nutrition and health on the agricultural productivity of a

sample in rural south India. The results show significant effects of weight-for-height, but not calorie intake, on wages. Behrman and Deolalikar (1989) explore the labor market effects of health and nutrition in south India. They find that there are nutrient and health (weight-for-height) effects only for males.

Health and nutrition may influence the productivity of students just as it may affect labor productivity. Some of the past studies on this issue claim a significant effect of health and nutrition on schooling productivity. Moock and Leslie (1986) and Jamison (1986) are some of these studies.

A summary of this evidence suggests that higher levels of human capital are associated with higher levels of productivity and hence higher wages and well being, but there tends to be a "circular linkage," or an interaction among typical and environmental resources that impacts on the productivity of each. Access to education, the productivity of other resources (land, physical capital), and numerous environmental factors that contribute to morbidity also affect the level and productivity of human capital, which in turn affects how these resources are husband. Markets alone typically under supply: education, agricultural technologies, market information, roads and infrastructure, and environmental public goods such as sanitation and property rights to resources subject to open access (e.g., forests and other untitled lands, and various biological resources). Judicious public interventions to correct for these failures tends to yield high social returns because of the direct impact on productivity (e.g., education that increases skills and cognitive ability and hence access to higher skilled jobs), and the indirect impact on other resources through the mentioned "circular linkages."

### 6.3. Policy Instruments

In the above section, we have discussed possible health and productivity effects of resource and environmental degradation. Now, for policy makers the question is to choose the appropriate policy instrument to reduce degradation of resources and environment without decreasing productivity. Let us first introduce the policy instruments which have been developed to promote sustainable resource development and environmental integrity. These include:

- i. direct regulation (emission guidelines and fines, water quality standards and fines);
- ii. charges, taxes and subsidies (license fees, land taxes, input taxes, production or export taxes, pollution charges);
- iii. market creation (auction of leases, tradeable permits, property right reforms); and
- iv. liability instruments (strict liability laws, performance bonds, insurance), (Eskeland and Jimenez (1992), World Bank (1992), and Graham-Tomasi, Mohtadi, and Roe (1992))

All have their advantages and disadvantages. Market creation is the most efficient but it is difficult to implement. Direct regulation in a "command and control" type of context is normally the first step in developing any structure intended to improve environmental integrity. Charges, taxes and subsidies allow efficiency and feasibility considerations. Liability instruments, on the other hand, are efficient to manage environmental resources. With the nature of these policy instruments, policy makers should have enough information on the nature of environmental and resource degradation to choose the appropriate instrument. Namely, the choice of the instrument is objective-based, implying that the choice of the

instrument is a function of objectives of policy makers. For example, economic instruments can be effective tools for environmental management if Ghana promotes a high growth strategy. World Bank (1992) recommends the following economic instruments outlined in environmental action plan of Ghana for assisting in environmental protection. Land tenure reform, that brings about the reform in capital market, is recommended to avoid deforestation and land degradation. The effects of mining and industrial sectors on environment are tried to be controlled by environmental quality standards and reclamation guidelines. Water pollution and hazardous chemicals are controlled by regulations. Under a high growth scenario, the above recommendations are needed to be augmented in accordance with sectoral targets and their indirect effects on environment and resource base of Ghana. The recommended augmentations for controlling the use of forests and land, reducing air and water pollution caused by mining and industry, water pollution, hazardous chemicals are respectively collective structures, performance bonds and recycling incentives, pollution charges and tradeable permits, and recycling incentives.

In order to evaluate the indirect effects of the structural adjustment program pursued in Ghana on environment and natural resource degradation, the relationship between trade patterns and the environment needs to be made clear. It is obvious that the trade pattern will affect the resource allocation between polluting and nonpolluting industries; therefore, the nature of health problems that Ghana faces will be changing in response to the changing importance of trade and non-trade sectors in the economy. The strongest linkage between trade liberalization and the effect of the environmental degradation on health comes through with an increasing electricity demand since many pollutants, such as sulfur dioxide, nitric oxide, nitrogen dioxide, and carbon dioxide are by products of electricity production. In this respect, international trade has two implications for embodied and disembodied effects of the

## **APPENDIX II**

### **A METHODOLOGY FOR ANALYZING SUB-SECTORAL ENVIRONMENTAL IMPACTS OF ADJUSTMENT**

environmental degradation. On the one hand, it provides access to the new technology that makes new products available to domestic consumers. By this new product, one can expect a decrease in the ill health effect of indoor air pollution. On the other hand, it induces changes in the allocation of resources among potential pollution generating industries and in the technologies used to produce goods and services.

## TABLE OF CONTEXT

- 1 INTRODUCTION
- 2 BASIC CONCEPTS IN ICONIC FORMS
  2. 1. Variables Impacting Environment
  2. 2. Assessment of Sub-sectoral Environmental Impacts
- 3 DISCUSSION AND CONCLUSIONS

## 1. INTRODUCTION

The purpose of Appendix II is to introduce a systems methodology to analyze sub-sectoral environmental impacts of structural adjustment program pursued in Ghana. The general approach has been developed by Hudson (1992) and modified to economic modeling by Temel, Hudson, and Roe (1994). Because the approach is based on an interaction matrix encompassing all relevant variables and interactions, it is potentially applicable to all systems. The advantage of this approach in complementing the existing ones is that it (i) utilizes all the existing information relevant to the system under study which is commensurate with the objective, (ii) imposes no theoretical restrictions on the relations among the variables in the system, and (iii) can treat any sub-system as an individual system. This methodology therefore encompass all possible relational pathways that operate in the real system.

The key point to make in introducing this approach is that we wish to apply this modeling approach to environmental impact analysis. By using this approach, all different interaction pathways between sub-sectors whose production impacts the environment will be studied. Here, we concentrate on the description and interpretation of a structure of productive units in the Ghanaian economy to show that sub-sectoral analysis of environmental degradation, as emphasized by World Bank (1992) and Adzobu (1993), can easily be studied by utilizing the systems approach. We will identify relevant variables, interactions, the flow pathways and hence lead towards a predictive capability via model dynamics. However, we will restrict our attention in the paper to the structure of the model.

In his report, Adzobu (1993) emphasizes an urgent need for a comprehensive technique to rank the sectors in terms of priorities for intervention and the associated costs imposed on the economy if there is no action. Along the same line of concerns about sub-sectoral contributions to environmental degradation, we modify the

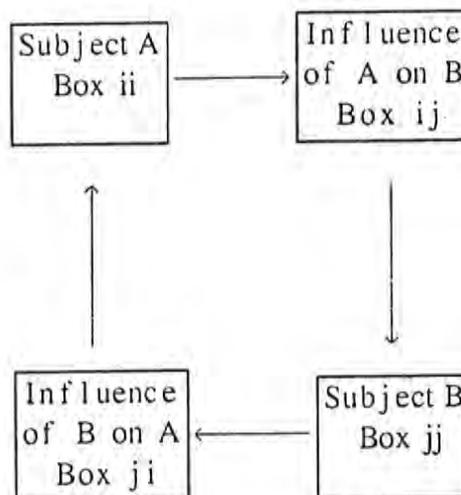
systems approach to address the issues including

- i. the determination of dominant sub-sectors which are potential sources of the environmental degradation and of income loss through the impacts of degradation on health and productivity;
- ii. the determination of cost of no action (i.e., no intervention);
- iii. developing appropriate institutional arrangements to control income loss; and
- iv. developing an environmental monitoring and auditing unit that will generate information on how sub-sectors impact the environment.

## 2. BASIC CONCEPTS IN ICONIC FORM

In order to explain how all relations among all variables in the model can be characterized, we first present the basic concepts which will be utilized in this paper. The term "iconic form" refers to the matrix icons used as presentational and functional devices. We assume a clockwise convention of interaction,

Clockwise Convention



so that the influence of, for example, A on B will be through the factors placed in the Box ij; likewise, the influence of B on A will be through the factors placed in Box ji.

### 2. 1. Variables Impacting Environment

In our sub-sectoral analysis of environmental degradation, there are mainly ten sub-sectors that influence environment directly/indirectly. These are industry (I), mining (M), energy (E), agriculture (A), land (L), ecosystem (ES), socio-economic conditions (EC), human settlement (HS), health (H), and environmental management unit (EM). We place them in the leading diagonal of Table 6 and explore the interactions among them in off-diagonal cells

|   |   |   |   |   |    |    |    |   |    |
|---|---|---|---|---|----|----|----|---|----|
| I |   |   |   |   |    |    |    |   |    |
|   | M |   |   |   |    |    |    |   |    |
|   |   | E |   |   |    |    |    |   |    |
|   |   |   | A |   |    |    |    |   |    |
|   |   |   |   | L |    |    |    |   |    |
|   |   |   |   |   | ES |    |    |   |    |
|   |   |   |   |   |    | EC |    |   |    |
|   |   |   |   |   |    |    | HS |   |    |
|   |   |   |   |   |    |    |    | H |    |
|   |   |   |   |   |    |    |    |   | EM |

The influence of, for example, "mining" on "health" will be through the factors placed in the cell A(2,9) in Table 6. Since these influences are not the same, the activity interaction matrix (Table 6) is not symmetric; the way in which mining influence health is not the same as the way in which health considerations of government influence mining activities. In Table 6 there are a total of ninety interactions. Some of these are as follows. The influence of agricultural production

activities on land cover-use-transformation will be through factors located at the cell A(4,5) in Table 6; likewise, the influence of land cover-use-transformation on agriculture will be through the factors in the cell A(5,4) in Table 6.

Having defined the variables along the leading diagonal, we now wish to specify all direct relations between each pair of variables. In the variable interaction matrix Table 6, as noted there are ninety interactions. Each cell in Table 6 indicates the binary interaction between the two corresponding leading diagonal variables. The term "binary interaction" refers to the "isolated" influence of one variable on another.

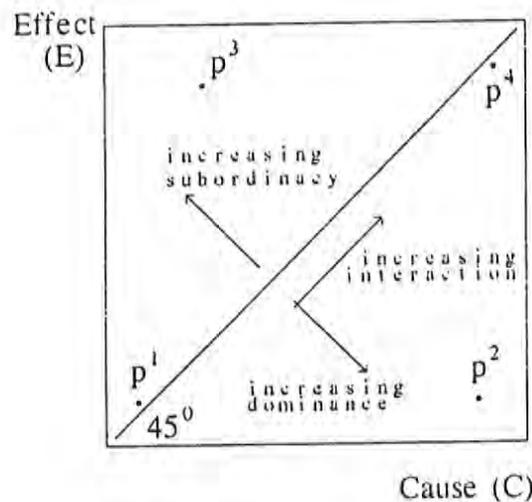
## 2. 2. Assessment of Sub-sectoral Environmental Impacts

To begin this section, we introduce further concepts used with the specific model. In particular, the significance of each variable is determined by using a cause-effect diagram that provides us with a clear illustration of relative importance of variables in the model. This diagram is crucial since it shows those variables dominating the whole system and those dominated by the system. Here is the procedure to construct a cause-effect diagram.

| I       | F(I,M) | F(I,E) | F(I,A) | F(I,L) | F(I,ES) | F(I,EC) | F(I,HS) | F(I,H) | F(I,EM) |
|---------|--------|--------|--------|--------|---------|---------|---------|--------|---------|
| F(M,I)  | M      |        |        |        |         |         |         |        |         |
| F(E,I)  |        | E      |        |        |         |         |         |        |         |
| F(A,I)  |        |        | A      |        |         |         |         |        |         |
| F(L,I)  |        |        |        | L      |         |         |         |        |         |
| F(ES,I) |        |        |        |        | ES      |         |         |        |         |
| F(EC,I) |        |        |        |        |         | EC      |         |        |         |
| F(HS,I) |        |        |        |        |         |         | HS      |        |         |
| F(H,I)  |        |        |        |        |         |         |         | H      |         |
| F(EM,I) |        |        |        |        |         |         |         |        | EM      |

To assess the structure of the model we use cause and effect co-ordinates defined as follows.  $C = \sum_{j=1}^{10} F(I,j)$  is the total effect of industry (I) on the rest of the system consisting of  $j=I,M,E,A,L,ES,EC,HS,H,EM$ . This is because of the clockwise convention, with the row elements containing the "cause" interactions. It indicates how strongly industry affects the rest of the variables in the system.  $E = \sum_{j=1}^{10} F(j,I)$  is the total effect of other variables on industry. It indicates how industry is affected by the system through the elements in the column representing the "effect" interaction.

We now plot the (C,E) co-ordinate values for a variable in a Cause-Effect diagram shown below. The diagram has four illustrative points  $P^1, \dots, P^4$  to indicate key areas of the diagram. Note that the  $45^\circ$  line indicates when the Cause=Effect.



A variable position in the  $P^1$  region implies that it is not very interactive with the rest of the variables, both cause and effect being low. A position in the region

of  $p^2$  shows that it dominates the system since its effect on other variables is much greater than other variables' influence on it (i.e.,  $C \gg E$ ). A position in the region of  $p^3$  means that it is influenced by the rest of the variables more than it influences them (i.e.,  $C \ll E$ ). A position in the region of  $p^4$  means that it is very interactive with the rest of the variables.

Since every point on the  $45^\circ$  line corresponds to  $C=E$ , this implies that a variable is plotted in this position influenced by all variables in the system as much as it influences them. The variable position represented by point  $P^4$  is the most interactive region in the system: its effect on the rest of the system is neutral (Note that when there is complete interaction, or saturation,  $C=E$ ).

So, for a general matrix structure, we plot the variables on the C-E diagram in order to provide an initial assessment of the variables' significance in the matrix structure.

### 3. DISCUSSION AND CONCLUSIONS

In this paper we have described a methodology using any number of variables and their binary interactions in order to explore the sub-sectoral sources of environmental degradation in Ghana. We also indicated how the relations can be established and the way in which the structure of each variable can be identified. In particular, we have demonstrated how a systems methodology can be applied for constructing a sound *environmental screening* of policy reforms implemented in Ghana after 1983. The emphasis has been on the generation and structure of the model itself using interaction matrices to comprehensively identify all the interactions between variables.

We can also establish an information structure which defines the *state of information* each variable is in. Thus, the location of each variable in the *Information Diagram*, which summarizes how much information is known about the "cause"

(i.e., source) and "effect" (i.e., sink) of the relevant variable, is determined. This allows us to analyze the significance of variables as a function of state of information.

The systems approach presented here has potential application for modeling all environmental process - because it formalizes, through the interaction matrix, the identification of relevant variables and associated interactions and hence the structure of any process.



