Pesticides Use and Policies in Ghana

An Economic and Institutional Analysis of Current Practice and Factors Influencing Pesticide Use

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With contributions of Irene Egyir, Gerd Fleischer

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and Factors Influencing Pesticide Use

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Preface

The study on „Pesticide Use and Policies in Ghana“ by Alfred Gerken, Jack-Vesper Suglo and Mathias Braun with contributions of Irene Egyr and Gerd Fleischer is the fifth such country study worldwide and the third in Africa. The study draws on the conceptual framework which was developed by the Pesticide Policy Project of Hannover University and has benefited form the experience of the previous studies. Like in those studies, the Ghana study not only offers a credible source of reference for crop protection issues of the country but has also advanced the methodology of conducting policy studies for the crop protection sector. This is of particular value as the University of Hannover together with the Global IPM Facility and other partners is engaged in further studies in more countries. In this way, Ghana contributes to a global public good i.e. the knowledge and understanding of how to build up consensus for advancing policy reform in one of the still most distorted sub-sectors within agriculture.

The results of the study show that the situation with pesticide in Ghana is similar to those in many other African countries: the overall level of pesticide use is low but in the areas where they are used, the picture is similar to those countries where pesticides are heavily used. Pesticide use in Ghana is concentrated on cocoa, vegetables and fruits. More often than not, in these crops pesticides are over- and misused with the known negative effects on productivity, human health and environment. While the problem is readily agreed upon by the different experts dealing with crop protection the agreement on the ways to overcome these problems is subject to debate.

Properly moderated policy workshops which base the discussion on the results of the study are a good tool to move towards consensus for selecting policy instruments.

An interesting result was derived from the stakeholder workshop in Ghana. Contrary to all of the previous studies the number of factors which experts consider to have a decreasing effect on pesticide use is as high as the number of factors which stimulate pesticide use. Despite of the many institutional factors believed to stimulate lower pesticide use it is the distortion in prices which drive pesticide use to uneconomically high levels and cause a deviation from the socially optimal pesticide use level.

Another genuine observation from the Ghana case is the perceived emphasis that the effectiveness of regulatory policies heavily depends on financial mechanisms that would allow a sufficient intensity of implementation and monitoring. These two examples illustrate the innovative potential that well-structured policy case studies can offer. It is to be hoped that the process which has been started will have enough steam to overcome the numerous bottlenecks and impediments which decorate the way towards economically sound and environmentally sustainable crop protection. The Ghana team has raised considerable hope in this direction.

Hannover, May 2001

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Special thanks also go to Mrs. Irene Egyir who collected statistical data, helped in the preparation and execution of the field survey and wrote drafts for some chapters of the study. Mr. Samuel Timpo did considerable work to support this publication. He collected statistical information, analysed the data from the field survey and helped with the editing of the material. Kwasi Koranteng helped in the revision of text. Mrs. Andrena Obeng did the data entry. To all four persons we extend our deepest thanks.

Prof. Dr. Hermann Waibel and Dr. Gerd Fleischer, both of the GTZ/University of Hannover PESTICIDE POLICY PROJECT, made this study possible through their ideas and by making the initial contacts between the partners involved in the study. We are again grateful to Gerd Fleischer for his helpful comments on earlier drafts and for his contributions in summarizing the results for this publication which is based on a more detailed report published in Ghana.

Finally, we would like to mention that financial support for this project was provided by the German Development Co-operation (GTZ). We are very grateful for this support.

Accra/Pokuase, May 2001 The Study Team

Alfred Gerken
Vesper Suglo
Mathias Braun

Executive Summary

Agriculture is the most important sector in Ghana's economy. It is expected to play a leading role in Ghana's VISION 2020 program, with a strategy for increased production on a sustainable basis. Intensification and other changes in agricultural production are likely to be accompanied by increased use of pesticides. Because of the potentially harmful effects of pesticides, their use has to be carefully regulated in order to maximize benefits and minimize the associated risks to farmers, consumers and the environment. The objective of this study is to analyze the current economic, political and institutional framework for Ghana's agriculture in general, and crop protection in particular, and to identify the major factors influencing the current level of pesticide use. Current practices in agriculture are also analyzed. Based on these objectives, recommendations are made to improve the current crop protection policy.

Over the last 17 years, economic reforms have affected developments in the agricultural sector. Examples of such reforms are price controls and monopolies for input distribution and marketing. With the exception of cocoa, markets for agricultural produce and inputs have been liberalized. The government policy aims at improving conditions for a sustainable growth of the private sector.

Subsistence production of staple crops features prominently in crop production in Ghana. Production of major crops has been increasing over the last few years, mainly as a result of extensive cultivation. The level of use of external inputs such as fertilizers, pesticides and certified seeds is generally low.

The current crop protection policy aims at increased production within the general agricultural policy framework. The measures include reduction in crop losses and improvement of quality with optimal use of pesticides. Currently, all pesticide imports are free of import duties and value added taxes (VAT). Integrated Pest Management (IPM) was adopted as a strategy for sustainable pest and disease control. However, some of the programs under IPM are yet to be implemented. Also, farmers are not motivated to adopt crop protection strategies which are in line with the principles of sustainable agriculture.

Under Act 528 (1996), the registration of pesticides and pesticide dealers, as well as pesticide import, distribution, marketing and safety have been regulated. However, due to problems with implementation, the relevant legal instruments have been largely ineffective in controlling and mitigating risks to

human health and the environment. To this end, special reference is made of the registration status of hazardous pesticides, control of pesticide residues in export crops and food for local consumption, as well as the identification and mitigation of occupational health hazards.

Within the last few years (1995 to 2000), an average of 814 tons of pesticides were imported into the country annually. Insecticides made up 70%, followed by herbicides with 14% and fungicides with 13%. Most of these imports fell within the highly and moderately hazardous categories (WHO classes IB and II). In the past, imports were mainly through bulk purchases by COCOBOD. With privatization, the share of private dealers has increased. Pesticide use by farmers has been concentrated on a few crops, namely cocoa, vegetables and fruits, and it has been observed that there are many cases of overuse and misapplication.

A field survey showed that farmers often spray pesticides on prophylactic basis due to lack of information. Handling of pesticides often does not take into consideration safety standards. About two thirds of the farmers interviewed reported health problems after pesticide application. Although the general level of pesticide use is still low in the country, cases of serious health problems have been reported, mainly by farmers, and in a few cases, by consumers. Statistics are not available on residues of pesticides in the food chain hence possible external effects cannot be easily assessed. The same goes for effects of pesticides on soil, water and the environment in general.

A workshop held for a group of experts in September 1999 revealed that the main determinants of the current levels of pesticide use are incentives in the economic and fiscal framework, inadequate information to farmers, and lack of effective coordination among various institutions. Participants held the view that indirect subsidies via tax and import duty reduction as well as preferential distribution programs will have a positive effect on the level of pesticide use. The experts agreed that effective implementation of current legislation and strict enforcement of standards for export produce would probably reduce the levels of pesticide application. Reduced application could result from adequate information for farmers on alternatives such as Integrated Pest Management.

At a follow-up workshop in November 2000 a framework for a comprehensive crop protection policy was developed through consensus. It touched mainly on effective regulation, institutional provisions, coordination and IPM extension.

After discussing results presented in the draft study, recommendations were spelt out for strengthening the pesticide regulatory bodies on a sustainable financial basis, for amending existing laws and supervising their implementation on a multi-sectoral basis, and for promoting IPM strategies to farmers in a participatory way. The responsibilities of the private sector in a properly coordinated pesticide management program were recognized (product stewardship). Present shortcomings, such as distribution of restricted pesticides and delayed registration were cited for urgent attention. Proposals for the setting up of a pesticide regulatory board and for levies on pesticides to finance regulatory activities were made for further study.

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List of Abbreviations

¢	Cedi
AEA	Agricultural Extension Agent
AgSSIP	Agricultural Services Sector Investment Program
CEPS	Customs, Excise and Preventive Service
CIC	Cocoa Input Company
CIF	cost, insurance, freight
CMC	Cocoa Marketing Company
COCOBOD	Ghana Cocoa Board
CPC	Cocoa Processing Company
CPI	Consumer Price Index
CRIG	Cocoa Research Institute of Ghana
CSD	Cocoa Services Division
CSIR	Council for Scientific and Industrial Research
CSSVD	Cocoa Swollen Shoot Virus Disease
DADO	District Agricultural Development Officer
DADU	District Agricultural Development Unit
e.g.	example given
ECOWAS	Economic Community of West African States
EIU	The Economist Intelligence Unit
EPA	Environmental Protection Agency
ERP	Economic Recovery Program
FAO	Food and Agriculture Organization of the United Nations
fob	free on board
GAEC	Ghana Atomic Energy Commission
GDP	Gross Domestic Product
GoG	Government of Ghana
GSB	Ghana Standards Board
GTZ	German Agency for Technical Co-operation
ha	hectar
ICP	Integrated Crop Protection
IMF	International Monetary Fund

IPM	Integrated Pest Management
ISSER	The Institute of Statistical, Social and Economic Research
KR2	Kennedy-Round Two Agreement
LBC	Licensed Buying Company
MEST	Ministry of Environment, Science and Technology
MLF	Ministry of Lands and Forestry
MoF	Ministry of Finance
MoFA	Ministry of Food and Agriculture
MoH	Ministry of Health
MRL	Maximum Residue Levels
NDPC	National Development and Planning Commission
NGO	Non-Governmental Organization
PBC	Produce Buying Company
PIC	Prior Informed Consent
PPMED	Policy Planning, Monitoring and Evaluation Directorate
PPRSD	Plant Protection and Regulatory Services Directorate
QCD	Quality Control Division
RADU	Regional Agricultural Development Officer
RDO	Regional Development Officer
SARI	Savannah Agricultural Research Institute
SMS	Subject Matter Specialist
sq.km	square kilometer
T&V	Training and Visit
US $	United States Dollar
VAT	Value Added Tax
WTO	World Trade Organization

1 Introduction

Agriculture is the main sector of the Ghanaian economy. According to political and social strategies, accelerated growth of the agricultural sector is necessary in boosting overall economic development. The share of agricultural products in the export earnings is high. The population is mainly in rural areas, depending to a large extent on small-scale farming. Increased growth of the sector would provide more income opportunities in the rural areas and help slow rural-urban migration.

The strategies for achieving this accelerated economic growth include creating the necessary political framework and investing mainly in infrastructure. Within the agricultural sector the objectives are to increase production on a sustainable basis, to improve storage and processing at the farm level, to organize better marketing locally and internationally, and to promote non-traditional export crops and processing of raw products in the country.

Linked to the intensification and structural changes in agricultural production is the potentially increased use of pesticides. To policy makers, the increased use of inputs like fertilizers and chemical pesticides often seems to be one of the most effective ways to increase production and food supply, since a good part of produce is lost through diseases, pests and weeds in the field and in storage. Pesticides may also improve quality of produce with proper application. However, to reach a sustainable development of the agricultural sector, it is necessary to do more than just increase input use.

Within the context of efforts to intensify agricultural production on a sustainable basis, crop protection policies play a crucial role. First, the level of crop protection is a major factor influencing quality and quantity of production. Therefore, effective policies enable farmers to apply measures which are regarded as the optimum to reach the set objectives. Secondly, policy makers have to take into consideration the current farmers' strategy of crop protection via the use of chemical pesticides that may have serious consequences for human health, the environment and the level of exports. Substantial losses of export revenues may be caused by increasingly restrictive regulations on pesticide residues in international trade. These factors make it necessary to regulate all aspects of pesticide use. A third objective of crop protection policy is to prevent or to minimize the level of pest outbreaks. For this, controls and

restrictions as well as protective measures are necessary. Effective programs for Integrated Pest Management (IPM) and bio-control measures have to be worked out.

For farmers, the profitability of intensification depends on the cost of additional pesticide use compared to the expected loss in yield or quality. Provided that the necessary information is available, farmers will reach a micro-economic optimum of pesticide use in the long term, where the profit of pesticide use is in the maximum. For the larger society on the other hand, pesticide use involves external costs that reduce the gains reached by improved agricultural production. These costs of externalities include the effects on human health and the related costs of treatment in cases of pesticide poisoning, contamination of food and water, development of resistance to pesticides and loss of bio-diversity. These side effects of pesticide use therefore involve costs which are external to the pesticide user and which have to be included in an economic analysis aimed at achieving the social optimum for pesticide use. Taking the social optimum into account means that government may have to introduce measures regulating and reducing the selection and use of pesticides in those cropping systems where there is overuse and misuse of chemical pesticides. Cropping systems which are targeted for intensification should avoid dependency on unilateral chemical pesticide use as this has been seen to create a long term burden for the agricultural sector. Problems of resistance to pesticides, secondary pest outbreaks and unsustainable production practices as a consequence of pesticide dependency should be avoided.

It can be expected that pesticide use at least in the near future remains one of the elements for intensified agricultural production. The overall objective should be a crop protection system which is based on rational and unbiased information leading to a balance of non-chemical and chemical components.

Government intervention in crop protection faces a policy dilemma. The objective of increasing agricultural production should be reconciled with an effective control of negative external effects. The availability of inputs for pest management should be improved whereas the current bias towards chemical pesticides should be counterbalanced by the introduction and promotion of alternative crop protection strategies. To define and implement a policy on this topic is a challenging task which needs a rational basis for decisions, clear concepts as well as a minimum consensus of all stakeholders. Ghana is

involved in international agreements demanding sustainability in agricultural development and natural resource use (Agenda 21).

This study intends to contribute in the effort to develop a more rational crop protection strategy which reconciles the expectations of farmers, society and government. The analysis is based on the following general hypotheses:

1. There is no comprehensive crop protection policy in place in Ghana, especially for pesticide use. Current crop protection approaches have been primarily shaped by technical expertise without taking economic arguments into proper consideration.
2. Implementation of legal instruments are currently inadequate for controlling and mitigating negative side effects of pesticides. Specific effects of pesticides, e.g. the risks to human health and the environment, have been partly taken into account by government decisions and are receiving in general the necessary attention.
3. Farmers knowledge and practices in crop protection are not sufficiently known to provide a sound basis for policy and extension planning. Handling and application of pesticides at farmers' and retailers' level are not satisfactory in terms of effectiveness, safety, the health of farmers, the prevention of side-effects on consumers and the environment.
4. The current level of pesticide use is generally low, in spite of overuse on some crops. Due to the government strategy of intensified agricultural production, it can be expected that pesticide use will increase in the near future.

Based on these hypotheses the general objective of the study is to give a comprehensive overview of the economic and institutional factors influencing crop protection in Ghana. The study

1. provides a status report comprising relevant information on pesticide use levels and its related side effects;
2. identifies and assesses the political and institutional factors influencing current levels of pesticide use from an economic point of view; and
3. makes recommendations in defining a crop protection policy taking into account the social optimum of pesticide use.

The study is part of a multi-country project on pesticide policies to evaluate government policies and to give recommendations on the removal of political and administrative barriers in the introduction and implementation of effective Integrated Pest Management policies. This study is in line with similar studies of the "Pesticide Policy Project" of the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) and the University of Hannover, Germany, as carried out in Zimbabwe, Costa Rica, Thailand and Côte d'Ivoire.

The methodology used in this study follows the framework for welfare economic analysis as presented in the ”Guidelines for Pesticide Policy Studies” (AGNE et al. 1995). Existing literature was reviewed and interviews with stakeholders were held. In order to establish information on the use of crop protection measures including pesticides at the farm level, a countrywide field survey with farmers and retailers was conducted. In total, a sample of 271 farmers, stratified along the crops grown in the country, were interviewed by the extension personnel in 1999.

Based on the situation analysis, policy reform recommendations were developed in a two-stage process. In a first step, consensus was achieved among national experts in crop protection policies, concerning the status and shortcomings of the current policy framework and the factors that influence the current level of crop protection in the country. After completion of the report, a policy workshop was held to discuss proposals for main elements of a comprehensive crop protection policy.

Chapter 2 gives an overview of the general economic and political situation in Ghana and identifies factors that affect the economic development of the agricultural sector. The current agricultural policy and its institutional framework are analyzed in Chapter 3, for purposes of identifying its possible influence on agricultural production and input use. Chapter 4 describes cropping systems, production and price developments.

In Chapter 5 the discussion focuses on crop protection policies beginning with an analysis of the policies and the institutional framework. Chapter 6 continues with the use of crop protection measures including the market for pesticides. In Chapter 7 available information on external effects of pesticide use is discussed, followed in Chapter 8 by an identification of the factors influencing the current level of pesticide use according to workshops with stakeholders. Conclusions and recommendations are given in Chapter 9.

2 Economic Performance and Contribution of the Agricultural Sector

Within the last few decades, the political and economic situation in Ghana has undergone major structural changes. These changes are reflected in the agricultural sector despite a structure of predominately small-scale farms and a high level of subsistence. This chapter identifies the macro-economic factors shaping developments within the agricultural sector and analyses the contribution of the sector to the economy.

2.1 General Economic Policy

Ghana has a wide range of natural resources including a high potential for agricultural products, forests and sizeable mineral deposits of gold, diamond, manganese and bauxite. Ghana has a population of 19 million people (1999) with an annual growth rate of 2.6% (WORLD BANK 2000). The average population density of the country is 83 people per sq.km with a range of 487 inhabitants per sq.km in the Greater Accra Region to 18.3 in the Northern Region. Nearly two-thirds of the population live in the rural areas. Within the last twenty years there has been a tendency among the youth to migrate from rural to urban areas in search of employment.

In the sixties, considerable economic expansion was attempted through forced industrialization (taking advantage of the Lake Volta and Akosombo Dam, the Volta Aluminum Company, and the Tema harbor etc.) financed mainly by revenues from cocoa and the international donor community. The side effects of industrial development were increasing poverty in rural areas and sidelining of educational needs and food production. Over the years the changing economic policies with different objectives due to the changes of government led to a crisis with high rates of inflation, poverty and the accumulation of external debts.

Since the early eighties, there has been a turn towards economic reforms. One of the main objectives was to re-organize the political and administrative framework so as to improve economic conditions. In 1983 the government launched the first Economic Recovery Program (ERP) on the advice of the World Bank and the International Monetary Fund. The reforms included more realistic and effective steps towards fiscal and monetary discipline, structural

and institutional reforms, opening up the country for foreign investors and privatization. The reform process is still going on. The introduction of ERP has evolved an economic policy which has given the agricultural sector an important role in the development process. This represents a change from one-sided support for industry and services towards a policy accepting the needs of the rural population and the country in general.

In 1995, the government launched a long-term, coordinated economic program under the title VISION 2020 aimed at moving Ghana from a low-income to a middle-income country by the year 2020. The specific objectives were to meet people's economic requirements and to improve conditions of life in all related areas. VISION 2020 is also the main basis for special programs for the agricultural sector.

The economic targets of VISION 2020 in particular seem to be very ambitious (see Table A-2.1 in the annex). For example, the Gross Domestic Product (GDP) is expected to rise from US $430 per head in 1993 to US $1,700 per head in 2020. The economic growth implies the need to develop into an industrial and service society with decreasing relative shares of agriculture and increasing shares of industry and services in the sector composition. Nevertheless, agriculture should play an important role, especially for the development of the rural areas.

The decentralization process, started in the mid-1990s, has involved a transfer of public sector tasks from the national and regional levels to the district, municipal and metropolitan levels, leading to the creation of 110 district assemblies in 10 regions as the second highest levels of political authority after the central government. Twenty-two sector departments were accordingly put under district assemblies (KORENG-AMOAKOH 1998). The pending Local Government Service Bill is expected to lead to full financial and administrative decentralization.

2.2 Development of Gross Domestic Product and External Trade

The projected growth rates of the Gross Domestic Product (GDP) as envisaged in VISION 2020 were not reached in the last six years. Table 2.1 shows GDP increases from ¢3.44 billion in 1993 to ¢4.55 billion in 1999 (at constant 1993 prices). The highest growth rate of 5.7% was achieved in 1999.

Agriculture has been and still is the most important sector of the Ghanaian economy with a share of nearly 41% of total GDP, followed by the service sector with 32% and the industrial sector with nearly 28% (see Table 2.1). With the exception of 1996 and 1998, the growth rate of the agriculture sector for the whole country has always been below the average rate.

Compared with the two other sectors the income situation of the agricultural sector can be described as under-average. Assuming that about two-third of the population lives in rural areas where there is a high dependence on agriculture, the figures of Table 2.1 indicate that the GDP per head in agriculture is far below the average for the society. While the GDP per head in agriculture reached an amount of ¢147,251 in 1999, the GDP per head for the general average was ¢239,500 (at 1993 constant prices).

Another indicator of for the income situation of the agricultural sector is the poverty index. In 1998/99, poverty was very high among food crop farmers. Among the group of food crop farmers the share of the poor is higher than that for the average of the population. Assuming a poverty line of ¢900,000 income per household per year, about 43% of the population have to be described as poor, while the share within the group of food crop farmers is 61%. About 39% of the farmers producing for export are within the poor category. This is an improvement compared to 1991/92 when about 62% of the export crop farmers were found to be poor. Food crop farmers have been found to be among the very poor. Assuming a poverty line of ¢700,000 the national average was 29% in 1998/99. About 46% of food crop farmers came under this line. Within the group of poor people about 63% are food crop farmers. On regional basis, poverty is above average in the rural areas of the Northern, Upper West and Upper East Region (GHANA STATISTICAL SERVICE 1999).

It is estimated that in 1994 about 48% of the economically active population were farmers, farm laborers or workers in related areas. While the percentage has decreased in the last two decades the total number of people in agriculture has increased from 2.6 million in 1987 to 2.9 million in 1994 due to the population growth. While in the seventies the sector played the role of supplying workforce mainly to the industrial sector, the reforms of the eighties sent a lot of people back to the countryside due to lack of job opportunities in the urban centers (NYANTENG and DAPAAH 1997).

From 1993 to 1999, Ghana increased the total annual volume of its exports from US $1,064 million to US $2,099 million through higher volumes of gold and cocoa bean exports. Still, a major problem of the Ghanaian economy is the high dependence on three main export products. Of the total 1999 export earnings, nearly 69% was derived from gold (33.9%), cocoa beans and products (26.2%) plus timber (8.3%). This situation has remained almost the same in the examined period, because the percentage shares of these three products always ranged between 70% and 86%, mainly depending on the actual world market prices for these commodities. The government's policy to promote non-traditional export products, especially in the agricultural sector is yet to make a significant impact. Only small quantities of agricultural exports are processed before leaving the country. Cocoa is mainly exported as beans. Also fruit and vegetables are mainly exported in their raw state.

Table 2.1: Development of Gross Domestic Product for Different Sectors
(in Billion Cedis at Constant 1993 Prices)

Sector	1993	1994	1995	1996	1997	1998	1999
At constant 1993 prices							
Agriculture, Forestry, Fishing	1.421,7	1.456,7	1.511,2	1.590,1	1.658,4	1.746,4	1.843,9
Industrial Production	953,7	994,5	1.035,3	1.084,4	1.153,3	1.182,3	1.256,5
Services	1.069,4	1.118,6	1.170,8	1.220,3	1.300,2	1.377,7	1.451,3
Gross Domestic Product*	3.441,3	3.569,8	3.717,3	3.894,8	4.111,9	4.306,4	4.551,7
Share of GDP in %*							
Agriculture, Forestry, Fishing	41,31	40,81	40,65	40,83	40,33	40,55	40,51
Industrial Production	27,71	27,86	27,85	27,84	28,05	27,45	27,61
Services	31,08	31,34	31,50	31,33	31,62	31,99	31,88
Real Growth Rate in %							
Agriculture, Forestry, Fishing	2,9	2,5	3,7	5,2	4,3	5,3	5,6
Industrial Production	4,3	4,3	4,1	4,7	6,4	2,5	6,3
Services	7,0	4,6	4,7	4,2	6,5	6,0	5,3
Gross Domestic Product*	5,0	3,7	4,1	4,8	5,6	4,7	5,7

* Gross Domestic Product (GDP) without imputed bank service charges and import duties.
Source: ISSER: The State of the Ghanaian Econmy. Accra, var. issues. Own Calculations.

The high dependence on raw products as exports with high fluctuations in volume due to international market developments is linked to high trade deficits. In 1999, the country had a foreign trade deficit of US $1,129 million,

nearly 53% of the export volume. Imports are also influenced by international price developments, especially oil, or dependent on Ghana's exchange rate policy.

2.3 State Budget and Key Macro-Economic Indicators

Taxes and duties are the main source of government revenue. Taxes include taxes on property, the Value Added Tax (VAT), which was re-introduced in 1998 (replacing the service tax), and taxes on income. The current rate of the Value Added Tax is 12.5%. Foodstuffs sold in their raw state, transport fares, fuel, domestic energy and some other essential goods are exempted from VAT. Since agricultural and fishing inputs are also excluded, pesticides and fertilizer are therefore free of VAT (ISSER 1999, IMF 2000).

One of the main taxes in the agricultural sector is the export tax on cocoa. In 1999 revenues from exports reached a volume of ¢259.5 billion or 7% of total government revenue after ¢377.5 billion or 11% in the year before (see Table A-2.3 in the annex). The increase in revenue accruing from export taxes from 1997 to 1998 was mainly due to higher export quantities (see Table 2.3) and higher world market prices, while the decrease from 1998 to 1999 is the result of the changing policy to support the cocoa farmers with a higher share of the fob price. It is obvious that the agricultural sector is a net contributor to the government budget. Compared to revenues from cocoa export tax, the government expenditure on the agricultural sector seems to be relatively small. In 1999 only ¢158.4 billion out of the central budget was spent to support agricultural development, which means a share of 2.7% out of the overall expenditure of ¢5,845 billion Cedis.

Ghana has a high rate of inflation. As Table A-2.4 in the annex shows, the Consumer Price Index (CPI) reached a level of 813.7 in 1999 (basis 1990 = 100) with a growth rate of 12.5% compared to the previous year. This was the lowest rate since 1993 with a peak of 74.3% in 1995. The expectations for 2000 are higher than the 1999 level because of the fast depreciation of the Cedi. The Food Price Index reached a level of 575.9 in 1999 with a growth rate of 8.7%. With the exception of 1998, the growth rates have always been lower than those of the Consumer Price Index. Consequently food prices did not increase as much as the prices of other consumer goods.

Over the years, the Bank of Ghana has pursued a high interest rate policy to fight inflation (see Table A-2.4 in the annex). Interest rates have not been very responsive to changes in inflation rates, but have tended to be constant over longer periods. The lending rates for agricultural credits were often below the Central Bank rates, yet still much higher than the changes in food prices. In 1999 the net lending rate for agriculture (nominal lending rate minus increase in food prices) reached a level of nearly 19% on the average (ISSER 2000).

Linked to the rates of inflation are the exchange rates of the Cedi to the major foreign currencies. At the end of 1999, the exchange rate to the US Dollar reached ¢3,400 to US $1, which means a depreciation of nearly 45% compared to the end of 1998 (EIU 1999b). Over the last seven years, the Cedi has lost nearly 80% of its value against the US Dollar (see Table A-2.4).

In 1999 the amount of foreign credits totaled US $6,189 million, with a total debt service of US $584.9 million. The ratio of total external debts to GDP decreased over the period from 1994 to 1999, which means that the government pursued a careful policy in taking credits. Nevertheless, in 1999 nearly 28% of export earnings had to be spent on servicing debts. On the other hand, in 1998, Ghana received US $698 million as bilateral and multilateral assistance. These financial transfers were either incorporated in the central budget or were used for assistance to certain ministries and government projects.

2.4 Contribution of the Agricultural Sector to the Economy

Within the agricultural sector, traditional crops and livestock production play the leading role in monetary terms (see Table 2.2). The share of crops and livestock is more than two-thirds of the sector GDP, followed by fishing, forestry and cocoa. There are no clear statistics on further division of crop and livestock production. However, it can be assumed that the share of livestock in the sector GDP is less than 10% (MoFA 1997). Crop production including cocoa has a share of more than three quarters of sector GDP.

Growth rates of the agricultural sub-sectors as shown in Table 2.2 fluctuate considerably. For cocoa and forestry, this is mainly due to changes in international market prices. Growth rates for crop/livestock have been more dependent on natural conditions in the respective years and the sub-sector has a stable but low growth rate as compared to other sub-sectors.

Table 2.2: Development of Gross Domestic Product for Agricultural Subsectors (in Billion Cedis at 1993 Constant Prices and Percent)

	1993	1994	1995	1996	1997	1998	1999
At constant 1993 prices							
Crop and livestock	991,8	1.003,0	1.038,4	1.103,5	1.132,7	1.168,9	1.221,5
Cocoa	108,2	121,3	134,7	138,6	151,5	168,3	181,6
Forestry and logging	103,7	109,6	111,8	114,8	139,5	170,3	195,9
Fishing	218,0	222,8	226,3	233,2	234,7	238,9	244,9
Total agriculture	1.421,7	1.456,7	1.511,2	1.590,1	1.658,4	1.746,4	1.843,9
Real Growth Rates in %							
Crop and livestock	3,02	1,13	3,53	6,27	2,65	3,20	4,50
Cocoa	0,08	12,11	11,05	2,90	9,31	11,09	7,90
Forestry and logging	1,19	5,69	2,01	2,68	21,52	22,08	15,03
Fishing	2,42	2,20	1,57	3,05	0,64	1,79	2,51
Total agriculture	2,91	2,46	3,74	5,22	4,30	5,31	5,58

Source: ISSER: The State of the Ghanaian Economy. Accra, var. issues. and Own Claculations.

Cocoa is by far the most important export crop. Within the last six years (see Table 2.3), on the average it has been exported in quantities of 280,000 tons of raw beans plus 33,000 tons in the processed form which represents an export volume of nearly US $440 million per year on average. Nearly 93% of the gross production of cocoa is exported either as beans or in a processed form. There are no figures of quantities marketed either through COCOBOD or through the registered private companies. Smaller quantities may be exported illegally via neighboring countries, especially if world market prices are favorable and there are high export taxes at the same time. Ghana's export of cocoa and cocoa products contributed about 15% to the total world export in 1999. That placed the country in the second position after Côte d'Ivoire (ISSER 2000).

Between 1993 and 1999 export quantities of the main non-traditional crops increased (Table 2.3). In 1999 the volume reached US $51.2 million or 2.4% of the total export volume. The leading crops here were pineapple (US $13.1 million) cotton seeds/lint (US $9.66 million), and yam (US $6.5 million).

Table 2.3: Export Quantities of Selected Crops

Commodity	1993	1994	1995	1996	1997	1998	1999
Traditional Export Crops (In '000 Metric Tons)							
Cocoa beans*	273.2	261.1	262.7	330.6	253.3	314.6	346.8
Cocoa products	22.8	14.1	13.7	45.4	53.3	48.4	35.3
Coffee*	2.5	2.8	5.6	2.1	0.5	9.4	n.a.
Non-traditional Export Crops (In Metric Tons)							
Pineapple	13,156.0	14,954.0	15,764.0	27,602.0	25,124.0	21,941.0	23,440.0
Cashew	n.a.	600.0	289.0	541.3	3,572.0	1,822.0	5,572.0
Cola nut	9,972.0	9,089.0	9,924.0	9,924.0	7,674.0	5,752.0	9,344.0
Yam/Cocoyam	3,574.0	5,323.0	6,866.0	8,086.0	7,018.0	7,532.0	9,869.0
Vegetables	834.0	1,449.0	2,142.0	5,344.0	3,706.0	3,857.0	4,574.0
Pawpaw	17.5	20.0	n.a.	949.0	1,440.0	937.0	1,780.0
Mango**	28.5	9.2	26.1	43.5	80.6	136.6	167.0
Banana***	46.8	583.0	1,855.8	3,295.4	4,531.0	2,825.0	3,383.0
Cotton****	9,763.0	14,107.0	5,535.0	5,725.0	6,674.0	4,396.0	17,699.0

n.a. not available
* Quantities are quoted for the second year of the respective crop year.
** Include figures for Avocadoes.
*** Includes figures for plantain.
**** 1995, 1996 and 1997 figures indicate values for cotton seed and cotton waste.
Source: COCOBOD (1999)
Ghana Export Promotion Council (1999)
ISSER (var. issues)

In 1998, Ghana imported 353,000 tons of cereals comprising about 262,000 tons of wheat and 91,000 tons of rice. Market experts calculated the gross imports of rice at about 250,000 tons, including quantities in transit to neighboring countries. Recorded imports reached nearly one-third of the local production in this year. Wheat is not produced at all in the country. The market volume for sugar is estimated at about 150,000 tons, all imported. Of lesser importance are imports of livestock products. They consist mainly of chicken, other poultry and milk products (MoFA 1999).

2.5 Conclusions

Beginning in the 1980s, reforms through liberalization and decentralization have changed the general economic framework to the advantage of agriculture, the main sector of the economy. Considering the high potential, there is every indication that agricultural intensification can take place.

The agricultural sector is a major contributor to the government budget and export earnings. However, government budget on agriculture is inadequate to give much direct encouragement for intensifying agricultural production. Since actual agricultural development has not been as expected, comparatively high targets were set within the VISION 2020 program. There might be the danger of a one-sided promotion of dependency on high levels of inputs, as a main element of a short-term strategy for increased production instead of pursuing a long-term sustainable growth strategy.

The current high rates of inflation and high interest rates are disincentives for economic activity in general. This situation has affected the use of imported inputs like pesticides. However, agriculture is in a relatively good position compared to other sectors due to its low dependence on external inputs.

3 Agricultural Policy and Institutional Framework

This chapter begins with a presentation of the current agricultural policy, followed by the different programs to accelerate the development of the sector. The institutions dealing with agriculture including extension services provide the topic for section 3.3. Because of its special role within the agricultural sector, cocoa policy and institutions will be presented separately in section 3.4. Conclusions are drawn based on the role of policy in the development of the sector in general and in production and input use in particular.

3.1 Current Agricultural Policy

Ghana's agricultural policy is based on five main objectives. The predominant goals are (1) to ensure food security and adequate nutrition for all the people in the country, (2) to promote the supply of raw materials and inputs to other sectors of the economy and (3) to contribute to export earnings (MoFA 1998). These goals were defined in the early days of independence and have not been changed substantially. Furthermore, agricultural development aims at (4) increasing employment opportunities and income for the rural population and (5) generating resources for general economic development (NYANTENG, DAPAAH 1997).

From independence until the seventies however, subsequent governments gave priority to industrialization, which placed the agricultural sector at a disadvantage through high direct and indirect taxation (especially on cocoa and other export crops). Other factors included under pricing of agricultural produce to the advantage of the urban population, concentration of infrastructure in the cities and a strict governmental control of marketing, storage, processing and distribution of agricultural produce and inputs. As a result production did not increase and productivity remained low (NURAH 1998). Food self-sufficiency ratios declined from 83% (1964-66 average) to 62% in 1982 (NYANTENG 1994).

Since 1983, a fundamental change of government policy for the agricultural sector was introduced. The policy package included, besides the macro-economic stabilization, price reform and market liberalization for agricultural products and inputs. The reforms aimed at the reduction of government expenditures and opening avenues for producer price increases depending on

the market situation and competition. Currently, there are no government price interventions in agricultural markets, with the exception of cocoa.

The proposed measures were implemented, however with different results. Tariffs on agricultural produce seem to be low, and local rice producers, for example, face stiff competition through imports of rice. The reforms have affected the supply and availability of pesticides, fertilizer and certified seeds substantially. Under the old regime these inputs were in principle subsidized, but in practice they were either not available or not supplied in the required specifications. After the reforms, private dealers were able to organize a countrywide distribution system that made fertilizer, seeds and pesticides available to farmers.

Internal Market Policy

Internal agricultural markets are free from direct state intervention except framework regulations. The state-owned produce buying companies which in the past acted as monopolists, for example for cotton, tobacco and food crops, are still active on the market, but are now in competition with other private companies. Some foreign companies started marketing of mainly industrial crops like cotton, tobacco and rubber in competition with the former state companies. In some cases technical processing facilities have been privatized and new companies have been established. In the case of food crops, most of the trade and processing activities are now in the hands of small-scale local traders. The share of the Ghana Food Distribution Corporation is estimated at about 5% of the food marketed in the country (NURAH 1998).

Trade Policy

The customs tariff of Ghana is based on the international Harmonized System with four levels of levies: 0%, 5%, 10% and 25% ad valorem on most imported goods. Furthermore, import tariffs are regulated for members of the World Trade Organization (WTO). There are no quantitative restrictions on imports and exports. In addition to import duties, customs authorities charge processing fees depending on the value of imports.

Import duties on food items are charged depending on the state of processing, with unprocessed goods generally free of duties. Tractors and other agricultural machinery, fertilizer and pesticides in general and food items

coming from other ECOWAS countries are exempted from import duties. There are no restrictions on the exchange of foreign currencies and Cedis.

Public Support

There has been a steady increase in public expenditures to the agricultural sector. Between 1995 and 1997, actual expenditures based on 1995 prices rose from ¢94 billion to ¢113 billion, an increase of 20%. The Ministry of Food and Agriculture spent the largest share (about 84% of the total amount), followed by COCOBOD, Ministry of Lands and Forestry (MLF), the Council for Scientific and Industrial Research (CSIR) and the Cocoa Research Institute of Ghana (CRIG). On the average, in 1995, all public expenditures for the agricultural sector were financed at a share of 34% by international donors.

Extension services and crop production are the priority areas for funding within the total expenditures for the agricultural sector. They receive 22% and 20% respectively of the budget (1995-1997 average), followed by administration/planning with 19%.

Since the beginning of the 90s, the Ghanaian government has launched a series of agricultural development programs. The main objective was to support a market-led growth in agriculture with the private sector investing in production and processing facilities and equipment. Despite some improvement in growth in the mid-1990s, the rate of agricultural growth and rural transformation did not meet expectations. This was mainly due to unfavorable macro-economic conditions, e.g. large increases in government deficit pulled resources away from the private sector. Also the high rate of inflation and high interest rates discouraged private sector investment and eroded the purchasing power of consumers.

VISION 2020 foresees an annual growth rate of GDP of 6% for the agricultural sector. Sub-programs include measures for improving access to markets, facilitating access to agricultural technology and rural finance, providing rural infrastructure and utilities, and building institutional capacity.

Increase in crop production is to be achieved through both increased acreage and intensification. The possibilities for area expansion are limited due to land tenure systems and concerns for the environment. However, only 38% of the potential agricultural area is currently under cultivation leaving room for the proposed expansion of acreage. Higher yields are supposed to be achieved

with irrigation, access to improved seeds and chemical inputs like fertilizer and pesticides.

Besides increased domestic demand, the strategy assumes high growth rates for agricultural exports including traditional export crops like cocoa as well as non-traditional products such as fruits, roots and tubers and vegetables.

3.2 Institutional Framework and Decentralization

3.2.1 Institutions of the Agricultural Sector

Responsibilities for matters concerning agriculture and the related areas have been shared out among the Ministry of Food and Agriculture (MoFA) and four other ministries, namely the Ministry of Lands and Forestry (MLF), the Ministry of Finance (MoF), the Ministry of Environment, Science and Technology (MEST) and the Ministry of Health (MoH). Smaller tasks have been assigned to the Ministry of Trade.

All aspects of land tenure and land distribution are the responsibility of the MLF. The MoF still supervises the Ghana Cocoa Board (COCOBOD), including the responsibility for all issues concerning cocoa and coffee (see Chapter 3.3 for details).

MEST participates in all policy and administrative decisions where environmental matters are concerned. Furthermore, under the supervision of MEST are two agencies which play an important role in the agricultural sector. These are Council for Scientific and Industrial Research (CSIR) and the Environmental Protection Agency (EPA). Most of the state or project financed agricultural research is carried out or coordinated by CSIR. The EPA is the national authority for all aspects of control and registration of chemicals, including pesticides. The Ministry of Health is involved in food and drugs control which includes monitoring of chemical residues in food, including pesticides. Export promotion including agricultural products falls under the Ministry of Trade.

Cooperation between the different ministries is currently organized on a day-to-day basis. The leading ministry for one particular project invites the others for participation, but generally there are no formal written agreements. The only exception so far is the Pesticide Technical Committee established under the Act 528 (1996, see Chapter 5). In this case, an agreement has been

signed between MoFA/PPRSD and EPA for a close co-operation on pesticide management.

Ministry of Food and Agriculture (MoFA)

MoFA is the leading body for the formulation of national agricultural policies as well as for planning, implementation, monitoring and evaluation of agricultural development projects. Additionally, MoFA advises the government on laws required to regulate agricultural activities. These include laws on agriculture-related industries and protection of farmers, consumers and the environment as far as agricultural production is affected. Besides these policy advisory functions, MoFA has to provide for the agricultural sector, services that cannot be delivered by the private sector.

In response to the decentralization process, MoFA has undergone drastic changes in organizational structure within the past few years (MoFA 1999a). The re-organized ministry now has four main directorates and eight technical directorates, including a Plant Protection and Regulatory Services Directorate.

The Government's decentralization policy transferred responsibilities including service provision and administrative tasks to District Assemblies. The central government and the ministries are the leading bodies for policy and program planning, monitoring and evaluation, while the District Assemblies and their district administrations are responsible for implementation of policies and programs and provision of services. The regions are responsible for coordination and monitoring of district activities in their areas.

The decentralization of MoFA tasks was implemented in October, 1997. For purposes of program and project implementation, Regional and District Agricultural Development Units (RADUs, DADUs) have been established. The 10 RADUs coordinate and monitor, while the 110 DADUs implement and manage projects and programs. District Agricultural Advisory Committees which are usually part of the District Assemblies, participate in the preparation of five-year development plans for the districts.

3.2.2 Agricultural Extension Services, Research and Education

Agricultural Extension Services

Apart from the Cocoa Services Division which is for the cocoa growing areas, MoFA is the only provider of extension services on a country-wide basis. Currently, extension services are offered free of charge to the farmers. Many NGOs work with MoFA extension staff. Some produce organizations, buyers and processing companies provide limited extension services for particular crops (e.g. cocoa, cotton and oil palm). Costs of services are deducted from payments for the produce (MoFA 2000).

In line with the decentralization policy, extension services are unified, which means that at the district level there are no specialized extension agents. At that level, the key person for extension services is the Agricultural Extension Agent (AEA) who works under the supervision and coordination of the District Director for Agriculture and the District Agricultural Development Officer (DADO). The responsibilities of the AEA include development of work programs and monitoring of extension work. The AEA works directly with the farmer in the field. In some districts, Field Extension Supervisors have been appointed to support both the DADOs and the AEAs to fulfill their tasks.

Technical support for extension agents is mainly through Subject Matter Specialists (SMS). The Regional Development Officer (RDO) and SMS represent the technical directorates of MoFA. The extension services of MoFA are currently working with a modified Training and Visit System (T&V). This means that farmers or groups of farmers are visited on a regular basis by AEAs. The contents of the extension work are defined at the district level. Previously available programs have not been changed so far, although the fieldwork is supposed to be done as unified extension services. The system of T&V came to a standstill in 1999 due to lack of financial resources.

The total number of AEAs is about 2,500, excluding Field Supervisors plus about 140 SMS at the regional level (ATENGDEM 1999). Currently the calculated extensionist-farmer ratio is about 1 to 2,370 farmers per AEA. The government is working towards an extensionist-farmer ratio of about 1 to 500 (NYANTENG and DAPAAH 1997).

Agricultural Research

Agricultural research has in recent years had increased funding from 0.8% to 1% of the agricultural Gross Domestic Product. The Crop Research and the Savannah Agricultural Research Institutes of CSIR mainly conduct public agricultural research in Ghana for the southern and northern sectors respectively. The Cocoa Research Institute of Ghana (CRIG) has been mandated to carry out research into cocoa, coffee, and sheanut. However, there has been a lack of coordination among various research institutes, universities, MoFA and other organizations conducting agricultural research and extension in the country. Consequently, research and extension have not been prioritized in line with national objectives, leading to overlaps and duplication of efforts as well as under-utilization of scarce resources, particularly with regard to research expertise at the universities.

Under a national agricultural research project, efforts were made to improve upon the institutional arrangements that govern agricultural research, to ensure that research priorities reflect national agricultural development objectives, that research would be made responsive to the constraints experienced by farmers, and that research results would be available for dissemination to farmers. Different programs for particular crops were set up.

CUDJOE (1998) found 28 researchers working in the different organizations on crop protection topics. The published output as recommendations is low. For 11 food crops he found 14 key publications and 19 international publications with relevant crop protection recommendations.

Agricultural Education

Agricultural education on a formal basis takes place at three different levels (ATENGDEM 1999). In some senior secondary schools of the country, it is possible to study agriculture as a starting point for further training at college or university level. There are currently six colleges offering courses in agriculture as a combination of academic and practical work. Until recently, the colleges trained mainly technical officers for MoFA and other government bodies. Guaranteed employment of graduates by MoFA has been changed to contracts based on quotas. On completion of studies, graduates are now able to continue at the universities or to work in private enterprises. Training includes the whole range of agricultural topics, including economics and extension with no specialization. In 1998, about 120 students graduated from

the five colleges under MoFA (ATENGDEM 1999). The certificate in general agriculture is the basic qualification for Agricultural Extension Agents (AEAs) in MoFA's extension service. One of the colleges, Bunso Cocoa College, is under the management of COCOBOD and is for the training of extension agents for cocoa production. Another function of the college is to give vocational training to farmers. Specialized farm institutes (e.g. Wenchi, Asuansi) train farmers.

Four universities[1] offer formal academic education in agriculture at different academic levels (BSc, MSc, MPhil, and PhD in agriculture). Academic degrees at universities (BSc and above) are a pre-requisite for DADOs or SMSs.

Besides formal education and training, some NGOs, churches and public institutions offer limited non-formal training to farmers mainly on an ad hoc basis, as vocational training.

3.3 Policy on the Cocoa Sector

Cocoa is one of the main sources of government revenue due to the export tax levied on it. This has led to a policy for this particular crop separated in contents and in institutional structures from what has been described so far.

3.3.1 Price and Trade Policy

External marketing is within the monopoly of a state-owned marketing board, allowing the export tax to be collected easily. For cocoa sold on the local market, a local duty is charged based on the same principles as the export tax (IMF 2000).

The rationale behind the taxation on cocoa was a stabilization of producers' revenues. Positive differences between international and pre-fixed producer prices were put in a reserve fund to compensate for negative differences in some years. From 1950 to 1955, the average producer price reached 168% of international prices due to the compensations paid from COCOBOD savings (IMF 1996). The situation changed after Ghana's independence. Since the end of the fifties, export taxes have become a major source of government revenue. Producer prices have always been far below world market levels.

Cocoa export taxation has however had a negative effect on the economy. In some periods, the actual producer prices were lower than the break-even point of long-term planting costs. The result was that neither new plantings were

[1] University of Ghana, Legon; Kwame Nkrumah University of Science and Technology, Kumasi; University of Cape Coast, Cape Coast, and University of Development Studies, Tamale.

done nor old trees maintained, causing a dramatic decrease in production as happened in the sixties and seventies. In periods of high taxation, significant quantities of cocoa were smuggled to neighboring countries offering higher producer prices. A third negative consequence of export taxation was the disturbance of income distribution within the agricultural sector. Cocoa farmers in the higher income classes lost more per person, because their share of cocoa revenues was higher than average. However, farmers with lower incomes lost more as a group in absolute terms due to their bigger numbers.

Due to better price incentives with lower rates of tax and a re-organization of COCOBOD, the negative trend was reversed in the eighties. Meanwhile, production is slowly but steadily increasing (see Table A-4.5).

Currently, the producer price is fixed in absolute terms based on a defined percentage of the expected free-on-board (fob) world market price and exchange rate. The remaining revenues are used for operation costs of COCOBOD and as contribution to the government budget. In cases where actual received world market prices are above the expected level, additional revenues are shared between producers and government until the defined share is reached. In cases where the world market price is below the forecast, the fixed producer price is not changed resulting in decreased government revenues (IMF 1996).

Table 3.1 shows the actual export taxes, producer shares and shares of marketing costs between the 1989/90 and 1998/99 cropping seasons. Shares are calculated from COCOBOD activities, which means that the export tax is shown as a percentage of total revenues. Export taxes varied between 14.5% and 46% in the examined period. While COCOBOD tried to keep the percentage of producers' proceeds relatively constant, shares of export taxes have varied considerably. Since 1994/95, all profits have been handed to government, which means that COCOBOD has not been able to build up reserve funds. Since the 1994/95 season, the percentage received by farmers has steadily increased from 44.6% to 58.2%. This is the result of the change in pricing policy with decreasing tax rates at the same time.

The marketing costs include payments to Licensed Buying Agents, freight, finance costs, general administration and other costs. These are expenditures for produce inspection, construction of feeder roads, research and subsidies for insecticides and spraying equipment. The amount spent on this broad area ranged from 2.3% to 27.4% of total revenues in the examined period (IMF 1996).

Table 3.1: Actual Export Taxes for Cocoa Calculated from COCOBOD Activities (Cocoa Division)

(in million Cedis and percent)

	Crop Year (1)									
Activity	**1989/90**	**1990/91**	**1991/92**	**1992/93**	**1993/94**	**1994/95**	**1995/96**	**1996/97**	**1997/98**	**1998/99 (Budget)**
Total revenues (2)	116.882	134.560	141.983	168.302	267.240	460.432	793.990	873.325	1.396.265	1.414.030
Total costs of activities	84.105	105.600	109.848	138.034	147.451	306.410	523.990	607.393	1.006.062	1.127.686
Thereof paid to producers	52.000	64.714	62.034	67.915	86.784	205.500	372.666	399.963	711.000	822.818
Thereof "other costs" (3)	12.124	10.917	11.314	46.009	19.521	26.167	18.570	62.366	96.720	54.713
Profits before taxes	32.777	28.960	32.135	30.268	119.709	154.022	270.000	265.932	390.203	286.344
Taxes paid	17.609	31.552	20.610	36.703	122.999	154.022	270.000	265.932	390.487	286.344
Profits after taxes	15.168	-2.592	11.525	-6.435	-3.290	0	0	0	-284	0
Export tax (%) (4)	15,07	23,45	14,52	21,81	46,03	33,45	34,01	30,45	27,97	20,25
Producers proceed (%) (5)	44,49	48,09	43,69	40,35	32,47	44,63	46,94	45,80	50,92	58,19
Marketing costs (%) (6)	27,47	30,38	33,68	41,66	22,70	21,92	19,06	23,75	21,13	21,56

(1) Crop Year: October 1 to September 30.
(2) Export of beans, local deliveries, other revenues.
(3) "Other costs" include produce inspection, research, construction of feeder roads and subsidies for insecticides and spraying.
(4) Export tax = taxes paid as share of revenues.
(5) Producer proceed = payments to producers as share of revenues.
(6) Marketing costs = total costs minus payments to producers as share of revenues.
Source: IMF: Ghana - Selected Issues and Statistical Annex. Washington, var. issues; Own Calculations.

Expenditures reached a peak in 1992/93, the year before COCOBOD started selling insecticides and fungicides in quantities much bigger than before (1993/94 to 1995/96, see Table 6.5). Another sizeable amount was spent on "other costs" in 1996/97. According to import statistics (see Table 6.4), in that crop year, COCOBOD imported 1,864 tons of pesticides which were in January 1997 transferred to the Cocoa Inputs Company.

With the introduction of the Ghana Cocoa Sector Development Strategy several measures involving both changes in policy and institutional reforms, have been put in place to increase production (MoF 1998). The monopoly of COCOBOD as the only authorized body for export of cocoa will remain the same in the medium term as well as the policy of pre-fixing producer prices as share of the expected fob export price.

To offer price incentives for producers, the share of producers from the cocoa fob price will be increased by 2% per year, starting with at least 56% in the 1998/99 season going up to 70% by 2004/05. With rates of 70% of fob price, the Ghanaian producer’s proceeds will be at par with those of neighboring countries, especially Côte d'Ivoire. It is expected that this will discourage smuggling. The ex-post adjustments to farmers in case of actual world market prices being higher than expected will remain. The estimated increase in production from the current 400 thousand tons to 500 thousand tons per year by 2004/05 will ensure that absolute payments of export taxes will also increase despite the lower rates. The same will apply to COCOBOD's available funds for its own activities. It is expected that cocoa production will reach a level of 700 thousand tons by 2009/10 (MoF 1998).

Price elasticities for cocoa are estimated between 0.22 and 0.62 in the short and long term (IMF 1996). This means that in the short term for example, one percent increase in producer price will lead to 0.22% increase in production. The short term elasticity represents higher production through intensification, with higher fertilizer and pesticide use. The long-term elasticity involves intensification of existing plantations, investments for re-planting of old plantations and establishing of new ones. The estimates on elasticities show that the main share of the expected production increase will come from increased acreage.

3.3.2 COCOBOD and its Branches

The focal point of cocoa activities is the Ghana Cocoa Board (COCOBOD). COCOBOD activities cover almost all aspects of cocoa growing in Ghana, i.e. input supply, extension, quality control, internal and external marketing as well as research. By law, the organization acts as a monopolist, with only a few exceptions. Besides production, no private firms or organizations are allowed to engage themselves in cocoa.

COCOBOD is divided into several branches which cover the following activities (MoF 1998, MoFA undated, GoG 1999):

- The Cocoa Marketing Company (CMC) is responsible for external marketing of cocoa. The CMC exclusively buys cocoa for export at fixed prices from the Produce Buying Company and other registered private dealers.
- The Cocoa Processing Company (CPC) and West African Mills Company (WAMCO) process cocoa with a yearly output of about 84,000 tons using three plants.
- The Produce Buying Company (PBC) does the internal marketing of cocoa. The internal marketing of cocoa was liberalized in 1993. Since then about 19 companies (Licensed Buying Companies, LBCs) have been buying cocoa on the internal market. For the 1997/98 season the share of PBC in marketing was estimated at 69%. Currently, PBC is under privatization. About 20% of the ownership will remain with the government, while another 20% will be offered on preferential conditions to cocoa farmers (GoG 1999).
- The Cocoa Research Institute of Ghana (CRIG) is responsible for research for purposes of improving production techniques, storage and processing. CRIG is also responsible for testing and certification of pesticides for cocoa production. The institute, in addition, conducts research into coffee, cola and sheanut. CRIG gets a budget at the equivalent of about 0.8% on average of the fob cocoa export value through COCOBOD, amounting to nearly US $5 million per year. The institute has about 1,000 staff members. It has been proposed that CRIG remains under COCOBOD and that the financing of research activities should be changed to a levy system of 1% on fob export volume to ensure a sustainable and long-term program.
- The Quality Control Division (QCD) is responsible for quality control and grading as well as residue analysis.

- The Cocoa Services Division (CSD) is responsible for four principal tasks within COCOBOD: (a) cocoa and to a lesser extent coffee extension activities in the field, (b) eradication of trees infected with the Cocoa Swollen Shoot Virus Disease (CSSVD) and replanting programs, (c) establishment of improved hybrid seed gardens and supply of seeds to farmers for planting and (d) joint CRIG/CSD field research activities.

3.3.3 The Cocoa Services Division and Pesticide Use

Organisation of Extension Services

CSD operates in all cocoa growing areas in line with the administrative set-up of the regions and districts. This means that currently six regional offices and altogether 39 district offices offer extension services. Three Deputy Regional Managers are responsible for CSD programs involving extension, agronomy and CSSVD-control. They work under the supervision of their respective Regional Managers (PLAN CONSULT 1995).

At the district level, the organization of CSD is similar to that at the regional level. The organization of extension services is based on the 1979 survey of cocoa growing areas. These areas have been divided into sub-units of 1,200 ha each for one Extension Field Assistant who is the first contact person for farmers for extension and input supply. In 1998, 1,315 Field Assistants worked for CSD. Due to the decreasing growing area for cocoa since 1979, the actual area to be covered by one assistant is now between 500 and 600 ha. Currently about 350,000 farmers are registered with the CSD and the average field assistant-farmer ratio is 1 to 267 (FIADJOE and AMEGASHIE 1998).

About 230 senior officers work on extension at the District and Regional Offices. Furthermore, CSD employs about 8,000 laborers mainly for re-planting programs against CSSVD, nursery of cocoa trees and other technical tasks.

There are long term plans to unify the extension services of MoFA and COCOBOD. Currently, there are joint pilot projects involving the extension services sections of the two bodies.

Recommendations by CSD for Plant Protection

CSD extension services have adopted the Training and Visit approach (T&V) with group meetings, advice to single (expert) farmers and a standard schedule of training. This approach is supposed to provide the farmers with advice on a regular basis. All registered cocoa farmers are required to participate in this program. Extensionists receive regular in-service training on topics they are supposed to impart according to their schedule. This training is organized by the District Extension Officers, specialists and researchers of CRIG. The extensionists usually have a specific agricultural education which centers on cocoa. So far, CSD staff members give only production advice. They do not cover the economic aspects of cocoa production.

A calendar of operation which states the technical contents of the advice is supplied to field assistants. In addition, a monthly calendar is given to the field staff. Topics cover the entire technical aspects of cocoa production, covering selection of new farm sites, planting materials, techniques of planting, shading, control of diseases and pests, harvesting, fermentation, drying and general farm maintenance.

With regard to plant protection, the recommendations given are calendar spraying against capsids and Black Pod Disease. For the control of capsids, only Propoxur (Unden 200 EC) and Gamma BHC (Lindane) are registered and recommended. The application is expected to be carried out four times a year on prophylactic basis (calendar sprays) in August, September, October and December. The recommendations on the use of Unden and Gamma BHC have remained unchanged at least since the beginning of the seventies (BOATENG 1973). Since 1990, CRIG has recommended three other insecticides for capsid control, which are, however, yet to be distributed to the farmers.[2] For capsid control, Unden 20 and Gamma BHC are alternated every two years between the northern and southern sectors of cocoa growing area to avoid resistance. Against the Black Pod disease, CSD recommends cultural methods like weeding, controlling shade and proper draining of a plantation. For chemical control, farmers are free to select one of the recommended fungicides. The spraying interval is not supposed to be longer than three

[2] The insecticides are Carbamult (a carbamate insecticide), a cocktail of Actellic/Talstar and Confidor (a nitroguanidine insecticide). Written information of Dr. Padi, CRIG, November 20, 2000.

weeks, starting in April and ending in December. This means that up to nine applications are recommended as calendar spray.

In practice, however, cocoa farmers seem not to follow the recommendations. Field surveys done by COCOBOD in 1997/98 and 1998/99 showed that out of 1,750 farmers interviewed, only 3.5% of farmers used the recommended pesticides Unden 20 and Gamma BHC at the recommended dosage, time and frequency (PADI et al. 2000). Between 17.5% and 24% did not apply any pesticide at all to their cocoa trees. The majority sprayed insecticides of their own choice, sometimes only twice a year and outside the recommended period of application. Farmers who did not follow the recommendations argued that they found the prices of Unden 20 and Gamma BHC prohibitive, even though subsidized.

Input Supply

Before subsidies were abolished in 1996, CSD was also responsible for sufficient and timely supply of recommended pesticides. This responsibility included importation of pesticides and in some cases formulation in the country, transportation to the cocoa growing areas and distribution to the farmers. The farmers were required to buy pesticides in quantities calculated per growing area and based on recommendations on spraying intervals and application rates. The same calculations applied to spraying equipment, which was sold under subsidized conditions. The Field Assistants were responsible for selling and distribution of these inputs to the farmers. Currently, procurement and distribution of inputs is solely handled by the Cocoa Inputs Company (CIC). CIC has established regional and district branches. Field Assistants are no longer engaged in the distribution of pesticides or fertilizer.

CSD is still active in the distribution of improved planting materials to the farmers. For this purpose, 21 stations have been established in collaboration with CRIG for the nursing of planting materials. Of major importance is the distribution of hybrid seedlings which bear fruits three years after planting. Programs for control of CSSVD are also still under CSD.

From 1990 to 1993, following the withdrawal of subsidies, COCOBOD, CSD and PBC offered farmers a credit scheme which enabled them to obtain inputs. The credit was interest free. In 1997, credits were granted by COCOBOD to Cocoa Inputs Company (CIC) to the tune of over ¢4,319 million

to stock and sell inputs. The pay-back by farmers was supposed to be in two parts, 70% in December and the remaining 30% in January. The implementation was done by the Licensed Buying Companies (LBCs). Currently, COCOBOD is not operating a credit scheme for cocoa farmers.

The Agricultural Development Bank offers credits to cocoa farmers. The credits range between ¢500,000 and ¢5,000,000 per season. Farmers' groups which need the facility have to be recommended by LBCs. The upper limit of each credit is 20% to 30% of produce sales of the previous year. A further requirement is a deposit of 25% of the credit amount in a savings account. A repeat depends on 100% recovery of the old credit (MoF 1998).

COCOBOD funds the internal marketing of cocoa through an overall credit facility to pre-finance buying from farmers. For this purpose, COCOBOD borrows to the tune of the expected turnover of cocoa export from national and international banks. For the 1998/99 season for example, this amounted to US $320 million. It then becomes possible for the LBCs to lend out money from this fund with interests lower than the prevailing market rates. Pre-conditions are bankers' guarantees and the payment of processing fees. For PBC there is a simplified procedure to have access to this credit fund.

So far, all credit facilities to farmers are limited to one growing season. Granting of the facility and re-payment usually has to be done within this period. There are no structured credit facilities for re-planting or establishment of new farms. Such facilities can be obtained only in individual cases under internationally financed projects.

3.4 Conclusions

The support and regulation of the agricultural sector is under the responsibility of MoFA and four other ministries. There is the possibility that different aims and objectives lead to different policies on crop protection. The greater part of MoFA budget goes into extension and crop services. Current extension services using the T&V methods have had only a limited impact on farmers' decisions on production practices, including rationale crop protection measures. There is lack of coordinated research on crop protection in general and on alternatives to chemical pesticides in particular.

The economic reforms initiated since the 1980s liberalized markets for agricultural products and inputs except for cocoa. Direct subsidies meant to

encourage input use have been removed. Imported chemical pesticides are offered on the market to the lowest possible price due to exemptions from import duties and sales tax.

Cocoa is the main export crop. In view of government revenues, farmers' income and employment, any reduction in production will not be in the interest of both, the government and the cocoa farmers. This might encourage the use of pesticides to sustain current production levels. The existing export tax is still a major disincentive for cocoa production. The negative effects were partly compensated for through preferential distribution of pesticides and spraying equipment.

4 Agricultural Production and Use of Fertilizer

Ghana has a high potential for agricultural production which is due to favorable natural conditions, the variety of agro-ecological zones, and the availability of land and workforce. More than two-thirds of all households gain their livelihood directly from agriculture, which is practiced mainly on a subsistence basis.

This chapter analyses of the characteristics of the agricultural sector and its contribution to the national economy. In Section 4.2, the volume of crop production and crop prices are analyzed. Section 4.3 analyzes fertilizer use.

4.1 Land Use and Production Systems

Ghana covers an area of 238.854 square kilometers. Arable land takes about 57% of this total land area, of which about 44% is under cultivation (see Table A-4.1 in the annex). Compared to 1994, this represents an increase of 5%. The country covers six agro-ecological zones, ranging from the high rain forest in the south-west to the Sudan savannah in the north of the country (see Figure A-4.1 and Table A-4.2 in the annex).

In 1996, there was a total of 2.016 million farm holders all over the country (MoFA 1997). Nationwide, about 62% of farm holders are male. However, there are high regional differences between the northern and southern regions. 90% of all farms fall within the category of small-scale farms with an average area of 4.2 acres (1.68 ha). 9% are medium-scale farms with 21.7 acres on the average, while the remaining are large-scale farms with an average of 57 acres. The average farm size in all the zones is 6.4 acres (2.56 ha).

Farms have been classified as follows: purely subsistence, mainly subsistence, mainly commercial or purely commercial depending on their production goals. The main system of farming in Ghana is the traditional subsistence system. Staple crops such as roots and tubers, plantain, legumes, cereals and leafy vegetables predominate. Such a system is generally closed, with little use of agrochemicals and mechanization and the use of family labor instead of hired labor. Simple farm tools like the hoe and cutlass are used for tillage and slashing and burning of vegetation is the method used in land clearing.

Soil fertility is maintained through organic matter management and biological nutrient fixation. The fields are usually cultivated for one or two seasons and abandoned for a couple of years when yields are observed to be too low. Cultivation is shifted to a fresh land or previously abandoned field (shifting cultivation). The abandoned land regenerates the lost fertility through natural processes. The system depends heavily on the rainfall pattern.

Mixed cropping takes the largest share of cultivated areas in all traditional farming systems. Cereal–legume mixtures have the largest share of cultivated areas in northern Ghana, while maize-roots-vegetable mixtures are most common in southern Ghana. Though farm households in Ghana have a strong orientation towards subsistence, surplus staple crops are often sold.

The modern type of farming system, which is more open and done on a large-scale (usually the plantation type), is geared towards the production of industrial and/or export crops such as rubber, oil palm, cocoa, tobacco, kola, cotton and coconut and to a lesser extent, maize, rice, pineapple, vegetables and citrus. Farm machinery, irrigation, high yielding varieties of seed, inorganic fertilizer and various forms of pesticides are used. Bullock plowing is widely practiced, especially in the north, and tractors may be hired to plough heavy soils. Mechanization is often used during land preparation on very large farm holdings, but it does not necessarily displace human labor.

Though most plantation fields have pure stands, crops like cocoa, oil palm, citrus and coffee are often intercropped with food crops like cassava, vegetables, plantain and maize etc. at the initial stages until tree crops form a canopy when they are left as pure stands. The rainfall pattern limits production of crops such as cereals, legumes and cotton to only one crop in the mono-modal rainy season in the northern savannah zone and two crops (especially maize and vegetables) in the forest and transitional zones which have bi-modal rainy seasons. The introduction of early maturing varieties of maize and millet has allowed two harvests of these crops in the northern savannah zone. Pest problems accentuated in the minor rainy season (e.g. stem borers for maize).

The existing land tenure systems are seen as major factors influencing the level of agricultural production. It may not be difficult to acquire land for farming but the farmer has limited rights to own the land. The current practice supports land rotation instead of investing in long-term measures to improve

productivity. Furthermore, the current land tenure systems do not allow farmers to use land ownership rights as guarantee for loans (NYANTENG, DAPAAH 1997). Renting (including long-term lease) is a temporary land tenure arrangement popular among migrant farmers. A common arrangement for land used for cultivating tree crops in southern Ghana is sharecropping.

4.2 Agricultural Production and Price Trends

Areas under Cultivation

Official records are available only for non-grain starchy staples (roots and tubers) and cereals. However, both groups are the main crop categories for plant production. In 1999, the total area under cultivation for roots and tubers was estimated at 1,508 thousand ha, that is, nearly one quarter of the total area under cultivation. Cereals were grown on an area of 1,300 thousand ha. Estimates at the end of the eighties calculated the area under vegetable cultivation as 90,000 ha and groundnuts as 130,000 ha (PPMED 1999). Since the early nineties, there has been an increase in areas for the cultivation of roots and tubers as well as cereals. Within the group of cereals and non-cereals, more acreage is being used for cassava and rice. While cassava had a share of 18% of this group in 1987, the share rose to 23% in 1999. The share of the rice production area increased from 3% (72,000 ha) in 1987 to 4% (105,000 ha) in 1998 (see Table A-4.4). Yam and cocoyam have slightly lost shares. It is mainly in the case of millet that production decreased substantially in the examined period.

The last available estimates show that the total area under cocoa cultivation is about 1.2 million ha, 33% less than the 1.6 million ha estimate of the early eighties (MoF 1998). In 1998 FAO estimates showed that the total area used for cocoa was about 910 thousand ha (FAO 1999). Especially in the Ashanti, Brong Ahafo and Volta Regions, cultivated areas decreased considerably because of drought and bushfires. It is estimated that one-third of the total area contributes relatively little cocoa due to the ageing trees and in the Eastern Region, due to the Swollen Shoot Virus Disease (MoF 1998).

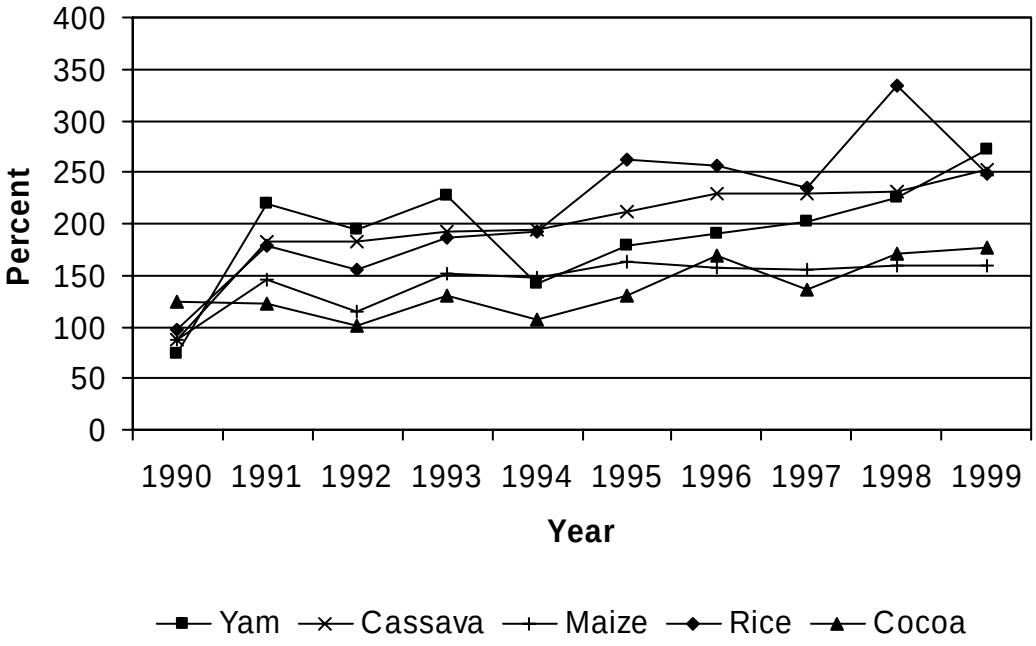
Compared to cocoa, coffee production has been marginal (10,000 ha). As in the case of cocoa, due to drought and bushfires, the size of areas under

cultivation has decreased considerably compared to the seventies and eighties.

Production Trends

The biggest crop produced in the country is cassava with constantly increasing quantities, going up to 7.8 million tons in 1999 (Table A-4.5). In 1999 the quantities of roots and tubers produced altogether amounted to 14.8 million tons, nearly 32% more than was produced in 1993.

Figure 4.1: Development of Production for Selected Crops
(in percentages, average 1987-1989 = 100)



The available statistics on areas under cultivation do not include legumes, vegetables, fruits, traditional and non-traditional export crops.

Source: Table A-4.5 in the annex.

Obviously, there has been a slow but steady increase in production as Figure 4.1 shows. The same applies to cereals. Compared to a production level of 1,644 thousand tons in 1993, the 1999 level was 1,684 thousand tons, an increase of 10%. Maize is the most important cereal with an average share of 59% of the total cereal production, followed by sorghum (19.5%), rice and millet. Fluctuations of cocoa production of almost 25% between the years have

been observed. Table A-4.5 shows that in 1998 the gross production was 420 thousand tons compared to the 335 thousand tons average of the last six year average. Coffee production has been marginal with 7.84 thousand tons in 1998.

Observation on Yields

Production increase was mainly a result of increased acreage. The yields for the main roots and tubers as well as cereals have remained nearly unchanged over the last six years (see Table A-4.6). The yield level seems to be high compared to neighboring countries. According to FAO estimates, yields in Ghana are always higher than in Côte d'Ivoire and Togo (FAO 1999). For example, in 1997, cassava yields in Ghana were more than 200% compared to the figures of the two other countries.

It is the opposite in the case of cocoa and coffee. Côte d'Ivoire and Malaysia are the main competitors on the world market. The average yield of cocoa does not exceed 360 kg/hectare compared to 1,800 kg/hectare in Malaysia and about 800 kg/hectare in Côte d'Ivoire (MoFA undated). Other estimates rate the level of production at 30% below those of the other two countries, and 13% below the African average (MoF 1998). The main reasons for these differences are the higher age of cocoa trees and the generally low yielding varieties cultivated in Ghana. To a lesser extent, but for the same reasons, the yields of coffee are lower compared to the major competitors.

For some produce only rough estimates on area, production and yields are available. Table 4.1 shows figures on area, production and yields for some vegetables, pineapple and rubber. These are not part of MoFA and COCOBOD statistics.

Table 4.1: Estimates on Area, Production and Yields of Selected Crops

Crop	Area (ha)	Production (Tonnes)	Yield (kg/ha)	Source
Tomato*	16.120	213.000	13.800	(1)
Tomato **	30.000	160.000	5.330	(2)
Pepper*	19.230	100.500	5.200	(1)
Okra*	3.370	35.000	10.400	(1)
Garden eggs*	3.700	29.040	7.800	(1)
Shallot/onion*	1.970	29.510	15.000	(1)
Pineapple**	n.a.	35.000	n.a.	(2)
Rubber**	n.a.	11.000	n.a.	(2)

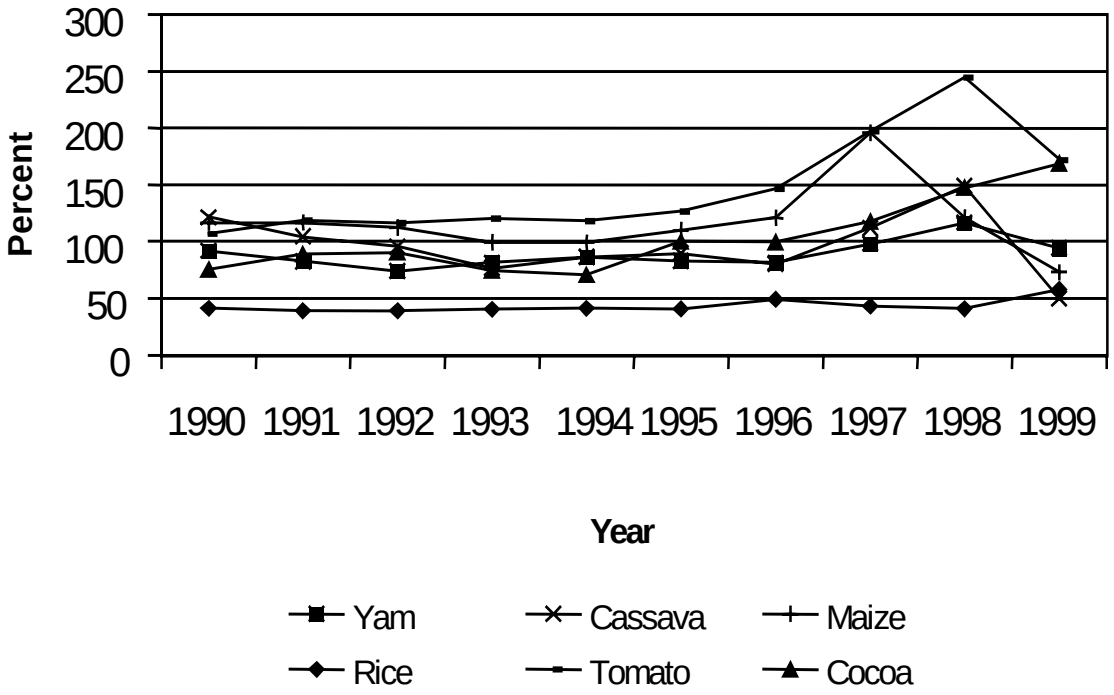
* Estimates for the year 1995.
** Estimates for the year 1998.
Source: NURAH, G. (1999)
FAO (1999)

For tomatoes figures from the two sources examined differ. Pineapple production reached a quantity of 35,000 tons in 1998, about 15% of the production in Côte d'Ivoire in the same year.

Price Trends

Nominal prices of all the selected crops have increased over the past twelve years due to inflation. Some of the 1998 prices are nearly twenty times the 1987 prices (Table A-4.7). Because of the high rate of inflation, prices shown here do not reflect changes in production or demand. Only wholesale price quotations were available. Whether producer prices at the farm gate increased at the same rate could not be ascertained. However, service price indices increased faster than those for food prices, so it is quite realistic to assume that farm gate prices did not follow wholesale price developments to a full extent.

Figure 4.2: Development of Real Prices of Selected Crops
(in percentages, average 1987-1989 = 100)



Source: Table A 4.8 in the annex.

The real prices of the selected crops as shown in Table A-4.8 were calculated using the Food Price Index. These prices reflect the market fluctuations and policy changes better than nominal prices. Figure 4.2 shows the development of real prices of selected crops over the period 1991 to 1998 in percentages of the 1987-89 average. With the exception of maize and tomato, for the other selected crops, real prices went down after implementation of reforms under structural adjustment. Prices of rice did not yet recover to previous levels. The 1998 price was 41% of the 1987-89 average. Yam prices needed six years to recover. A similar trend was observed for cowpeas and groundnuts. High maize prices in 1997 and 1998 were exceptional due to the influence of the credit scheme offered by the Agricultural Development Bank.

Nominal cocoa prices (fixed grower prices) doubled in 1995. Since then, there has been an upward trend in real prices caused by the new price policy of the

government. Exceptions to the downward or flat trends for agricultural commodities are the wholesale prices of tomato which peaked in 1998.

4.3 Input Use

All inorganic fertilizers used in Ghana are imported. As Table 4.2 shows, imported quantities fluctuated within the observed period of 1990 to 1998. Fertilizer use decreased in the early nineties, then increased sharply in 1997. In 1999 the whole quantity of fertilizer reached only 20,439 tons, a reduction of 48% compared to 1998 (ISSER 2000).

Related to areas under cultivation, the level of fertilizer use is low. On the average, only 7 kg of fertilizer (product weight) is applied per ha per year calculated for the 6 million ha under cultivation. Out of this quantity, 6.5 kg is nitrogen fertilizer. If it is assumed that chemical fertilizer is applied to only 40% of the area under cultivation, the average fertilizer application rate will not exceed 20 kg per treated hectare.

Higher levels of production seem to be mainly the result of increased area cultivation and not of intensification due to increased fertilizer use. This situation also applies in the use of certified seeds. In the case of maize, sales of certified seeds reached a peak in 1995 with about 1,000 tons. Sales decreased to about 717 tons in 1998 (AL-HASSAN 2000). This means that certified seeds were used on about 4 % of the whole maize area.

Under the agricultural policies of the seventies and eighties major production incentives for increased input use were given to farmers. These included fertilizer, improved seeds and bank loans administered by public agencies. In the early eighties, fertilizer was sold to farmers at about half of the prices the agencies had to pay. From 1987 onwards, subsidies were gradually removed, ending completely in the year 1989.

Table 4.2: Fertilizer Imports (in metric tons**)**

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
NPK (15-15-15)	4.250	0	14.500	10.000	13.040	9.300	5.870	19.230	13.058	3.202
Other NPK	17.000	0	3.000	0	0	0	2.830	17.850	8.800	400
Urea	20.100	0	0	0	0	4.250	950	1.850	500	0
Muriate of Potash	0	0	400	2.000	2.500	3.400	4.500	5.450	3.095	6.506
Amm. Sulphate	2.500	0	11.500	7.600	8.500	9.000	5.320	10.700	13.265	4.800
Others	0	0	0	560	20	2.190	900	1.083	3.597	5.531
Total	43.850	0	29.400	20.160	24.060	28.140	20.370	56.163	42.315	20.439

Source: ISSER (2000)

After the removal of subsidies, the real prices remained for two years and afterwards increased constantly up to 1996 (Tab. A-4.9). For the last two years of the examined period there seem to have been a slight downward trend to reach about 157% and 126% of the 1987-89 average for NPK and AS, respectively.

Combined with the development of real prices for some crops the crop-fertilizer price ratio decreased to the disadvantage of the crops. This is true for example for yam, maize, millet, sorghum, rice and legumes. Most recently, prices for some crops (plantain, cocoyam, cassava, tomato and cocoa) increased faster than fertilizer prices, meaning that increased fertilizer use appears to be more favorable.

4.4 Conclusions

The intensity of land use is generally low. The traditional farming method include shifting cultivation dominates most of agricultural production. Existing farm sizes mainly support subsistence and semi-subsistence production systems. Most of the prevailing cropping systems lower pest pressure and therefore involve lower external input use compared to a system with intensive land use. Starchy staples and cereals cover the larger part of the cultivated farm land. The production of both crop groups is increasing, mainly because of increased acreage. If area expansion becomes difficult especially for high value perishable export crops, the use of chemical inputs is likely to increase with intensification. The price ratio between agricultural products and fertilizer developed in the 1990s for most of the crops to their disadvantage.

5 Crop Protection Policies and their Institutional Framework

Crop protection is shaped by a variety of policy measures in different sectors, including agriculture, environment, health, trade, finance. The analysis starts from an overview of the crop protection policy followed by a review of the measures regulating the market for pesticides (trade measures and special import programs). Section 5.2 focuses on the Plant Protection and Regulatory Services Directorate of MoFA as the main institution that implements crop protection policy instruments in the agricultural sector. Policies for the management of pesticides (registration and control of pesticide use) form the topic for section 5.3.

5.1 Crop Protection Policies

Relevant Acts and Their Regulations

Currently, there are two Acts defining crop protection policy, namely the Prevention and Control of Pests and Diseases of Plants Act (Act 307, 1965) and The Pesticides Controls and Management Act (Act 528, 1996).

Act 307 is the legal framework for regulating the work of the Ministry of Food and Agriculture in the field of crop protection. It formed the basis for the setting up of the Plant Protection and Regulatory Services Directorate (PPRSD) and describes the responsibilities of the directorate.

In order to regulate importation, registration, distribution, application and disposal of pesticides, the government promulgated the ”Pesticides Control and Management Act (Act 528, 1996)”. With this Act, a Pesticides Technical Committee was established at the Environmental Protection Agency (EPA). Furthermore, EPA acts as the Pesticides Control Authority.

In addition, there are other legal Acts which deal with various aspects of crop protection. With Act 490 the Environmental Protection Agency (EPA) under the Ministry of Environment, Science and Technology (MEST) was established. One of the tasks is to regulate the management of chemicals in the country. The Food and Drugs Law (PNDCL 305 B, 1992) spells out measures for the control of food, drugs, cosmetics etc. to protect the health of consumers. Technical regulations for the importation of plants are laid down in Cap 159 to

prevent the introduction of pests and plant diseases. Regulations on biosafety and on genetically modified organisms are in process.

Trade and Tax Policy for Pesticides

Agricultural inputs like fertilizer, machinery etc are in general exempted from import duties and Value Added Tax (VAT). Pesticides, however, are treated differently. Herbicides, plant growth regulators and fungicides are free of import duties and VAT. This group is treated like other agricultural inputs. Insecticides, rodenticides and disinfectants in principle attract an import duty of 10% on the CIF value plus the actual VAT rate.[3]

The importers of the latter group of pesticides can apply for a waiver. MoFA, represented by the Minister, can approve an application on the recommendation of the Director of PPRSD. According to information from importers the waivers are always approved. This means that in practice all pesticides are free of import duties, either in line with the customs tariff or through the waiver approved by the Minister. The imposition of VAT on insecticides, fungicides etc is under revision. Currently, they do not attract VAT.

The procedure for import clearance involves a four step approach, including review of registration status with EPA, application for import duty waiver with MoFA, and clearance of VAT status. Parts of the procedure can be started before the shipment arrives. However, some importers have been complaining about the long delays in clearing consignments from the harbor. The extra time attracts additional charges on the consignment. However, the exemption from import duties through the waiver procedure is obviously taken advantage of by every importer.

Pesticide Distribution under the KR2 Programme

The Japanese government offers developing countries in Africa, Asia, Central and South America and East Europe grants under the Kennedy Round Two Agreement (KR2). The purpose of the grants is to help improve agricultural production, mainly of cereals. In Sub-Saharan Africa, KR2 grants for pesticides had a share of 48% of the 1993 program budget, followed by fertilizer and

[3] See Act 578 (2000) The Customs and Excise Amendment Act. Chapters 3808.10 (insecticides), 3808.20 (fungicides), 3808.30 (herbicides), 3808.40 (disinfectants), 3808.90 (others).

machinery. Ghana has been a beneficiary since 1981 (ADACHI and TOWNSEND 1999, ADACHI 1999).

In Ghana, PPRSD is the body responsible for deciding on the use and the conditions for sale of KR2 pesticides. For that purpose the Chief Director of MoFA and the Director of PPRSD fix wholesale prices for available pesticides. Their decisions on reduction rates compared to market prices help to determine the funds available for other projects. Local pesticide dealers and farmers buy the pesticides at the PPRSD headquarters at fixed prices. There are no restrictions on dealers' retail prices.

For Ghana the KR2 annual budget is about US $2.5 million. Out of this budget 40% to 50% is used for pesticides. Revenues from selling the inputs to farmers are ploughed back into a counterpart fund (PPRSD 2000).

Integrated Pest Management Policy

The first systematic attempts to integrate non-chemical control measures started in the sixties with trials to control the CSSVD through management of the vector with formicid ants. Until the early nineties, the development of alternative pest control concepts were isolated and concentrated on classical bio-control (e.g. the cassava mealy bug) as well as on traditional methods of post-harvest treatment (DIXON et al. 1992). Attempts were also made to introduce biological control methods for the Larger Grain Borer, Water Hyacinth, Mango Mealy Bug and Cereal Stem Borer (DIXON 1999). There was no organized action at the national level to develop Integrated Pest Management (IPM) programs as a general crop protection strategy. It was left to extensionists or project organizers to initiate control measures.

In 1992, Ghana adopted IPM as her strategy for pest and disease control (NATIONAL PLANT PROTECTION AND PESTICIDE REGULATORY COMMITTEE 1992). IPM is a pest management system that systematically uses all available techniques to keep pest pressure below levels which can cause economic damage. In 1995, MoFA and FAO jointly started a project to implement IPM programs for rice production. The Farmers' Field School approach was adopted. In this project, extensionists and farmers were trained in the integrated production of rice and later, of cassava, vegetables and plantain. The positive results of the pilot and follow-up phases in the reduction of pesticide use, especially for rice, and the overall economic benefits encouraged the continuation of the project. In 1997, a National IPM

Coordinator was appointed to strengthen IPM awareness and expand IPM projects to other crops.

From the beginning of the project to 1999, about 85 extension agents and 2,100 farmers had participated in the Farmers' Field Schools. The results were considered positive. Project reports indicate that the income of participating farmers went up by about 30% and the use of pesticides was reduced by about 90% compared to the beginning of the program. Limited funds however did not enable the project to be expanded to other crops and regions (AFREH-NUAMAH 1999).

The Integrated Crop Protection Project (ICP) of the PPRSD, supported by GTZ, started in 1997. It has developed cost-effective, decentralized, participatory extension for IPM with elements of the Farmer Field School approach in the Brong Ahafo Region as well as policy, technical and framework conditions for IPM at the PPRSD. To date about 400 farmers and 30 extensionists have been trained. In the next phase (2001) the project aims to out-scale its extension methodology to other districts and improve the service of institutions involved in crop protection.

The government has been supporting the development of locally produced formulations as substitutes for chemical pesticides. The initial efforts included estimates on the market potential of neem extracts (GTZ 1998). Pilot projects have been initiated to test the effectiveness of neem extracts and other plant products such as jatropha as alternatives for chemical pest control (FOERSTER and LARBI 1999).

International Agreements and Trade Relations

Ghana's crop protection and pesticide policy is guided by several international agreements and conventions. The country is a signatory to the International Code of Conduct on the Distribution and Use of Pesticides (Code of Conduct). Adopted in 1985 under FAO leadership, the objectives of the agreement are to strengthen responsibilities of national governments, to establish voluntary standards of conduct for public and private institutions and to strengthen co-operation between those institutions. To date, there is no information on implementation progress available.

The Prior Informed Consent (PIC) procedure was adopted at the Rotterdam Convention in 1998. The previously voluntary agreement is now international

law and regulates trade in highly dangerous or hazardous chemicals, including pesticides. An exporter has to inform the responsible national authority on planned shipment of these chemicals. The country of destination is also informed through the coordination unit of FAO. The country of destination has the right to react within its national laws. In Ghana, EPA has the mandate to react. There is regular exchange of information. So far, no announced shipment of banned/restricted pesticides has been rejected by EPA under this procedure.

Ghana has also been participating in the Inter-Governmental Forum on Chemical Safety (1994 and 1997) and is one of the countries involved in the UNITAR/IOMC Pilot Capacity Building Program for Integrated Chemical Management.

The current legislative framework for exporting crops does not include any quantitative or qualitative restrictions on exporting crops to international markets. This also applies to residues of pesticides in exported produce. Setting of limits and control of residues are left to the countries of destination.

It is expected that the harmonization of Maximum Residue Levels (MRL) for pesticides in food in the European Union will affect exports from Ghana. The European Union will probably place a ban on the use of 350 pesticides in crop production in the Union. MRL will also be harmonized between the member countries on a positive list. If no research data is available on acceptable levels of residue, they will be set to the limit of detection. Even if regulations of the European Union allow the use of the pesticides not registered in the EU for tropical produce, a MRL will be determined for imports to Europe (COLEACP 1999). However, import tolerances for pesticides in certain crops may be applied for.

Ghanaian produce affected include mango, papaya, passion fruit, pineapple and avocado. The MRL will lead to restricted use of pesticides in export crops. Active ingredients often leading to high residue levels are Benomyl, Dithiocarbamates, Etephon, Thiabendazole and Triademefon. Shipment of produce with excess residue can be rejected by European authorities with additional costs for exporters to re-import the produce to the country of origin.

5.2 Plant Protection and Regulatory Services Directorate

The current Plant Protection and Regulatory Services Directorate (PPRSD) was established in 1965 by an act of Parliament (Act 307), giving it the mandate to develop, organize, implement, monitor, train and regulate the plant protection sub-sector in the country (except cocoa, cola, coffee and cotton). In October 1997, parts of the services of the directorate were decentralized in line with other directorates of MoFA (PPRSD 1999a). However the regulatory divisions of the Directorate were not decentralized. The functions of PPRSD have been divided into the following four divisions, i.e. the Seed Inspection and Certification Division, the Plant Quarantine Division, the Pesticide Management Division, and the Crop Pests and Diseases Management Division.

The Pesticide Management Division was created in 1996. It has a head office which has technical linkages with the Regional Development Officers for Plant Protection (10 officers) who serve as coordinators for the fieldwork. The Division works closely with the Environmental Protection Agency (EPA) on the actual registration and inspection of pesticides. It organizes the registration and inspection of pesticide dealers and sprayers. It also trains extension staff and registered dealers in pesticide management.

The Crop Pest and Diseases Management Division was created in 1965 in response to national pest outbreaks. It has units for phytopathology, nematology and classical bio-control. It has laboratory facilities and reference collections for identification of pests as well as mass rearing of bio-control agents. The Division works together with Regional Agricultural Development Officers and SMSs in plant protection.

PPRSD has been engaged in several projects on crop protection. They include the following:

- Integrated Crop Protection (MoFA/German Development Co-operation, (GTZ), 1997 – 2001, first phase);
- Agro-Skills Development, Poverty Alleviation Farmer Field Schools (UNDP/FAO/MoFA, 1996 to the present);
- West African Plantain Project (International Institute for Tropical Agriculture/ University of Ghana, Legon, 1993 – 1999);
- Inter-African Phyto-sanitary Registration Project (HIP), West and Central Africa (Caisse Française/other Plant Protection Services in West Africa, 1995-ongoing);

- Root and Tuber Crops Improvement Program (IFAD/MoFA, 1999 to the present);
- Integrated Chemicals Management (EPA/UNITAR, 1997 – 1999).

Within the total budget of MoFA (votes from the central budget, without donor support) PPRSD had a decreasing share from 4.9% in 1995 to 3.8% in 1997. A considerable part of the PPRSD budget went into contributions to the Regional Agricultural Development Units. The budget of the headquarters was mainly used for recurrent expenditures. It is envisaged that PPRSD will receive about US $4 million from the AgSSIP budget over the next four years.

Currently the staff strength at the PPRSD headquarters is 32, consisting of professionals, technical staff and people for supporting tasks . 149 people are employed outside headquarters with 94 of them engaged in phyto-sanitary inspection at the borders, 30 in seed inspection and 25 in pesticide field inspection. The Pesticide Management Division is also supported by 10 Regional Plant Protection Development Officers.

5.3 Pesticide Management and Control Policies

Several governmental institutions are currently involved in policy formulation, pesticide management and control and execution. As laid down in Act 528, the leading body is EPA, supported by the Pesticides Technical Committee. Members of the committee include officers from MoFA (Director, PPRSD and Director, Veterinary Division), representatives of COCOBOD and officers from organizations engaged in control of pesticides (Head of Chemistry Department of the Ghana Atomic Energy Commission, a representative of the Ministry of Health, and a representative of CEPS). Farmers and dealers' associations were also represented on this committee. The committee acts on behalf of the Board of EPA as the main body responsible for the control of, and management of pesticides. The management is under a Chairperson, elected within the Committee.

Based on formal agreements, some tasks are shared among the different bodies such as the Pesticide Management Division of PPRSD, Ghana Standards Board (GSB) and the Chemistry Department of the Ghana Atomic Energy Commission (GAEC).

5.3.1 Registration of Pesticides and Dealers

To ensure an effective control and management of pesticides, Act 528 requires registration of all dealers and pesticides. Requirements for registration are not defined in the Act itself. It is left to EPA to specify these requirements as legal instruments. Currently, information required in applying for registration are: address of the company, names and qualifications of responsible persons in that company, list of pesticides to be handled under the license and a description of technical storage and handling facilities. Licenses could be suspended or cancelled by EPA if the conditions are not fulfilled at a certain point.

Registration of Pesticides

Registration with EPA is a basic requirement for the importation, export, manufacturing, advertising and selling of a pesticide. Exemptions are possible if an unregistered pesticide is to be used for research, national emergency or in transit to other countries. It is also possible to produce unregistered pesticides in Ghana for export, if the requirements of the importing country are fulfilled.

The actual registration process based on Act 528 started in April, 1999. Due to the short period of registration, no differences were made between pesticides already on the market and new pesticides. Current applications with EPA for registration have not yet been approved. EPA is in the process of evaluating recent applications. Importers however get a provisional clearance immediately after handing in their applications.[4]

The applicant has to provide information including clear details on the applicant and the pesticide. Information on whether the pesticide meets the requirements on effectiveness, upper limits of possible residue, toxicity, environmental effects etc can be supported with documents either from the country where the manufacturer is based or through records of trials under similar conditions other than Ghana. EPA demands field trials only in special cases and can give a provisional clearance for the pesticide if the agency is convinced that most of the required information has been provided and that the pesticide is likely to meet toxicity levels.

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4 Information by Mr. KLUFIO and Mr. ANTWI, EPA on July 3, 2000.

The Pesticide Technical Committee makes the necessary remarks to the Minister of Environment, Science and Technology (MEST) for the approval or non-approval of the application. For this purpose the Committee has established sub-groups to check effectiveness, environmental aspects and toxicity. So far, the Committee has had difficulties in defining the limits for approval. It has to decide each application on its own merits and demerits. Act 528 does not define quantitative limits for the criteria. The rules and regulations supporting Act 528 have not yet been fully developed.

Information on pesticide quality control and residue analysis necessary for the registration process is the duty of the Ghana Standards Board (GSB) and the Ghana Atomic Energy Commission (GAEC). The major limitation the two bodies face is the absence of fully equipped laboratory facilities where the quality of pesticide formulations can be tested. Furthermore, a manufacturer's claims of effectiveness and safety cannot be assessed and validated as a prerequisite for registration, effective field inspection and monitoring. Full checks on residues in food, water and soil or the quality of a pesticide are not yet possible. The scheme as designed is therefore implemented without local scientific support. It only involves obtaining as full information as possible from the literature and from pesticide firms on their products.

When an application receives the approval of the MEST, an approval letter valid for three years is issued to the applicant. Within this period the company is allowed to import any quantities of a registered pesticide if the license does not spell out limitations on the quantity or the use. For purposes of statistical control and in fulfillment of PIC procedures, however, the actual imports have to be announced in advance. EPA then issues an import license valid for the applied quantity in one or more shipments. The license for a particular pesticide is given only to the applicant. Other persons who want to distribute the same formulation have to go through the registration process separately. The fee for registration as in July 2000 was ¢900,000 per pesticide for a three-year license. With effect from April 1, 2000, no unregistered pesticides can be imported or sold on the Ghanaian market. For a renewal of the registration after the three-year period, EPA can request information gained from experiences in the previous licensing period. If during the validity of the license, additional information concerning effectiveness or toxicity are available, EPA can amend the classification, suspend or ban a particular

pesticide. The agency also keeps a Register of Pesticides, which is published at least once per year in a gazette which is accessible to the public.

For pesticides to be used in the cocoa sector, further requirements have to be fulfilled before EPA approves an application. The Cocoa Research Institute of Ghana (CRIG) has its own facilities for checking effectiveness, toxicity and possible residues of pesticides that are to be applied to cocoa. All pesticides for the cocoa sector need approval from CRIG before EPA takes a decision. The two institutions are required to come to an agreement. The Ghana Standards Board and Ghana Atomic Energy Commission may also veto the registration of a pesticide.

Act 528 defines four classes of pesticides: (1) general use, (2) restricted use, (3) suspended pesticide and (4) banned pesticide. Pesticides in classes (2), (3) and (4) are subject to the Prior Informed Consent (PIC) procedure as laid down in the international procedures for exchanging information. A pesticide may be suspended or restricted if its application may cause unreasonable adverse effects on people, animals or the environment.

Table 5.1: Provisional List of Banned Pesticides in Ghana

Name	Active Ingredient	Reason for Ban
Aldrex T	Aldrin and Parathion	persistent, highly toxic
Aldrin	Aldrin	persistent
Dieldrin	Dieldrin	persistent
E-605 Combi	Parathion	highly toxic
Parathion Methyl	Parathion Methyl	highly toxic
Heptachlor C10	Heptachlor	not in use
DDT	Dichloro-Diphenyl-Trichloro-Ethane	safer alternatives
EDIB	Ethylen Dibromide	highly toxic
D-D	Dichloropropane	banned internationally
Bidrin	Dicrotophos	banned internationally

Source: EPA (1994, 1997)

Currently, ten pesticides have been banned in Ghana (see Table 5.1). The reasons for the ban are either the persistence of the pesticide in the environment or high toxicity. This list is in line with international conventions.

Eight more pesticides have restricted application (see Table 5.2). Among this group are Unden and Lindane insecticides registered for capsid control in cocoa. According to COCOBOD, alternatives with the same effectiveness for

capsid control are not yet available, which justifies the decision not to ban the two pesticides as has been done in other countries. Six of the eight restricted pesticides can be found on the market in considerable quantities (Table A-5.3 in the annex).

Table 5.2: Provisional List of Severely Restricted Pesticides in Ghana

Product Name	Active Ingredient
Azodrin	Monocrotophos
Unden	Propoxur
Lindane	Gamma BHC
Elocron	Dioxacarb
Gramaxone	Paraquat
Furadan	Carbofuran
Thiodan	Endosulfan
Atrazine	Atrazine

Source: EPA (1994)

Section 17 of Act 528 requires licensing of (1) importation, formulation or manufacture of pesticides, (2) distribution or sale of pesticides, (3) commercial application, especially application of restricted pesticides and (4) transportation of restricted pesticides. Currently about 100 out of the estimated total of 250 large-scale dealers in pesticides are registered with EPA. This list includes all importers and wholesalers as well as some of the retailers.

Some concerns have been raised with regard to the effective functioning of the registration process. Inadequate size of personnel and budget of EPA have been cited as limitations as well as the strong dependence on other institutions for registration related research and requirements which are not classified as priority issues in their work descriptions. Survey results also indicate that there are illegal re-packers and importers who do not apply for permit and who are therefore not under regulatory control.

5.3.2 Control of Pesticides

Control of Pesticide Distribution and Application

Act 528 demands inspection and monitoring of application of pesticides in the field. For this purpose, special inspectors have been appointed with the right to examine the respective technical facilities. The inspectors have the right to

stop illegal activities, to arrest suspected persons and to seize equipment which does not fulfill the requirements. Under the Act, offenders can be sentenced to a fine. Illegal actions include (1) importation, distribution, manufacturing or selling of unregistered pesticides, (2) activities under (1) by an unregistered person or company, (3) inappropriate use of pesticides or requesting employees to do so, (4) altering registered pesticides, (5) distribution of pesticides of doubtful quality and (6) incorrect labeling and packaging. The Customs, Excise and Preventive Services (CEPS) assist in enforcement of the law. For this purpose, EPA has the obligation to make available to CEPS information necessary for this task.

The Act does not spell out regulations on disposal of obsolete pesticides and other waste. Obsolete pesticides are a considerable problem in Ghana. According to two inventory surveys, obsolete stocks owned by government establishments, farmers services companies and private companies increased from 50 tons in 1997 to 71 tons in 2000 (FAO 1998, 2000). Almost all the pesticides already registered in the 1997 inventory are still found in the 2000 inventory.

The Pesticide Management Division of PPRSD monitors and enforces the rules and regulations on the distribution and use of pesticides based on an agreement among the various government bodies. At the same time, the division is responsible for monitoring the pesticide market as regards quality and dates of expiry. Currently, about 25 inspectors in charge of the whole country are involved in the control of pesticides. The main clientele for the inspectors are pesticide dealers and commercial sprayers. The inspector-retailer ratio is very low and the inspector-sprayer ratio is even lower. Inspection is therefore limited to small samples and only a few bio-efficiency control tests can be conducted. In performance of their duties, the inspectors have to work hand-in-hand with Subject Matter Specialists (SMS) in the various Regional Departments of Agriculture.

Training of Officers for Crop Protection

With the re-structuring of MoFA in the course of decentralization and the promulgation of Act 528, training of dealers and commercial sprayers was made compulsory. Training focused on the various aspects of crop protection, storage and safety. For purposes of training and information, the Pesticides Management Division keeps a register of all pesticide dealers and commercial

sprayers and upgrades it annually. Handbooks on management of pesticides were prepared by the Pesticide Management Division as a basis for training (YEBOAH 1998, SUGLO 2000, BLAY et al. 2000). Basic training of inspectors was carried out in June 2000.

Pesticide Laboratory Facilities

Out of the 19 analytical laboratories in the country, only four are for regular control. Most of the analytical laboratories are located in the universities and research institutes, mainly to support teaching and research (EPA 1999). These laboratories are basically capable of analyzing pesticides. However they lack standards of reference for testing pesticides and laboratory staff who have been specifically trained to handle pesticides. The pressure on these facilities is high, so that it becomes difficult to make them available to other organizations on a regular basis.

Analytical laboratories that are in principle equipped for regular control are located at Environmental Protection Agency (EPA), Ghana Atomic Energy Commission (GAEC), Ghana Standards Board (GSB) and COCOBOD. The GAEC laboratory was set up partly to undertake national pesticide formulation control analysis. Though the laboratory has three analysts for pesticide quality control, none of the major equipment has been in working condition for the past four years. The GSB laboratory has been mandated and equipped with facilities to control the quality of locally manufactured products.

The COCOBOD quality control laboratory at Tafo has been equipped to routinely monitor pesticide residues in cocoa, coffee and sheabutter prior to export. Results of the analytical work on these produce are not available to the public. The facility is for the exclusive use of COCOBOD and has not yet been used by other organizations.

Some large exporters of fresh fruits have organized voluntary controls, mainly in laboratories in the countries of destination. Due to strict import regulations of the European Union, exporters of pineapple and papaya have expressed interest in having their produce checked for pesticide residue before shipment.

5.4 Conclusions

Some legislative instruments for the implementation of existing laws are either in their draft stage or are outmoded. Pesticide registration is still done on a provisional basis. Restrictions on pesticide use in the country are yet to be effectively enforced. The implementation of some international agreements, e.g. PIC, is yet to be fully effected. This leaves room for non-compliance by importers, input dealers and users, and reduces the transparency of the market.

IPM is the national policy for crop protection. However, there is no coordinated countrywide strategy to implement IPM. New trends in crop protection need to be taken into consideration, e.g. restrictions from importing countries on pesticide residues in food.

Cooperation of the government organizations involved in regulating and enforcing control of pesticide distribution and use is not yet effective. The current institutional framework conditions favor the use of pesticides over alternative strategies.

6 Crop Protection Measures and Pesticide Use

This chapter analyses trends on the use of crop protection measures including pesticides in Ghana. The analysis takes into consideration three aspects: factors influencing crop protection practices, supply of pesticides and price trends.

6.1 Crop Protection Practices

Trends in crop losses

Crop protection is mainly influenced by cropping systems, pest pressure, access to inputs, prices for pest control inputs and crops, available information on crop loss and efficiency of pest control measures. The analysis here concentrates on pest pressure, crop loss and available information for decision-making.

Table A-6.1 lists the main pests and diseases of the most important crops. Most of these pests attack crops in almost all areas. Examples are the capsid bug and Black Pod Disease of cocoa. Some pests appear only under special conditions and in limited areas, e.g. army worms and grasshoppers. The general pest situation in Ghana is typical of other tropical countries where arthropod pests prevail in the dry season and diseases prevail in the wet season.

It has been observed that pest pressure has been increasing of late. Investigations carried out by PPRSD show that invasive pests can sometimes be observed drifting into the country. Other pest outbreaks encountered in the country include the Larger Grain Borer, which attacks dried cassava and stored cereals, especially maize, and Spiraling White Fly. Several native pest species like Army Worms, Variegated Grasshopper, White Fly, Diamond Back Moth and witchweeds have become problematic over the last few decades (BLAY et al. 2000).

So far, there are no reliable or systematic estimates on potential crop losses, either under farm or trial conditions. Surveys of the Yam Disease Project, Savannah Agricultural Research Institute (SARI) and the Crop Research Institute (CRI) indicate that viral diseases attacked 60% – 70% of yam, fungal diseases were found on over 35% of yam leaves and nematodes infected

between 8% and 18.5% of areas planted to yam (GHANA NEWS AGENCY 1999) . However, no estimates were made concerning possible yield losses related to these pests. For vegetable production, losses from pests are estimated between 15% and 50% (NURAH 1999). It is generally assumed that about 30% of all crops/yields are lost through attacks by pests and diseases (NYANTENG and DAPAAH 1997). However, this figure has not yet been confirmed by in-depth research results.

Information channels and decision making

Farmers and agricultural extension officers rely on empirical experience to decide whether direct plant protection measures are necessary or not. Preventive measures like crop rotation, inter-cropping, good hygiene and use of pest-resistant varieties which can reduce pest pressure or possible losses have been recently integrated into extension training programs (MoFA undated). Successful biological control measures are currently limited to a few crops like cassava, maize and mango as well as weeds like water hyacinth and *Chromolaena odorata*. (BLAY et al. 2000). So far, early warning systems are in place for a few pests like army worms and grasshoppers. Such systems are helpful especially for pests that do not appear regularly.

The results of the field survey indicate that farmers receive information mainly from experts i.e. extension staff from MoFA and COCOBOD (GERKEN et al. 2001). Contacts with extension staff and material were linked to farm size. Larger farms contacted more sources of information than smaller farms. Other sources of information include printed extension material, the farmers' own experience, other farmers, labels on pesticides, retailers' material, television/radio and the print media. Retailers supply information to all categories of farmers, especially the illiterate small holders. The higher a farmer's level of education, the more he depended on different sources of information.

The selection of a particular pesticide and its right application depends on available information. Lack of information can lead to unnecessary crop protection measures including over- and misuse of pesticides. The general lack of information on possible losses, on the expected severity of pest outbreaks and on alternative control and protective measures may encourage pesticide use as an insurance against unpredictable losses compared to a situation where more information is available. Pressure may be put on the

farmers by dealers who want to sell their products and by produce buying agencies and traders who demand good quality produce. These interested groups may give recommendations on the selection and application of pesticides.

Recommendations made by pesticide dealers are available to most farmers. Given the limited independent advice from agricultural extension agents or from research, there is the danger that the recommendations of interest groups take the character of obligations rather than neutral advice to farmers.

A list of official recommendations on the main pesticides available on the Ghanaian market is currently prepared by PPRSD. It is so far the only reference list for comparing recommendations by different stakeholders. The list covers only general technical recommendations and does not provide advice for pesticide use at the individual crop level or on economic criteria for decision making.. With the exception of some insecticides[5] and rice herbicides,[6] most other pesticides recommended there are for use for a wide range of crops.

Some wholesalers distribute their own extension material with recommendations on use and application rates. Most of the pesticide labels inspected during interviews with wholesalers in the course of the study were not made specifically for the Ghanaian situation, but bear the manufacturers' general information with non-specific application rates. Some wholesalers train extensionists in the use of their pesticides. Recommendations by dealers differ from the recommendations by PPRSD. Generally, there is limited information for farmers, extensionists and pesticide dealers on the proper and efficient use of the different pesticides.

The lack of information on pest population dynamics and crop loss assessment as well as the lack of independent recommendations on pesticide use limit the farmer's freedom to decide. It can be assumed that most contacts with pesticide dealers or exposure to field demonstrations by wholesalers result in higher pesticide use compared to a situation where objective information is available. As long as there is no independent advice available to

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5 Insecticides with Gamma BHC as active ingredient (Lindane for cocoa, Cocofin and Gampax for seed treatment), Propoxur (Unden) for cocoa, Actellic in some formulations for post-harvest control and Evisect for oil palm.

6 Herbicides for rice: Ronstar, Avirosan, Stam, Garlon and Rilof.

farmers, they will be influenced one way or the other to use pesticides. As long as alternative measures are not well developed, for example biological control or traditional methods, short-term dependence of farmers on chemical pesticides is supported.

About 45% of the respondents in the field survey applied pesticides depending on the intensity of the observed pest, while 46% preferred calendar spraying and 8% applied pesticides based on expert advice. Experts in this context refers to officers of MoFA's extension service, PPRSD staff, produce buying companies or staff of NGOs or other service organizations. More medium- and large-scale farmers did calendar spraying compared to the small-scale farmers. These groups also sought more expert advice before spraying.

The field survey results show that payment for pesticide purchases is largely on cash basis. Only 15% of respondents receive credit from pesticides retailers, buying companies, banks and other sources of credit. These were mostly small- and medium-scale farmers who had credit arrangement with the sources.

Pesticide Use at Crop Level

Results of the field survey conducted during the study, show that chemical pesticides appear to be the most important agents for controlling pests (GERKEN et al. 2001). More large-scale farmers (85% of the farmers in that group) than small-scale farmers (74%) used chemical pesticides. A study by CHILDS (1999) indicates as well that pesticides are used by more than two thirds of the farmers.

The use of traditional products[7] such as vegetable oils, wood ash, neem extracts and other botanical mixtures is well known to farmers especially for the control of storage pests in cereals. In the survey, between 14% and 25% of the farmers, depending on the size of their farms, were found to use various traditional products for crop protection. Small-scale farmers use traditional products for field pests. Large-scale farmers did not use traditional products on the field at all but applied them frequently to stored products. About one-

[7] The term "traditional products" includes all indigenous formulations produced or developed at the farm level for crop protection. They do not include practices of fertilization, manual weed control material, hygiene/sanitation or production techniques like crop rotation.

quarter of all the farmers applied traditional measures for more than one purpose.

The choice of crops determines the use of pesticides by the farmers to a large extent. Starchy staples are usually not treated with chemical pesticides. More than 90% of the farmers who cultivate these crops did not spray them either in the field or in storage. Technically, the most threatening pests of cassava (e.g. cassava mealy bug) were managed with classical bio-control measures. Most other pests were either non-economical or could be dealt with by cultural/ physical measures or choice of varieties (BLAY et al. 2000).

Nearly one-third of the cereal crops are not treated with pesticides, especially sorghum and millet. About 19% of maize is untreated. Post-harvest application of pesticides (46% of all cereals) is more important for the farmers than treatment in the field (37% of cereals, see Table 6.1). For legumes, the general practice is almost the same as for cereals; the share of treatment in the field is higher (57%) while the share of post-harvest application is lower. More growers of legumes use pesticides both in the field and in storage. While almost all the farmers used pesticides for cowpeas in the field, application to groundnuts or soybeans is much lower (GERKEN et al. 2001).

Table 6.1: Use of Pesticides for Different Purposes

(in number of cases and percent, multiple answers)

Crop	Purpose							
	Pesticide in the Field		Pesticide for Post-harvest		No Pesticides at all		**Number of answers**	
	cases	%	cases	%	cases	%	cases	%
Starchy staples	24	8.7	4	1.4	253	91.3	277	101.4
Cereals	93	36.6	116	45.7	82	32.3	254	114.6
Legumes	81	56.6	50	35.0	50	35.0	143	126.6
Vegetables	254	87.0	1	0.3	37	12.7	292	100.0
Fruit	30	73.2	2	4.9	11	26.8	41	104.9
Cocoa	40	93.0	0	0.0	3	7.0	43	100.0
Coffee	7	100.0	0	0.0	0	0.0	7	100.0
Cotton	13	100.0	1	7.7	0	0.0	13	107.7
Pineapple	13	68.4	2	10.5	4	21.1	19	100.0
Other Non-trad. Export Crops	26	39.4	2	3.0	38	57.6	66	100.0
Total	581	50.3	178	15.4	478	41.4	1,155	107.1

Source: Farm survey.

NB: On the average, each of the 271 farmers interviewed grew 4 crops which meant that 1,155 answers were analyzed.

The more a crop is cultivated for sale on the local market or for export, the more it is treated with pesticides. For vegetables, cocoa, coffee and cotton almost all the farmers use chemical pesticides in the field. The same applies to about two-thirds of pineapple and other fruits. For these crops, post-harvest treatment, if it is done at all, is executed by the buyers.

Crops grown mainly for export (cocoa, coffee, cotton, and pineapple) are usually treated intensively with pesticides. Cocoa is treated with Gammalin (Lindane) and Propoxur (Unden) against capsid and other insect pests. There is a high proportion of cocoa farmers who could neither name the particular pest nor the pesticide applied. Obviously, they obtained chemicals without knowing the specific use.

Within the group of non-traditional export crops, only oil palm has a low rate of treatment. Almost three-quarters of oil palm growers do not use chemicals. All other non-traditional export crops are treated in the field.

In vegetable production, especially tomato, a tendency to spray chemical pesticides in short intervals, to use improper application techniques and to disregard waiting periods between spraying and harvesting were observed. Calculations show that high intensities of pesticide use which are used in production for export contribute to higher gross margins (WOLFF 1999). However, the sustainability of intensive vegetable production systems has not yet been investigated.

6.2 Supply and Distribution of Pesticides

All chemical pesticides are imported. There are no official exports of pesticides, so that import quantities and market supply are at about the same level.[8] Imports are mainly formulated products. To a limited extent pure active ingredients are also imported for the cocoa subsector. There is only one pesticide formulation plant and it works exclusively for COCOBOD and Cocoa Inputs Company.[9]

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8 Imports via Ghanaian harbors with destination to neighboring countries (for example Burkina Faso) are not included in official import statistics, because they are handled as transit goods with special customs procedures.

9 Information by Chemico (Ghana) Ltd., September 14, 1999.

Pesticide Imports

Pesticides officially imported between 1995 and 2000 are on average 814 tons (Table 6.2). Insecticides make up 70% followed by fungicides with 14%, herbicides (13%) and nematicides (2.6%). Because the compilation of official records started in 1995, earlier data on pesticide imports is not available. Furthermore, in some cases the official records seem not to cover all imports. For example, Kocide 101, a fungicide and bactericide for cocoa and vegetables, is broadly available on the Ghanaian market, however in the last six years there were no imports reported to CEPS. The 1997 figures were influenced by imports of 1,250 tons of Propoxur (Unden) and Gamma BHC (Lindane), more than twice the figures for 1996 and nearly twelve times the figures for 1995 (see Table A-6.1 in the annex).

Table 6.2: Pesticide Imports by WHO Classification (1995 to 2000)

Hazardous Class		**Quantity (MT)**	**Percent**
I A	Extremely Hazardous	34	0.7
I B	Highly Hazardous	555	11.4
II	Moderately Hazardous	3,040	62.2
III	Slightly Hazardous	966	19.8
IV	Unlikely Hazardous	284	5.8
Total		**4,884**	**100.0**

Source: CEPS (Undated): Declared Chemical Imports to Ghana. Unpublished Working Documents. Accra.

Quantities of pesticides imported over the last four years shows that the most important insecticides are Propoxur (Unden 200) with a share of 21% (one million liters) and Gamma BHC (Lindane) with nearly 20% (955.6 thousand liters) (Table A-6.1 in the annex), used for cocoa. It can be assumed that these quantities were exclusively ordered by the Cocoa Services Division (CSD).

More than 12% of the imported pesticides (based on the product weight) are classified as extremely and highly hazardous (Classes IA and IB of WHO scheme, see Table 6.2), while 62% are in Class II (moderately hazardous). 26% are in classes III and IV. Pesticides classified as most hazardous tend to be cheaper on international markets.

Furthermore, about 47% of the imported pesticides in the examined period belong to the restricted formulations as specified in the relevant draft regulation. Out of the ten restricted pesticides mentioned there, seven can be found on the Ghanaian market. The main ones are Propoxur and Gamma BHC, followed by Atrazine, Endosulfan (Thiodan) and Paraquat (Gramoxone). There were no official imports of banned pesticides within the period.

The biggest manufacturer of pesticides on the market is Bayer (Germany) with an average of 256 tons per year (26% of all imports) due to the high Propoxur shipments, followed by Agro Chemical Industries with 239 tons (24% of all imports), mostly Gamma BHC imports. Novartis (Switzerland) is in the third position with 127 tons per year, followed by Zeneca with 81 tons annual average. These four companies had about 71% share of imported pesticides in the period 1995 - 1998.

The annual total volume of pesticide imports into Ghana is estimated at US $25 million over the 1995 – 1998 period (FAOSTAT 2000). These figures include pesticides for household use and animal health (e.g. insecticides against tsetse flies). According to FAO statistics, there was an upward trend of pesticide imports starting with US $14 million in 1990 and ending with US $30 million in 1998.

Table A-5.3 in the annex shows products found on the Ghanaian market but which have not been officially recorded as imports. There are three categories of these imports outside legal procedures. (1) Pesticides can be found which have been registered with EPA and could therefore be marketed freely on the Ghanaian market. (2) Products which have themselves not been registered but have active ingredients which have been registered in other formulations or products. Such imports and officially imported products might differ in terms of contents of active ingredients which are taken into account to determine their prices. (3) Some pesticides are not registered at all by EPA.

There are neither official records nor estimates on the quantities of unofficial imports of pesticides into the country. It can be assumed that some pesticides are sold country-wide (for example Thionex), while others are traded only along the borders, especially with Côte d'Ivoire (e.g. Callifan, Sherdiphos).

Differentiation of Imports by Sectors

By far the biggest importer of pesticides was COCOBOD through its Cocoa Services Division (CSD, see Table 6.4). However CSD imports have had a decreasing share from 48% of total imports in 1995 to 19% in 1998, with peaks in 1996 and 1997 due to the high imports of Unden and Lindane. With the removal of subsidies on inputs to cocoa farmers and the privatization of the inputs section of the CSD, the role of COCOBOD as an importer has decreased considerably. The private pesticide dealers increased their market share from 44% to 74% in the four-year period. Of lesser importance are MoFA imports under the KR2 program with import quantities of between 34 and 62 tons per year (between 3% and 8% of the imports).

Table 6.3: Pesticide Imports by Sectors from 1995-1998

(in metric tonnes and in percentages of market share)

Sector	**Year**							
	1995		**1996**		**1997**		**1998**	
Public	MT	%	MT	%	MT	%	MT	%
• COCOBOD	213	48	616	66	1,248	69	125	19
• MoFA	34	8	47	5	62	3	47	7
Private	191	44	273	29	516	28	490	74

Source: CEPS (undated)

Distribution of Pesticides by CSD and CIC

The Cocoa Services Division (CSD) imported mainly insecticides and to a lesser extent fungicides. The import policy was to take large quantities of pesticides into stock. In January 1997, the Cocoa Inputs Company (CIC) took over large quantities of the stocks including 2 million liters of Gamma BHC (Lindane), 597,000 liters of Propoxur (Unden), 856,000 liters of fungicides (Ridomil, Kocide, Champion, Nordox) and smaller quantities of herbicides (Roundup) (ISSER 1998). Between January 1997 and April 1998 only 8.3% of the insecticides and 22.1% of the fungicides were sold to cocoa farmers. The CIC sold out the insecticides at reduced prices, from ¢30,000 to ¢20,000 per liter (see Table 6.4). The limited quantities sold out at reduced prices did not reflect any significant trends on the market at the time though cocoa producer prices increased during the period.

Table 6.4: Insecticides and Fungicides Distributed by COCOBOD

Season	Insecticides		Fungicides	
	Price (Cedis/liter)	Quantity (000 liters)	Price (Cedis/kg)	Quantity (kg)
1990/91	2,585	286	3,500	7,717
1991/92	2,585	159	3,500	6,685
1992/93	2,585	170	4,100	5,117
1993/94	1,500	1,059	2,750	27,840
1994/95	1,500	1,296	2,750	54,181
1995/96	1,500	2,294	2,750	35,221
1996/97	30,000	n.a.	n.a.	n.a.
1997/98	20,000	n.a.	n.a.	n.a.

n.a. = not available

Source: COCOBOD, Cocoa Service Division, quoted in: ISSER (1998)

One possible reason for the limited quantities sold between January 1997 and April 1998 might be that farmers and pesticide dealers had bought large quantities of insecticides and fungicides in the 1993/94 and 1995/96 seasons because of the announced removal of subsidies on pesticides. As Table 6.5 shows, in 1993/94 CSD sold more than six times the quantity of insecticides and more than five times that of fungicides sold in the previous season. The peak was in 1995/96 with 2.3 million liters of insecticides sold out, nearly the same quantity as imported at that time.

CSD tried to keep pesticide prices stable, despite inflation and increasing cocoa grower prices. The price of ¢2,585 per liter was kept constant from 1990/91 for four seasons, and even reduced to ¢1,500 for three seasons. With the removal of subsidies in 1996, the price increased to ¢30,000. It can be assumed that before 1996, the subsidy was at least 95% of the market price because conditions of payment etc. were not included and might have been to the advantage of cocoa producers. In 1997/98, the reduction in the prices of insecticides, then the responsibility of CIC, might have resulted from taking over the above mentioned stocks. CIC might have taken over the stocks without financial transfers, so that CIC did not make any losses selling insecticides at ¢20,000 instead of the previous ¢30,000 per liter.

Private Supply Channels

Besides the official channels of pesticide distribution for cocoa there are extensive private supply channels for other crops. These companies can be

divided into roughly three groups: importers, wholesalers and retailers. Some private companies combine all three functions.

Importers usually represent one or more international manufacturers of pesticides. There are six major importing companies which do not represent external pesticide manufacturers.[10] These firms are almost exclusively importers and wholesalers and only to a small extent retailers. Based on the information given in the interviews, it can be assumed that 80% of all privately imported pesticides in 1998 were handled by these six companies. These firms are also the major importers of fertilizer and other inputs like agricultural equipment and seeds.

Besides these specialized firms, general trading companies occasionally import limited quantities of pesticides. Some big farms order their supplies of pesticides and other inputs directly from external wholesalers. Altogether, about 33 importers are currently registered with EPA. Private importers distribute their pesticides either through their own branches or through wholesalers. These wholesalers normally deal in more pesticides than the importers as they stock pesticides from different companies.

The third level of distribution includes the retailers who sell pesticides directly to the farmers. A survey among retailers conducted during this study shows that these are mainly small companies with an average of 2 employees. About 25% of them obtain the pesticides from only one wholesaler, while 71% have contacts with more than one large wholesaler. 30% also deal in pesticides supplied by government institutions.

With the exception of some insecticides for the cocoa sector, pesticides imported are ready-to-use products. Nearly 70% of these pesticides are sold in their original packages, while the remaining 30% are re-packed by retailers into smaller units. Our field survey shows that there are regional differences in the re-packing. However, importers and wholesalers generally sell in the original containers. Re-packing creates problems with handling. Most re-packed pesticides are sold in small containers without proper labeling. For farmers, labels are a main source of information. It is therefore likely that re-packed pesticides are not used in their recommended dosage.

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[10] Chemico (Ghana) Ltd., Wienco (Ghana) Ltd., Dizengoff Ghana Ltd., Reiss and Co Ghana Ltd., Agrimat Ltd. and AgroVets Ltd. All companies have been interviewed for this study in the period of August to October 1999. If not otherwise stated the sources for the following are these interviews.

Intensity of Pesticide Use

In 2000, the total estimated area of land under cultivation was about 6 million ha. Out of the total area, about 1.1 million ha was cultivated with roots and tubers and 510,000 ha with millet and sorghum. For this group of crops, farmers do not normally apply pesticides. For maize, the main pesticides include the herbicides Atrazine and Roundup and the post-harvest insecticide Actellic. Related to the total acreage under maize cultivation, the application rates of herbicides reached 0.02 liters respectively per ha in 2000 (based on the six-year average quantity of the respective pesticides). The average dosage of Actellic in that same year was about 0.1 liters per ton of produce.

In 1995/96 the area under cocoa cultivation was roughly estimated to be about 1 million ha. In that period, COCOBOD distributed 2.3 million liters of insecticides and 35,221 kg of fungicides to cocoa farmers (see Table 6.4). It is likely that all cocoa farmers bought the applied pesticides from COCOBOD due to the subsidies granted at that time. This means that about 2.3 liters product weight of Gamma BHC and Propoxur were applied per ha in the 1995/96 season or almost 0.5 liters of active ingredients were applied. For fungicides, the average dosage based on this calculation would be 35 grams per ha, which seems to be low. This does not mean that these quantities were actually applied. It seems that most of the cocoa farmers did not use the purchased pesticides for the foreseen purpose.

If areas cultivated with roots and tubers, cereals and cocoa are deducted from the total cultivated area in 2000 it means the remaining crops were grown on 2.6 million ha. They include legume, fruit, vegetable, coffee and industrial crops. About 450 tons of pesticides were applied to this group, based on the calculations done above. The average dosage would be about 0.2 liters of pesticides per ha. Assuming that for half of the above mentioned area no pesticides were applied to crops like oil palm and cowpea, the average dosage reached roughly 0.38 liters per ha.

6.3 Pesticide Price Trends

Pricing of pesticides has been one of the main factors influencing their demand by farmers. Important factors are the level of prices and the relationship between real product prices and real pesticides prices. The real prices of some important crops increased slightly in the last years as the

analysis has already shown. Fertilizer prices also increased in real terms. However, the relationship between produce prices and input prices developed in some cases to the advantage of the crops (e.g. maize, tomato).

Long-term price statistics for pesticides are not available. Results of the field survey show no clear picture concerning the trend of prices in the period between February 1998 and December 1999. One would have expected prices to increase due to inflation and depreciation of the Cedi. However, increases did not correlate with the depreciation and related inflation rates. The survey data compiled in the Greater Accra Region showed that in some cases there were even price decreases in nominal terms.

Price setting by the private retailers seem to reflect more the weak demand than the necessary inclusion of transport costs, increasing import prices etc. There was no indication of higher prices in the north, or of generally higher prices over the period, as would have been expected. Price trends did not indicate a significantly adverse effect on farmers taking into consideration the overall economic situation with the fast depreciation of the Cedi. It can be assumed that the situation on the pesticide market was the same as on the fertilizer market (see Chapter 4.4). For some crops the price ratio developed to their advantage, resulting in higher demand for pesticides, while in other cases the pesticide/crop ratio increased resulting in a reduced demand.

MoFA sold limited quantities of pesticides under the KR-2 program. These were mostly herbicides, mainly for rice. With the exception of Londax, a lowland rice herbicide, all other pesticides under KR-2 were available on the market. One herbicide (Atrazine) was on the list of severely restricted pesticides.

Price differences ranged between 7.9% and nearly 60%. The un-weighted average rate of price differences was 34% for herbicides, 44 % for fungicides, and 22 % for insecticides.

6.4 Conclusions

The extent of pesticide use can only be estimated. The official import figures for pesticides do not cover all pesticides found on the market. Insecticides including restricted cocoa pesticides rank highest in terms of imported quantities. There is a high proportion of extremely and highly hazardous pesticides used mainly in the cocoa sector.

Farmers have limited information on pesticides and rely to a large extent on recommendations from pesticide dealers. Labels of pesticides are often not specific enough for farmers to apply the product properly and effectively. It is common practice among pesticide dealers that they repack a large proportion of pesticides for sale without proper labeling. This is in response to farmers demand for small quantities of pesticides due to cash problems and small areas to be treated.

The average rate of application of pesticides per hectare cultivated land is low. There are large differences though between cocoa and vegetables on one side and roots and tubers on the other side concerning actual pesticide use per unit area.

7 External Effects of Pesticide Use

Currently, the general level of pesticide use in Ghana is on the average low. However, negative side effects of pesticides on the environment, water, soil and human health occur. Relevant research activities in Ghana have concentrated mainly on the effects on human health. Other external effects are generally acknowledged, but detailed and quantitative information is superficial and limited.

7.1 Effects of Pesticide Use on Human Health

To analyze the possible side effects of pesticide use on human health, a distinction has to be made between occupational health hazards and pesticide residues in food products and drinking water.

Meeting the minimum requirements of occupational health standards is regarded as one of the elements of sustainable agricultural development. Apart from a limited number of case studies, there are no countrywide statistics on the extent of poisoning of farmers through pesticide application. At least four reasons are responsible for this. (1) Farmers seek medical attention only in cases of serious health problems due to the costs involved. (2) Most of the farmers are not aware of the specific symptoms of pesticide poisoning, so health workers are not informed and therefore cannot draw the right conclusions. (3) The system of health statistics does not clearly specify cases of poisoning. (4) In many cases of poisoning or death no further investigations are done due to the lack of technical facilities for autopsies.[11]

Clarke undertook a field study to examine the extent of pesticide-associated symptoms in farmers involved in irrigation projects in Ghana (CLARKE 1995, 1997). About 36% of the interviewed farmers had experienced negative side effects after applying pesticides. The most significant symptoms included headache, dizziness, fever, blurred vision, and nausea/vomiting. These symptoms were more prevalent with the farmers than with a control group of teachers in the same region. Blood tests for cholinesterase as an indication of residues of organophosphates showed a lower activity band in the farmers

[11] Information by Dr. E. CLARKE and Mr. C. NYADEDZOR, Occupational Health Unit, Ministry of Health. Accra.

compared to the teachers. Cholinesterase levels were influenced by the duration and frequency of pesticide handling.

Clarke showed furthermore that there were direct linkages between knowledge and/or the protective equipment of farmers on the one hand and the extent of negative side effects on the other hand. Most of the interviewed farmers were aware of pesticide-related symptoms and possible routes of pesticide absorption. General awareness of protective devices seemed to be common. However, the transfer of knowledge into practice seemed to be weak. Most of the farmers stored their pesticides in their bedrooms or other rooms in their home and the actual use of protective equipment was limited. For example, only 22% used boots while applying pesticides, and this was the main protective measure. The common reason for non-utilization of protective equipment was unaffordable prices. The majority of the farmers had contact with, and possible exposure to, pesticides while storing, mixing, applying or working in recently sprayed fields.

The investigations carried out for the National Profile to Assess the Chemical Management in Ghana confirmed Clarke's findings on occupational health. The lack of protective measures is a problem not only at the farm level, but also during transportation, distribution and disposal of waste. Empty containers are often re-used for household water or food items. Furthermore, in case of accidents, no first aid kits, showers etc. are available, which lead to more serious consequences for the victim (EPA 1997).

A long-term study on possible poisoning caused by pesticides was carried out by researchers of the Ghana Standards Board and the Department of Pathology of the University of Ghana (ADETOLA et al. 1999). The research analyzed organs of the body, body fluids, foods and drinks submitted by various hospitals and other state institutions in the country to the Forensic Science Laboratory of the Ghana Standards Board. Between 1989 and 1997, about 1,215 toxicological cases were examined. Out of this, 963 cases were tested positively for chemical poisoning. 30% of cases of chemical poisoning were directly related to the misuse of pesticides. The main causes for deaths were carbamates (126 cases), organophosphorous pesticides (66 cases) and organochlorines (74 cases).

Health aspects and the use of protective equipment formed part of the farmers' field survey carried out during this study. The majority of the farmers

interviewed (58% of all respondents) knew of health problems associated with pesticides. The most serious problems farmers associated with pesticide use were general ill health after spraying (42% of respondents) and acute poisoning (17%). Farmers listed the following acute poisoning symptoms: headache, general weakness and dizziness, body pains, nausea and vomiting, stomach-ache and diarrhea. Poisoning was a phenomenon more common among the illiterate farmers. Small- and medium-scale farmers generally experienced more problems with pesticides than large-scale farmers, including phytotoxicity. 48% of the literate farmers reported to have no problem with the application of pesticides.

The survey results show that 88% of the respondents use some form of protective equipment.[12] The main protective items mentioned by the farmers were long trousers, long sleeved shirts, Wellington boots, hats, gloves, respirators, goggles, overalls. Aprons were rarely used by farmers and were not used at all by the small-scale farmers. In general, there was a tendency to use more protective clothing on larger farms. Farmers normally did not use the complete set of protective gear that was technically desirable.

Most farmers (about 53%) store their pesticides either in a farm hut or in their houses though storing pesticides in the house has implications for safety, especially that of children. The majority of farmers (particularly large holders) destroyed empty pesticide containers. About 20% of the farmers used empty pesticide containers for storing pesticides again or for other purposes such as storing fuel, water and seeds. They also sold or disposed of them in other ways without destroying them.

Consumers can be affected through relatively low doses of pesticide residues in drinking water and in food products (long-term effects) or acutely through high doses caused by misuse, wrong application or overdose at the farm level. There are indications of existence of such side effects in Ghana. However, detailed statistical data is missing.

An instance of poisoning when three children died of possible overdose of carbamates in fruits in March, 1999 was reported by the Ministry of Health. Medical investigation after the incident supported the hypothesis of misuse.

[12] Survey results may be biased due to the administration by plant protection inspectors which may have influenced farmers' responses.

Possibly the farmers did not observe the necessary waiting period between pesticide application and harvesting. Furthermore, health workers in that area had not been trained to handle this kind of poisoning, and relevant anti-dotes were not available.[13]

Discussions during the expert meeting organized in the course of this study in September 1999 discussed health aspects in detail. Participants pointed out that the health effects might be underestimated due to the farmers' limited awareness of the risks involved. Even if farmers know about the risks of particularly hazardous and sometimes cheaper pesticides they might feel that they have no option but to use these in order to secure their livelihood. They are therefore prepared to take the health risks. Only cases where pesticide application has had acute consequences are reported. Farmers do not relate negative long-term effects to the practice of using unsatisfactory or inadequate protective clothing. Another issue is that health care centers cannot easily diagnose acute poisoning. The experts agreed that there is a need for building up capacities for control and management of poisoning in general and for poisoning resulting from pesticide use in particular.

7.2 Effects of Pesticide Use on Water, Soil and the Environment

According to investigations carried out for the National Profile to Assess the Chemical Management in Ghana, the level of concern for water pollution and soil contamination is considered to be quite high. At the same time however, the ability to control these problems and the level of information is found to be low or insufficient. The recommended approach for a sound management of pesticides is the development of national baseline data as a basis for assessment of possible impacts and strengthening capacities to monitor and control negative side effects (EPA 1997).

In principle, pesticides can affect water in two ways.

(1) Run-offs from heavily sprayed crops near rivers or disposal of pesticide waste can harm inland water bodies. This has negative consequences on animal and plant life within the water.

[13] Ministry of Health (1999): Internal Memorandum of Poisoning of Children in Adawu Community. Accra; and personal communication with Dr. Clarke, Ministry of Health on August 20, 1999.

(2) Seepage of contaminated rain water which has washed off pesticide from crops or irrigation water into underground water.

The two problems can have negative effects on the drinking water network making it necessary to filter and purify water before use. The two problems can also lead to soil contamination.

In a specific case study, tomato production in two areas was examined to assess the water pollution potential from agrochemicals (KYEI-BAFFOUR and MENSAH 1993). The results received from interviews with farmers and qualitative observation show that intensive tomato production is mainly done at riverbanks for purposes of easy irrigation. This creates the possibility of run-off of fertilizer and pesticides into the river. Many farmers use the water from the river to clean the equipment after applying fertilizer and pesticides. Some even clean the equipment right in the river. The study points out that there is a relationship between education and information levels of farmers and the possible negative effects of agrochemicals on water. Where extension services are available, the farmers use about the recommended dosage of pesticides, while in the absence of any such support, the farmers often apply more than the recommended dosage and often change pesticides. Another aspect is the lack of soil conservation measures which could also accelerate the possible run-off of fertilizer and pesticides.

Organochlorine insecticides were the focus of two studies carried out to examine possible residues in water, crops, fish and human body fluids. An analysis with gas chromatography for both studies showed significant residues in the materials examined. Osafo and FREMPONG (1998) took water and fish samples from three rivers in the Ashanti Region from January 1993 to October 1995. These rivers were selected based on the fact that they flow through areas of intensive agricultural production, mainly cocoa, vegetable and tomatoes. While the analysis of water in 1993 showed low levels of Lindane and no residues of Endosulfan, a similar analysis done in 1995 however showed significant residue levels for both pesticides. The highest quantities were found in the River Oda, which flows through cocoa and vegetable growing areas. Also for fish, the 1995 quantities were higher than the results for 1993. In general, the residues of both Lindane and Endosulfan found in fish were higher than those in water. This might have been caused by the accumulation of pesticides in fish. The residues in fish were under the lethal dose.

A more sophisticated research on possible residues of Lindane and other organochlorine pesticides was done by NTOW (forthcoming). A total of 208 samples for water, sediment, tomato, other crops, farmers' blood and breast milk of women in the Akumadan area (Ashanti Region) were analysed. The results of the water and sediment analysis showed significant levels of Lindane and Endosulfan. These levels were however lower than the levels reported by Osafo and Frempong for samples collected from the same area. The residues in crops could be identified but were under the detection level. The same was true for residues of other organochlorine pesticides tested for. Most of the blood and milk samples analyzed were positive for presence of tested residues. The detected levels were higher than those in the water, which is again an indication that there might be an accumulation of residues in animals and human beings. Altogether, Ntow confirmed that residues of some pesticides are present in areas of highly intensive agricultural production, although there were some cases of low residue levels. Because of their persistent and lipophilic character, there are indications that accumulation might cause serious health problems.

There is limited hard data available so far on negative effects of pesticides on the agricultural sector itself like resistance, pest outbreaks caused by overuse etc. Development of resistance is suspected for White Fly and Diamond Back Moth (CRITCHLEY 1995). Invasive pest species might cause biodiversity threats for the environment. For Ghana a first overview was prepared with twelve pests and their possible damage on other crops, wildlife and water. Their outbreak is mainly caused by a lack of natural enemies. Most of them are open for measures of biocontrol (BLAY et al. 2000).

A cost-benefit-analysis based on the willingness-to-pay method was carried out to estimate the effects of degradation (TUTU 1996). The study covered agriculture, forestry health, tourism and property damage. For agriculture, as main reasons poor agricultural practices, bushfire and overgrazing were found. These factors could lead to nutrient and productivity losses. The use of pesticides was not mentioned in particular. Overall losses were estimated at ¢41,684 million or 4% of total GDP for 1988. The share of agriculture was calculated with 69% of total damage.

7.3 Conclusions

There is lack of adequate information on the extent to which external effects of pesticides affect human health and the environment. The extent maybe considerable, even though the qualitative information is very general. Most of these effects are linked to lack of information, improper application techniques, incentives for overuse, and lack of regulatory monitoring and control.

Many farmers have experienced side effects in the application of pesticides concerning health and phytotoxicity. Despite the awareness of possible dangers from pesticide application, farmers do not use appropriate protective gear mainly due to financial restrictions and lack of awareness. Education and training are inadequate to prevent side-effects.

Pesticide information and poison centers as well as trained medical personal are not in place. The lack of adequate management practices, first aid, diagnosis and treatment can worsen the effects of pesticide poisoning.

8 Stakeholder Perspectives and Policy Recommendations

Crop protection policies are influenced by a wide variety of stakeholders which include government organizations in the agriculture, environment, and health protection sectors, farmers' organizations, pesticide importers and retailers, government parastatals like COCOBOD, exporters and agribusiness units, consumers and other non-governmental organizations. Potentially, all concerned groups provide information, express their views, and exert political pressure in the process of policy making.

In order to improve the information basis for rational policy decision making, the study adopted a two-step approach. An expert meeting was organized in September 1999 to present the preliminary study findings and achieve a consensus related to the status of crop protection in the country. Experts representing different stakeholder organizations were asked to identify and assess the factors that influence current pesticide use levels. In a second step, recommendations for starting a policy reform process were elaborated during a two-day workshop in November 2000, after review of the complete study results.

8.1 Factors Influencing Pesticide Use

Study results were presented to a forum of experts in a preliminary draft[14]. The forum which was based at the inclusion of all relevant stakeholders from governmental and non-governmental organizations aimed at exchanging information on viewpoints, identifying the factors influencing the observed trends in pesticide use, and rating them according to their importance. While participants generally shared the analysis of the prevailing situation in crop protection as given in the report, the assessment of factors influencing pesticide use trends and their possible consequences reflected the different positions of the interest groups.

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[14] Expert meeting in Aburi, September 21, 1999.

Identification of Factors Influencing Pesticide Use

The expert forum included 14 representatives of government bodies (PPRSD, EPA, Ministry of Health, GAEC, GSB, CEPS), 9 from research institutions, 6 from COCOBOD, 1 of the Agro-Chemical Association of Ghana, 6 of other NGOs, and 4 of international and bilateral donor organizations.

The analysis was based on the classification of potential factors according to their mode of influence (price factors and non-price factors. obvious or hidden). A 2 by 2 matrix for identification of pesticide subsidy factors has been used widely in other countries (WAIBEL 1994, FARAH 1994). The experts agreed that most of the factors mentioned for other countries could also be found in Ghana. Examples are tax exemptions and subsidized distribution of pesticides (KR2 program). Most of the non-price factors needed to be defined more precisely to be able to rate them. The experts generally agreed that the lack of information for farmers, the general public and politicians is one of the main factors which have a bearing on the level of pesticide use.

Altogether, the experts identified 24 factors which influence the level of pesticide use. These factors were put into three categories according to their effects. Price factors include the level of agricultural output prices, exemption of pesticides from taxes and import duties as well as preferential distribution of pesticides through specific organizations. The second category consists of factors which are under the direct influence of state policy like promotion of intensive cropping, implementation of legislation and funding of pesticide research. Within the third category are institutional factors and information which have an indirect effect, mostly long-term, on pesticide use.

Based on the results of the discussion, a questionnaire was developed for the rating of the factors identified. The experts were asked to rate them according to a scale from minus five for the most discouraging effect on the level of pesticide use to plus five for the strongest stimulation. Neutral factors were given a zero. For the differentiation of the results, the experts were divided into three groups: ministries, research and NGOs.

Results of the Expert Assessment

The ratings of the 35 returned questionnaires show a high level of accord for some of the factors while there were controversial assessments for the influence of other factors (see Figure 8.1). Indirect subsidies for pesticides

through preferential distribution programs and crop prices are seen as the factors with the highest influence on the current level of pesticide use in Ghana. Although the quantities of pesticides sold under the KR2 program were found to be low compared to the total market volume, this form of preferential distribution is rather unanimously seen as having a considerably high positive influence on pesticide use levels. Also the involvement of COCOBOD and later, CIC is found to have a stimulating effect. All experts agree that the effects of the exemptions on import duties and Value Added Tax have a stimulating effect on the current level of pesticide application, though to different extents (see Table A-8.1 in the annex). Assessments on the removal of subsidies on pesticides differ. While researchers and NGO representatives see a discouraging effect on pesticide use levels, representatives from the ministries judge a slightly stimulating impact. This probably reflects different viewpoints and experiences about the effectiveness of direct input subsidy schemes with regard to availability and actual prices at farm gate during the period of high subsidies.

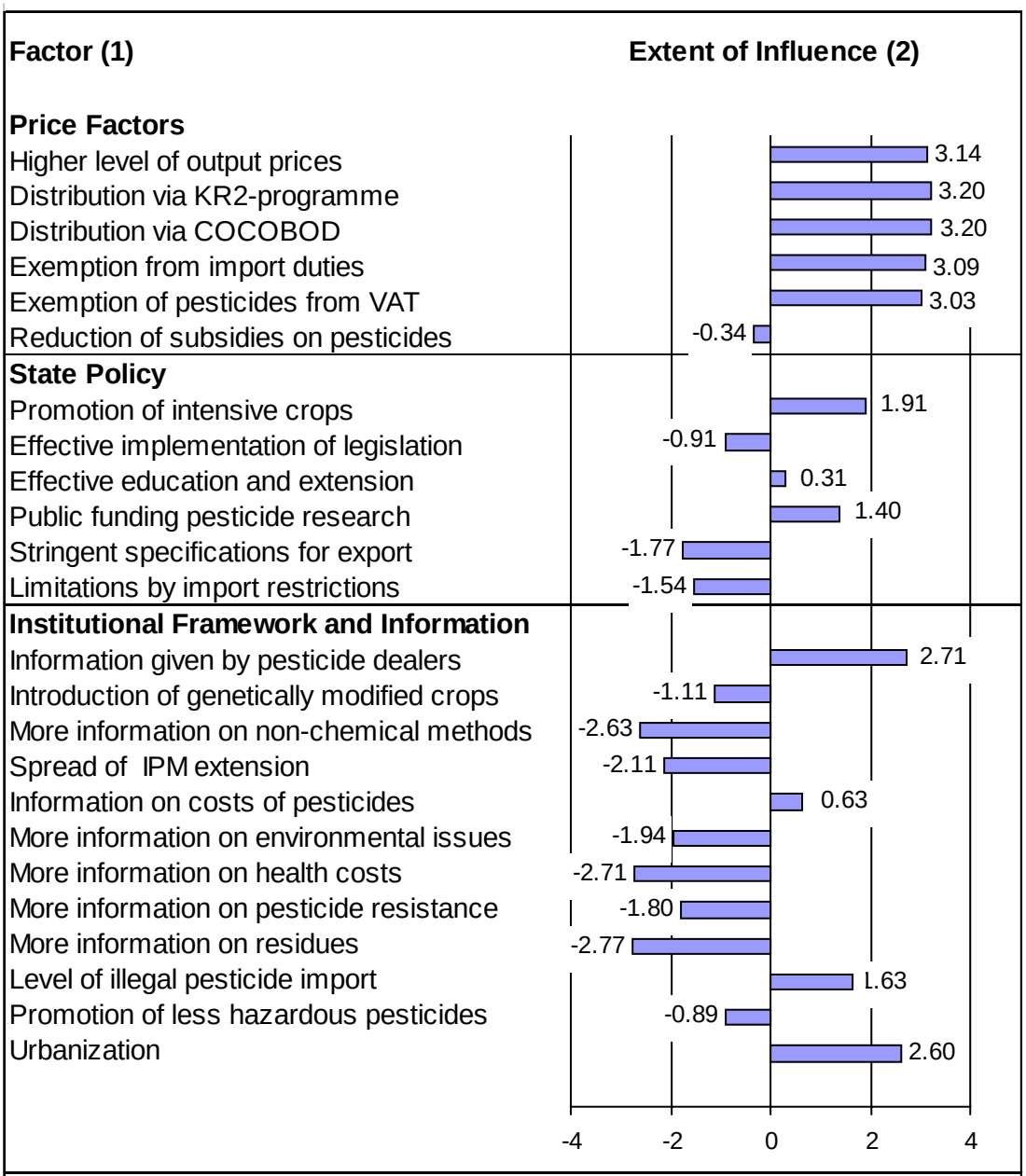
Besides policies influencing the relative input-output price ratio, there are other, more indirect government policies with an impact on pesticide use levels. The experts' rating shows that those policies have a more limited impact. A more effective implementation of current pesticide legislation, especially concerning pesticide management, could have a small discouraging effect. This refers to more stringent controls with regard to possible residues in export crops and possible limitations on the importation of particular pesticides. The experts see residue control as an effective way to control the level of pesticide use (a discouraging effect of -1.7 on the average). Promotion of high value crops, especially those for export, is found to have a stimulating effect on pesticide use. The need is felt for more effective education on, and equally effective extension services for, crop protection. This situation, according to the experts, means that most farmers are not aware of the possibilities of increasing production via optimum application of pesticides. In some cases, this would mean higher, in other cases lower pesticide use compared to current levels.

In general, more information on the negative side effects and on available alternatives would have a discouraging effect on the level of pesticide use. As the experts' rating shows, this refers to health costs, pesticide resistance and residues in food, water, soil and other areas of the environment. All groups of

interviewed experts agree with this viewpoint. As could be expected also, they are of the opinion that the spread of Integrated Pest Management (IPM) extension services and broader information on alternative non-chemical methods could lead to a reduction in pesticide use. They feel the current technical information given by pesticide dealers to farmers has a stimulating effect (+2.7 on the average) as well as the current level of illegal pesticide imports.

The results of the expert assessment reveal the widely held perception among experts of crop protection policy that the fiscal and economic framework conditions might have a decisive impact on pesticide use levels. More information on the negative side effects and possible alternatives to high levels of chemical pesticide use would potentially reduce the amount used. However, the extent to which programs for effective delivery of information to users are implemented is currently limited.

Figure 8.1: Extent of Factors Influencing Current Level of Pesticide Use
- Findings of an Expert Meeting



(1) For full text of factors see Table A-8.2 in the annex.
(2) Average extent of factors influencing current level of pesticide use according to experts opinion. A positive value means a encouraging effect and vice versa.

Source: Proceedings of an Expert Meeting, Aburi, 14 September 1999.

8.2 Recommendations for Policy Reform

The study project on the analysis of crop protection policies in Ghana concluded with a workshop for developing appropriate policy recommendations based on the consolidated study results. The two-day

workshop was held November 15 and 16 in Accra on invitation from PPRSD of MoFA. A multisectoral approach for crop protection policy formulation was considered necessary to achieve all objectives. At the level of the government, this means that the different ministries dealing with aspects of crop protection have to co-operate in developing a policy strategy. This is especially true when it comes to regulatory measures for pesticides. Also the private sector and other non-governmental organizations have to be included because some of the measures need to be executed with their support.

The first objective of the workshop was to bring the different stakeholders together for stimulating better co-operation between the partners. Secondly, facts and conclusions of the baseline study were to be consolidated as a basis for discussions on policy formulation. The third objective was to draft key recommendations and policy statements for a comprehensive crop protection policy to be presented to policy makers. Furthermore the workshop was expected to create awareness for the current situation of crop protection in Ghana and the need for a consolidated policy.

Participants of the workshop included key stakeholders from ministries and other government institutions, the private sector, research institutions, non-governmental organizations, and representatives of projects dealing with aspects of crop protection. Three working groups were established to discuss recommendations in different areas:

- improvement of regulations on crop protection and operationalization of effective procedures,
- improvement of institutional set-up and co-operation in crop protection policy
- development of adequate IPM strategies and related extension programs to improve awareness and adoption.

Effective regulation in crop protection policy

The forum identified the stakeholders dealing with regulatory and implementing services as EPA, PPRSD, Ministry of Health, Ghana Standards Board (GSB), Customs, Excise and Preventive Service (CEPS), MEST, MoFA, Ministry of Trade and Industry, Ministry of Finance, Ghana Atomic Energy Commission (GAEC). Importers/distributors, dealers, commercial operators/

applicators, manufacturers, farmers, farm workers, and consumers are affected by the regulations.

As the regulatory set-up currently has shortcomings, the importance of improvements in specific areas was stressed. The processing of regulations under the Pesticide Control and Management Act (Act 528) should be sped up as major regulatory decisions have not yet become effective. This includes the registration status of pesticides, regulations for sound disposal of obsolete and unwanted pesticides, and the revision of the Seed and Quarantine Laws. It was considered necessary to promote the harmonization of pesticide control schemes in the region. All international conventions signed by Ghana should be ratified and implemented. This includes the ban of all UN red-listed pesticides in Ghana. Implementing agencies should ensure that restricted pesticides are used solely for their intended purpose. Product stewardship of the industry for their products is currently not up to international standards and should be improved. Participants urged regular training for regulatory and implementing agencies.

In the center of the discussions were proposals for sustainable financing of regulatory activities. The funding mechanism for EPA and other organizations performing regulatory and control functions are regarded as lacking sustainability. In order to operationalize an effective regulatory process adequate funding on a regular and reliable basis is needed for infrastructure, equipment, transportation and operational costs (e.g. levies, fees, government funds, community participation).

The forum debated a proposal for a levy on pesticide imports in order to provide a basis of sustainable financing of a Pesticide Control Scheme.[15] A financial levy of up to 5 % would be based on the import value of the pesticide and would partially or fully designated for funding organizations implementing regulatory and control tasks. Because of the link to the amount of pesticide imports this would guarantee a reliable source of funding for regulatory and control activities, independent from government budget decisions.

Participants stressed that a levy system has been proved feasible as the experiences of the Veterinary Services Directorate showed. Parts of the

[15] YEBOAH, P.: Financing a Pesticide Control Scheme. Paper presented at the workshop in Crop Protection Policy in Ghana, November 15 and 16, 2000, Labadi Beach Hotel. GAEC Accra.

collected charges are going to a revolving fund to be used within the service. An additional argument for pesticide levies would be the expected impact on the decision making of users. In view of the increasing cost for the government for control of pesticide regulations and the likely costs for monitoring and curing the effects on human health and the environment, pesticide prices might be currently too cheap in the country. If prices are increased in order to reflect their true costs including the externalities, for example due to an additional levy, impacts on total production costs and on food prices are expected to be small while substantial amounts of funds would be available for regulatory control and IPM extension. Moreover, the higher the price of pesticides the better are the chances for implementing IPM on a broad basis.

Institutional set-up and co-operation

Roles of the different stakeholders need to be clarified since addressees of the current policy are not clear. A unified scheme for the national crop protection organization is necessary because information flows between EPA, CEPS, MoFA and the private sector are insufficient. International trends in pesticide use and pesticide policy have to be considered. This is especially true for Maximum Residue Levels (MRL) implemented by importing countries.

More specifically, participants identified the following shortcomings which should be addressed:

- A clearing house to get information on IPM and pesticides is necessary, one of the task is to develop and run a data bank on pesticides.
- Cases of poisoning caused by pesticides underline the necessity to establish poison control and information centers.
- There is a need for qualified and accredited laboratories for pesticide quality and residue analysis, including building up of capacities to run the laboratories.
- Further research needs to be executed on the influence of different land tenure systems on pesticide use and the economics of pesticide use.
- The current importation procedure for pesticides is inefficient.

It was recommended that EPA should give more attention to pesticides by setting a special department or unit, or consider the establishment of an independent board. The tasks of the board would be the coordination of pesticide quality control, setting up and coordination of poison control centers,

pesticide residue control in food, enforcement of regulations, registration of pesticides.

Participants discussed whether transfer of responsibilities to an independent body could be realized in the short run. One alternative option would be to strengthen EPA by establishing a separate unit with sufficient resources for work. Setting up an independent board might cause frictions in continuation of already started work. Other participants stressed that mechanisms for sustainable funding for pesticide regulatory control should be achieved soon regardless of the status of the responsible agency.

Awareness and adoption of IPM

The participants agreed that adequate information should be developed through identification, updating and documentation of existing information on IPM, including indigenous crop protection knowledge. Information gaps should be filled through research and other scientific sources, followed by packaging appropriately information for different end users. Information has to be disseminated through training of farmers, input dealers, pesticide applicators, government extensionists and researchers. Extension methodologies and strategies should be amended by participatory techniques. Additionally, multi-media promotion and sensitization of stakeholders should be used.

IPM adoption and attitudinal change can be accelerated through decision facilitation of stakeholders to adopt IPM strategies, promotion of farmer to farmer information exchange, and monitoring of adoption rates and environmental, health and economic impacts. For information dissemination participatory training including farmer field schools shall be used. It was emphasized that the community at large including consumers should be sensitized about IPM as an opportunity to reduce dangers from pesticide use.

The participants of the workshop agreed on further activities to develop and implement a comprehensive crop protection policy. Policy makers shall be sensitized to promote sound management of pesticides in the country. Relevant bodies of Parliament shall be lobbied to play an advocacy role in the decision making process. This includes the Committee on Agriculture and the Committee on Finance. For feedback and further action follow-up meetings and consultations shall be arranged. Mechanisms for constant interactions amongst stakeholders have to be established to make implementation more efficient.

9 Conclusions and Recommendations

As Ghana poises herself to be a middle-income country by the year 2020, significant increases of agricultural productivity are expected. The current situation of crop protection is still insufficient concerning reaching the goal of sustainable agricultural development. Existing laws do not function in an adequate way due to inefficient implementation and missing legal instruments. There are still high crop losses and quality problems with already harvested produce. The level of pesticide residues is not controlled in a proper way which might cause problems especially with foreign customers due to strict regulations in the importing countries. Farmers and pesticide applicators as well as consumers are experiencing health problems due to pesticide application. Especially in crops where pesticides are mis- and overused there is a lack of incentives for farmers to switch to crop protection strategies which are in line with sustainable agriculture.

Crop protection policy in Ghana is not yet comprehensive, especially for pesticide use. There are different efforts in the country to improve the situation, however, the coordination between the different stakeholders is not very well developed. Current crop protection approaches have been primarily shaped by isolated technical expertise without taking institutional and economic framework conditions into proper consideration.

Farmers’ knowledge and practices in crop protection are not sufficiently known to provide a sound basis for policy and extension planning. Handling and application of pesticides at farmers' and retailers' level are not satisfactory in terms of effectiveness, safety, the health of farmers, the prevention of side-effects on consumers and the environment.

The current level of pesticide use is generally low, in spite of overuse on some crops. Due to the government strategy of intensified agricultural production, it can be expected that pesticide use will increase in the near future.

Besides economic and technical considerations of the farmers, the level of pesticide use is currently influenced by political, institutional and information factors. Some factors encourage the use of pesticides while others discourage its use. Indirect subsidies and tax reductions have a strong positive effect on the level of pesticide use. The lack of adequate information not only for farmers and dealers, but also for all other stakeholders is currently favoring the

level of pesticide use. Better information should change the structure of pesticide use and will encourage alternative crop protection strategies such as Integrated Pest Management.

Implementation of legal instruments are currently inadequate for controlling and mitigating negative side effects of pesticides. Specific effects of pesticides, e.g. the risks to human health and the environment, have only been partly taken into account by government strategies.

Based on the study results the participants of the policy workshop adopted the following recommendations for addressing crop protection policy reform:

1. The implementing and regulatory agencies shall promote sound pesticide management in the country. There shall be regulatory and implementation agencies adequately funded by government. Sources of adequate funding shall include a) budgetary provisions for the operation of the regulatory and implementing agencies, b) a special levy on pesticides to be used for regulatory and implementation bodies, c) revenues from services provided by regulatory and implementing agencies, and d) initial funding from donors.
2. The Pesticides Control and Management Act 528 shall be amended for EPA to give more attention to pesticides by setting up a functional pesticide control center or alternatively a new law shall be passed to establish a financially independent Pesticide Control Board (PCB) to ensure a unified approach towards pesticide regulation. The board should harmonize the activities of stakeholders to ensure a unified approach of pesticide management. The board shall ensure and establish the set up of functional and standard pesticide and residue analysis laboratories. The board shall develop and build capacities to run the laboratories. COCOBOD's systems of pesticide control shall be integrated into the national control program.
3. IPM policy has to be environmentally sound, sustainable, economically viable, up to date and available to all stakeholders in an appropriate form. While setting up the process for updating IPM information, IPM needs to be clearly defined. IPM information should be mainstreamed into all agricultural and extension training. Adoption of IPM must be facilitated through appropriate methods including participatory farmer training, mass media promotion and consumer awareness.

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Annex

Table A-2.1: VISION 2020 Targets

Indicator	1993	2000	2020
Population growth %	3.1	2.9	1.7
Adult literacy %	60	70	90
Rural population %	65	61	n.a.
GDP/head US $	430	486	1700
GDP growth rate (%)	3.5	5.9	8.3
Sector Composition as % of GDP*			
Agriculture	49	41	32
Industry	16	17	18
Services	35	42	49
Gross Domestic Investment (% of GDP)	16	22	29
Gross Domestic Savings (% of GDP)	8	17	25
Central government expenditure (% of GDP)	20.7	23.1	26.0

* Sector composition as shown in this table for 1993 and 2000 is based on constant 1977 prices and not comparable with shares shown in Table 2.1 in the main text.

Source: NDPC (1997)

Table A-2.2: Foreign Trade of Ghana

(In Million US-$)

	1993	1994	1995	1996	1997	1998	1999
Gold	434,0	548,6	647,2	612,4	579,2	687,8	710,8
Other minerals*	39,6	39,5	31,6	29,0	33,8	30,1	38,3
Cocoa beans	250,5	295,0	361,1	479,8	384,8	538,4	497,3
Cocoa products	35,4	25,2	28,4	73,2	85,2	79,0	52,7
Timber	147,9	165,4	190,6	146,8	172,0	171,0	173,7
Non-trad. agric. prod	26,1	39,2	27,4	50,3	57,4	77,8	84,5
Other non-trad. prod	45,6	80,1	132,3	225,9	271,6	323,9	319,9
Total Exports	1.063,6	1.237,7	1.431,2	1.571,0	1.489,9	2.090,8	2.099,4
Total Imports	1.728,0	1.579,9	1.687,8	1.937,0	2.128,2	2.896,5	3.228,2
Balance of Trade	-664,4	-342,2	-256,6	-366,0	-638,3	-805,7	-1.128,8
Share of Selected Products on Total Export Earnings							
Gold	40,80	44,32	45,22	38,98	38,88	32,90	33,86
Cocoa beans	23,55	23,83	25,23	30,54	25,83	25,75	23,69
Cocoa products	3,33	2,04	1,98	4,66	5,72	3,78	2,51
Timber	13,91	13,36	13,32	9,34	11,54	8,18	8,27
Non-trad. agric. prod	2,45	3,17	1,91	3,20	3,85	3,72	4,02

* Other minerals include diamonds, bauxite and manganese.

Source: Bank of Ghana, cited in IMF (1996)
ISSER (var. issues)
EIU (var. Issues)
Own Calculations

Table A-2.3: Development of Government Finances

(in Billion Cedis at Current Prices)

	1993	1994	1995	1996	1997	1998	1999
Total Revenues	**664,4**	**1.261,0**	**1.784,0**	**2.219,0**	**2.616,0**	**3.339,0**	**3.702,0**
Taxes and Duties	516,1	826,4	1.138,7	1.710,5	2.069,0	2.729,0	3.089,0
Import Duties	81,8	115,0	161,6	228,0	289,6	402,2	1.000,8
Cocoa Export Duties	36,1	133,2	157,2	277,7	265,9	377,5	259,5
Non-Taxes	112,4	395,4	552,3	287,5	376,7	448,0	310,0
Grants	35,9	39,2	93,8	78,0	66,6	162,0	302,0
Total Expenditures	**760,9**	**1.150,0**	**1.714,5**	**2.555,0**	**2.914,0**	**4.383,0**	**5.845,0**
Agriculture, Forestry,Fishing	21,2	19,0	28,7	35,5	41,2	51,2	158,4
Interests on Public Debts	135,9	230,1	328,8	579,3	843,2	1.268,0	1.319,8
Surplus/Deficit							
in Billion Cedis	-96,5	111,0	69,5	-336,0	-298,0	-1.044,0	-2.143,0
in Million US-$	-148,7	116,0	57,9	-205,2	-145,4	-451,1	-809,6

* Provisional outturn.

Source: EIU (var. issues)
Statistical Service (Accra, var. issues)
ISSER (1999)

Table A-2.4: Key Macro-Economic Indicators of Ghana

	1993	1994	1995	1996	1997	1998	1999
Price Indices (1990 = 100)							
Consumer Price Index	162,3	202,7	353,4	473,7	605,8	723,3	813,7
% change to previous year	24,9	24,9	74,3	34,0	27,8	19,4	12,5
Food Price Index	150,2	188,9	302,6	365,5	442,3	529,9	575,9
% change to previous year	24,9	25,8	60,2	20,8	21,0	19,8	8,7
Central Bank Rate (%)	35,0	33,0	45,0	45,0	45,0	37,0	27,0
Exchange Rates (Annual Average)							
Cedis per 1 US-$	649,1	956,7	1.200,4	1.637,2	2.050,0	2.314,2	2.647,3
Cedis per 1 German Mark	390,8	589,5	837,6	1.088,0	1.293,5	1.315,1	1.442,0
Debts and Development Assistance (Mill US-$)							
Total External Debts	4.880,0	5.464,0	5.872,0	6.202,0	5.982,0	6.152,5	6.189,4
Total Debt Service	306,0	366,0	406,0	478,0	506,0	576,5	584,9
Total Debt/GDP (%)	83,3	102,4	92,5	90,4	88,6	79,3	79,5
Debt Service/Exports (%)	25,0	26,1	25,2	26,9	29,5	28,0	27,9
Bilateral Developm. Assistance*	312,4	331,8	358,6	348,9	291,9	374,5	n.a.
Multilat. Develop. Assistance*	310,2	220,5	300,9	307,1	192,9	324,1	n.a.

* net positions
n.a. not available

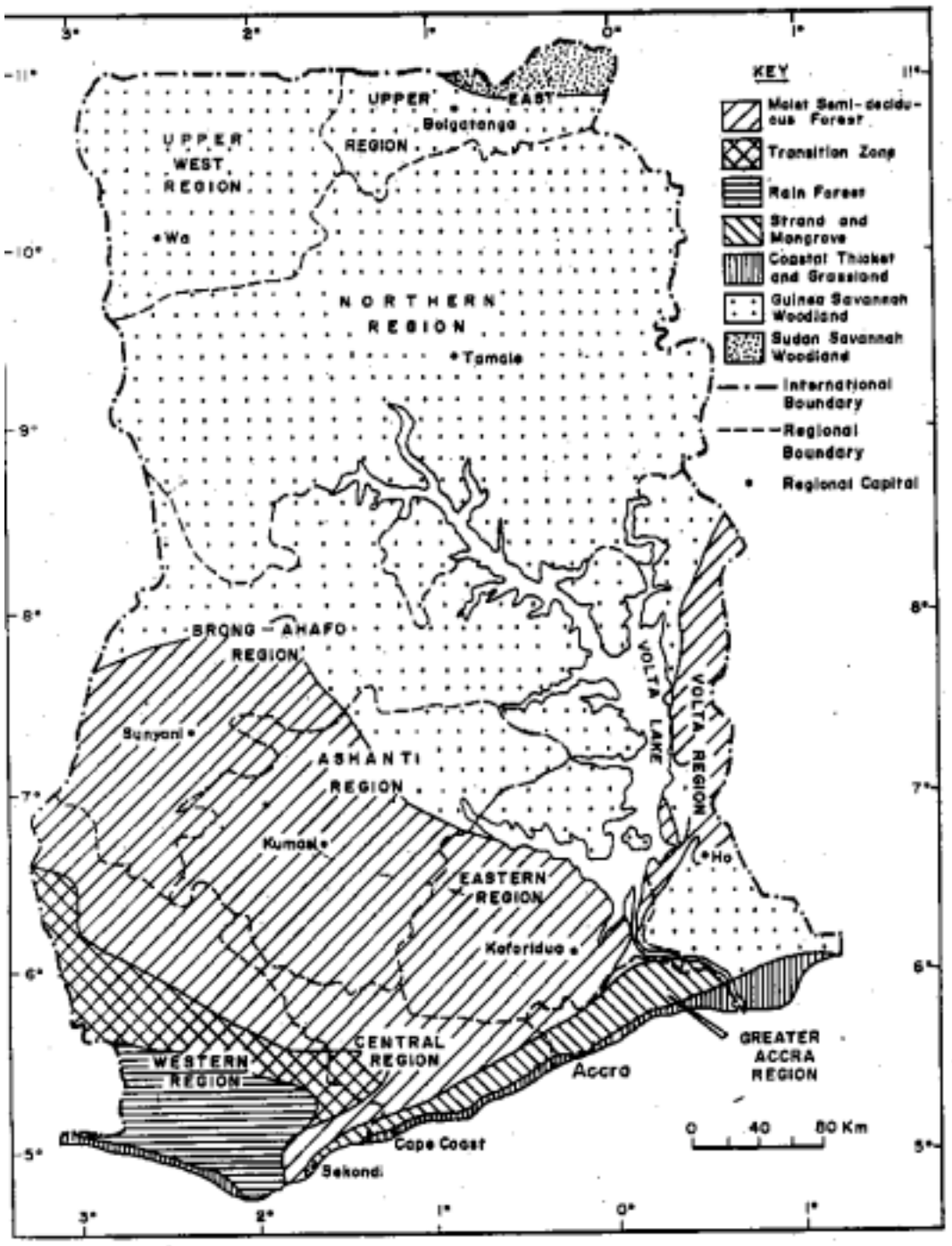
Sources: EIU (var.issues)
ISSER (1999)
Statistical Service (Accra, var. Issues)

Annex A-3.1: Land Use Specific to Agriculture, 1998

Land area	**Hectares**	
Total land area	23,853,900	
Total arable land	13,628,179	57.1 % of total land area
Area under cultivation	*6,000,000*	*44.0% of total arable land*
Area under irrigation	*10,500*	*0.2% of area under cultivation*
Area under inland waters	1,100,000	4.6 % of total land area
Others	9,219,641	38.7 of total land area

Source: MoFA. (1997, 1999)

Figure A-4.1: Map of Agro-ecological Zones and Regions in Ghana



Source: UNDP (1997)

Table A-4.1: Climatic Conditions of Agro-ecological Zones

Zone	**Area (sq.km)**	**Per-cent**	**Rainfall (mm)**	**Rainfall pattern**		**Rainy season**	
			average	*range*	*Mode*	*Major*	*Minor*
High rain forest	9500	4	2200	800-2800	bi-modal	March-July	Oct.-Nov
Semi-deciduous rain forest (Sefwi-Bekwai)	50000	21	1400	1200 – 1600	bi-modal	March – July	Sept – Oct.
Forest savannah Transition (Wenchi)	26200	11	1200	1100 – 1400	bi-modal	March – July	Sept – Oct.
Coastal savan-nah (Ada)	16700	7	800	600-1200	bi-modal	March – July	Sept – Oct.
Guinea savan-nah (Tamale)	17900	54	1100	1000-1200	uni-modal	May – Sept.	--
Sudan savannah (Navrongo)	7200	3	800	500-1000	uni-modal	May – Sept.	--

Source: BADIANE et al. (1992)

Table A-4.2: Major Crops Grown in the Agro-ecological Zones

Zone	**Category of Crops**				
	Cereals	*Roots/ Tubers / Plantain*	*Vegetable/ Legumes*	*Tree crops*	*Industrial crops*
High rain forest	Maize, rice	Cassava, plantain, banana, cocoyam	Pepper, garden eggs, okro	Citrus, coconut, oilpalm, rubber	--
Semi-deciduous rain forest (Sefwi-Bekwai)	Maize, rice	Cassava, plantain, banana, cocoyam	Pepper, garden eggs, okro	Citrus, coffee, oilpalm	--
Forest savannah Transition (Wenchi)	Maize, rice, sorghum	Cassava, plantain, cocoyam, yam	Tomato pepper, garden eggs, okro, Cowpea	Citrus, coffee	Cotton, tobacco, kenaf, groundnut
Northern Savannah	Maize, rice, sorghum, millets	Cassava, yam	Tomato, onion, cowpea, groundnut	Shea-butter	Cotton, tobacco, kenaf, groundnut
Coastal savannah (Ada)	Maize Rice	Cassava	Tomato, shallot	Coconut	--

Source: BADIANE et al. (1992)

Table A-4.3: Distribution of Agro-ecological Zones over the Regions

Zone	**Region**
High rain forest	Western Region
Semi deciduous rain forest	Parts of Western, Eastern, Ashanti, Central, Volta and Brong Ahafo Region
Forest- savannah Transition	Parts of Ashanti, Brong Ahafo, Eastern and Volta Region
Coastal savannah	Parts of Volta, Central, Greater Accra Region
Guinea savannah	Parts of Brong-Ahafo, Northern, Upper West Region
Sudan savannah	Upper East and parts of Upper West and Northern Region

Source: MoFA (1997a)

Table A-4.4: Area under Production for Selected Crops
(In 1000 Hectares)

Commodity/Year	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Non- grain starchy staples													
Yam	204,4	203,0	204,0	119,4	227,3	224,1	206,7	154,2	176,1	178,0	187,0	211,0	243,0
Plantain	189,0	211,0	182,4	129,1	173,5	157,1	164,3	183,5	212,5	228,8	222,5	245,9	253,0
Cocoyam	196,4	249,0	249,0	141,6	202,9	195,9	173,3	178,8	204,5	213,7	205,4	217,7	372,0
Cassava	389,5	444,0	446,0	322,8	534,7	551,9	531,8	520,4	551,3	590,7	592,7	629,6	640,0
Cereals													
Maize	548,3	500,0	595,8	464,8	610,4	606,8	636,7	629,4	688,6	665,0	663,2	696,6	697,0
Millet	235,0	228,2	244,0	123,7	208,5	209,7	203,7	191,2	193,4	189,6	186,8	180,7	186,0
Sorghum	271,6	243,0	295,5	215,2	262,6	307,3	309,6	299,2	334,5	314,3	317,3	332,3	312,0
Rice	72,0	116,6	74,4	88,3	94,9	79,7	77,2	80,9	99,9	105,3	109,4	130,3	105,0

Source: PPMED (1999)
ISSER (2000)

Table A-4.5: Gross Production of Selected Crops
(In Thousand Metric Tonnes)

Commodity/Year	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Non- grain starchy staples													
Yam	1.185,4	1.200,0	1.200,0	877,0	2.631,9	2.331,4	2.720,3	1.700,1	2.125,7	2.274,8	2.417,1	2.702,9	3.249,0
Plantain	1.078,6	1.200,0	1.040,0	799,0	1.178,3	1.082,0	1.321,5	1.474,7	1.637,5	1.823,4	1.877,5	1.912,8	2.046,0
Cocoyam	1.101,8	1.115,0	1.200,0	815,0	1.296,8	1.202,2	1.235,5	1.147,7	1.383,2	1.551,8	1.535,2	1.576,7	1.707,0
Cassava	2.725,8	3.300,0	3.320,0	2.717,0	5.701,5	5.662,0	5.972,6	6.025,0	6.611,4	7.111,2	7.149,6	7.171,5	7.845,0
Cereals													
Maize	597,7	600,0	715,0	553,0	931,5	730,6	960,9	939,3	1.034,2	1.007,6	996,0	1.015,0	1.014,0
Millet	173,1	192,4	180,0	75,0	112,4	133,3	198,1	167,8	209,0	193,3	139,0	162,2	158,0
Sorghum	205,9	177,6	215,0	136,0	241,4	258,8	328,3	323,9	360,1	353,4	320,4	355,5	302,0
Rice	80,7	105,0	67,0	81,0	150,9	131,5	157,4	162,3	221,3	215,7	197,2	281,1	210,0
Export Crops													
Cocoa	227,8	188,2	300,1	295,1	293,4	242,8	312,1	254,7	309,5	403,8	323,1	409,4	420,0
Coffee	0,8	0,4	0,6	1,0	4,9	2,8	0,3	3,9	6,0	2,1	2,7	7,8	n.a.

Source: PPMED (1999)
ISSER (2000)

Table A-4.6: Average Yields of Selected Crops
(In Kilogramme per Hectare)

Commodity/Year	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Non- grain starchy staples													
Yam	5.799,4	5.911,3	5.882,4	7.345,1	11.579,0	10.403,4	13.160,6	11.025,3	12.071,0	12.779,8	12.925,7	12.810,0	13.370,4
Plantain	5.706,9	5.687,2	5.701,8	6.189,0	6.791,4	6.887,3	8.043,2	8.036,5	7.705,9	7.969,4	8.438,2	7.778,8	8.087,0
Cocoyam	56.068,2	4.477,9	4.819,3	5.755,6	6.391,3	6.136,8	7.129,3	6.418,9	6.763,8	7.261,6	7.474,2	7.242,5	4.588,7
Cassava	6.998,2	7.432,4	7.443,9	8.417,0	10.663,0	10.259,1	11.230,9	11.577,6	11.992,4	12.038,6	12.062,8	11.390,6	12.257,8
Cereals													
Maize	1.090,1	1.200,0	1.200,1	1.189,8	1.526,0	1.204,0	1.509,2	1.492,4	1.501,9	1.515,2	1.501,8	1.457,1	1.454,8
Millet	736,6	843,1	737,7	606,3	539,1	635,7	972,5	877,6	1.080,7	1.019,5	744,1	897,6	849,5
Sorghum	758,1	730,9	727,6	632,0	919,3	842,2	1.060,4	1.082,6	1.076,5	1.124,4	1.009,8	1.069,8	967,9
Rice	1.120,8	900,5	900,5	917,3	1.590,1	1.649,9	2.038,9	2.006,2	2.215,2	2.048,4	1.802,6	2.157,3	2.000,0

Source: Tables 4.8 and 4.9 and Own Calculations.

Table A-4.7: Nominal Prices of Selected Crops (In Cedis per Unit)

Commodity	Unit	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Roots and tubers	**(wholesale)**													
Yam	100 tubers	10.769	19.387	23.365	30.102	29.469	29.070	40.098	53.310	82.219	97.487	142.086	202.328	166.434
Plantain	16 kg	453	517	696	1.109	887	1.069	1.610	1.940	4.160	3.693	6.538	8.239	6.099
Cocoyam	91 kg	4.396	4.677	5.399	7.984	7.680	9.117	11.725	16.017	26.260	25.301	42.305	108.249	55.518
Cassava	91 kg	3.595	4.674	2.510	4.274	4.000	4.048	4.048	5.733	9.550	10.289	17.390	27.772	19.235
Cereals (wholesale)														
Maize	100 kg	5.387	6.859	5.300	8.633	9.435	10.048	11.072	13.863	24.708	32.814	64.326	47.676	45.153
Millet	93 kg	5.370	8.755	10.664	10.956	14.363	14.632	17.225	18.357	30.527	42.754	69.918	87.190	72.272
Sorghum	109 kg	5.872	8.326	9.493	10.603	13.405	14.544	18.271	17.918	29.757	43.710	67.156	80.414	66.886
Rice	100 kg	10.631	19.452	32.230	18.662	19.277	21.179	27.330	35.163	55.157	80.520	86.051	97.497	116.463
Legumes (wholesale)														
Cowpeas	109 kg	10.140	15.223	16.578	20.479	23.059	21.861	30.498	35.991	46.428	97.907	109.470	135.093	149.367
Groundnut	82 kg	10.495	12.056	16.275	17.205	20.670	25.973	33.114	34.576	54.409	69.025	114.775	137.637	117.938
Vegetables (wholesale)														
Tomato	51 kg	3.154	2.918	4.652	6.968	8.435	9.118	11.786	14.575	25.023	34.866	56.857	84.426	62.907
Hot pepper		6.324	12.043	12.248	15.243	11.700	25.209	15.592	25.334	40.558	60.272	114.654	105.684	n.a.
Traditional Export Crops	**(Thousand Cedis/Tonne)**													
Cocoa*	Grower Price**	85,0	150,0	165,0	174,0	224,0	251,2	258,0	308,0	700,0	840,0	1.200,0	1.800,0	2.250,0
	fob price	347,3	518,4	420,8	514,4	544,3	556,8	574,9	1.012,3	1.675,6	2.157,1	2.784,7	3.877,9	3.797,7
	proceed***	24,5	28,9	39,2	33,8	41,2	45,1	44,9	30,4	41,8	38,9	43,1	46,4	59,2
Coffee*	Grower Price**	62,3	94,0	156,8	186,0	275,4	300,0	312,0	850,0	2.333,3	2.250,0	1.166,7	2.380,0	n.a.
	fob price	261,1	312,4	396,5	193,8	249,6	453,8	518,9	1.028,2	2.414,3	2.505,8	2.187,2	3.154,5	n.a.
	proceed***	23,8	30,1	39,5	96,0	110,3	66,1	60,1	82,7	96,6	89,8	53,3	75,4	n.a.

* Prices are quoted for the second year of the respective cropyear (October to September)
** Grower Price fixed at the beginning of the season without ex-post compensation.
*** producers proceed = grower price as share of fob world market price in %.
Sources: COCOBOD (1999): Written Information on Cocoa and Coffee Production and Prices, Accra.
PPMED (1999): Written Information on Areas, Production and Prices of Main Crops. Accra.
PPMED (2001): Oral Information on Prices of Main Crops. Accra.

Table A-4.8: Real Prices of Selected Crops

(in Cedis per Unit at Constant 1990 Prices)

Commodity	Unit	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Roots and tubers	**(wholesale)**													
Yam	100 tubers	25.339	34.012	32.724	30.102	27.036	24.165	26.696	28.221	27.171	26.672	32.124	38.184	28.900
Plantain	16 kg	1.066	907	975	1.109	814	889	1.072	1.027	1.375	1.010	1.478	1.555	1.059
Cocoyam	91 kg	10.344	8.205	7.562	7.984	7.046	7.579	7.806	8.479	8.678	6.922	9.565	20.429	9.640
Cassava	91 kg	8.459	8.200	3.515	4.274	3.670	3.365	2.695	3.035	3.156	2.815	3.932	5.241	3.340
Cereals (wholesale)														
Maize	100 kg	12.675	12.033	7.423	8.633	8.656	8.352	7.372	7.339	8.165	8.978	14.544	8.998	7.840
Millet	93 kg	12.635	15.360	14.936	10.956	13.177	12.163	11.468	9.718	10.088	11.697	15.808	16.455	12.549
Sorghum	109 kg	13.816	14.607	13.296	10.603	12.298	12.090	12.164	9.485	9.834	11.959	15.183	15.176	11.614
Rice	100 kg	25.014	34.126	45.140	18.662	17.685	17.605	18.196	18.615	18.228	22.030	19.455	18.400	20.223
Legumes (wholesale)														
Cowpeas	109 kg	23.859	26.707	23.218	20.479	21.155	18.172	20.305	19.053	15.343	26.787	24.750	25.495	25.936
Groundnut	82 kg	24.694	21.151	22.794	17.205	18.963	21.590	22.047	18.304	17.981	18.885	25.950	25.975	20.479
Vegetables (wholesale)														
Tomato	51 kg	7.421	5.119	6.515	6.968	7.739	7.579	7.847	7.716	8.269	9.539	12.855	15.933	10.923
Hot pepper		14.880	21.128	17.154	15.243	10.734	20.955	10.381	13.411	13.403	16.490	25.922	19.945	n.a.
Traditional Export Crops	**(Thousand Cedis/Tonne)**													
Cocoa*	Grower Price*	200	263	231	174	206	209	172	163	231	230	271	340	391
	fob price	817	909	589	514	499	463	383	536	554	590	630	732	659
Coffee*	Grower Price*	146	165	220	186	253	249	208	450	771	616	264	449	10
	fob price	614	548	555	194	229	377	345	544	798	686	495	595	n.a.
Food Price Index		42,5	57,0	71,4	100,0	109,0	120,3	150,2	188,9	302,6	365,5	442,3	529,9	575,9

* Prices are quoted for the second year of the respective cropyear (October to September)

** Grower Price fixed at the beginning of the season without ex-post compensation.

Sources: Table A-4.7 and Statistical Service: Quarterly Digest of Statisitcs. Accra, var. issues.

Table A-4.9: Nominal and Real Fertilizer Prices
(In Cedis per Kilogramme)

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Nominal Prices													
NPK*	27,60	46,00	67,00	84,00	84,00	140,00	170,00	347,40	450,00	620,00	680,00	780,00	780,00
Urea	n.a.	n.a.	n.a.	84,00	84,00	84,00	84,00	321,80	700,00	700,00	840,00	860,00	860,00
AS**	25,40	32,00	47,00	62,00	62,00	128,00	156,00	262,00	320,00	500,00	480,00	440,00	440,00
Muriate of Potash	n.a.	n.a.	n.a.	76,00	76,00	200,00	240,00	300,00	500,00	700,00	760,00	760,00	760,00
Real Prices	**(At Constant 1990 Prices)**												
NPK*	64,94	80,70	93,84	84,00	77,06	116,38	113,18	183,91	148,71	169,63	153,74	147,20	147,20
Urea	n.a.	n.a.	n.a.	84,00	77,06	69,83	55,93	170,35	231,33	191,52	189,92	162,30	162,30
AS**	59,76	56,14	65,83	62,00	56,88	106,40	103,86	138,70	105,75	136,80	108,52	83,04	83,04
Muriate of Potash	n.a.	n.a.	n.a.	76,00	69,72	166,25	159,79	158,81	165,23	191,52	171,83	143,43	143,43

*NPK = Nitrogen-Phosphate-Kalium 15-15-15
**AS = Ammonium Sulphate
Source: ISSER (1998)
NYANTENG, V.K. (1994)

Table A-5.1: Major Pests and Diseases of Selected Field Crops in Ghana

CROP	MAJOR PESTS	MAJOR DISEASES
CABBAGES	Diamond back moth, *Plutella xylostella,* Oriental cabbage webworm, *Hellula undulalis,* Cabbage aphid, *Brevicoryne brassicae*	Bacterial soft rot, *Erwinia carotovora*
CASSAVA	Cassava mealybugs, *Phenacoccus manihoti,* Green spider mites, *Mononychellus tanajoa,* White fly, *Bemisia tabaci* (vector) Larger grain borer, *Prostephanus truncatus* (store)	African Cassava Mosaic Disease Cassava bacterial blight, *Xanthomonas campestris pv. manihotis* Cassava anthracnose disease, *Colletotrichum gloeosporioides*
COCOA	Cocoa mirids/Capsid bugs, *Sahlbergella singularis*, *Distantiella theobroma,* Cocoa mosquito bug, *Helopeltis spp.*, Mealy bugs, *Planococcoides njalensis, Planococcus citri* (vectors of virus) Ants, *Formicidae* (attend mealy bugs)	Black pod, *Phytophthora infestans* Swollen Shoot Virus
COTTON	American bollworm, *Helicoverpa armigera,* Aphids, *Aphis gossypii* Spider mites, *Tetranychus spp., Oligonychus spp*.	Fusarium wilt, *Fusarium oxysporum* Bacterial blight, *Xanthomonas malvacearum*
COWPEAS	Aphids, *Aphis craccivora,* Flower thrips, *Megalurothrips sjostedti* Pod borers, *Maruca sp*., Sucking bugs, *Anoplocnemis curvipes, Clavigralla tomentosicolis, C. shadabi*, and others Cowpea storage weevil, *Callosobruchus maculatus*	Wilts, *Fusarium oxysporum* Anthracnose, *Colletotrichum lindemuthianum*
CUCURBITS	Melon fly, *Dacus sp.*	Powdery mildew, *Erysiphe cichoracearum* Cucumber Mosaic Virus
GARDEN EGGS	Budworm, *Scrobipalpa blasigona* Stem and fruit borer, *Leucinodes orbonalis* Egg plant defoliator, *Selepa docilis*	Damping off in nursery, *Pythium spp.* Root knot nematodes, *Meloidogyne incognita, M. javanica*. Wilt, *Fusarium semitectum*
GROUND-NUTS	Aphids, *Aphis craccivora* (as vector for virus disease) Pod sucking bugs, *Elasmolomus sordidus, Leptoglosus spp.*	Rosette Virus Disease
MAIZE	Stem borers, *Sesamia calamistis, Eldana sp., Busseola fusca,* Army worms, *Spodoptera spp*., Larger grain borer, *Prostephanus truncatus* (storage)	Maize Streak Virus Witchweeds, *Striga spp*.
MILLETS	Stem borers, *Busseola fusca, Eldana sp., Sesamia calamistis, Coniesta ignefusalis,* Army worms, *Spodoptera spp.*	Downy Mildew/Crazy top, *Sclerospora sorghii*

Table A-5.1 (continued)

CROP	MAJOR PESTS	MAJOR DISEASES
OKRA	Flea beetle, *Podagrica uniformis, Nisotra (Podagrica) sp., Podagrixena decolorata* (virus vector), Cotton aphid, *Aphis gossypii*. White fly, *Bemisia tabaci*	Root knot nematodes, *Meloidogyne incognita, M. javanica* Leaf Curl Virus
ONIONS	Onion fly, *Delia antiqua*, Onion thrips, *Thrips tabaci*	Downy mildew, *Peronospora destructor* Bacterial rot, *Erwinia carotovora* (storage)
PEPPERS		Root knot nematodes, *Meloidogyne incognita, M. javanica*
PLANTAINS	Banana/Plantain weevil, *Cosmopolites sordidus*	Free living nematodes, *Radopholus similis, Pratylenchus coffeae, Helicotylenchus multicinctus* Sigatoka disease, *Mycosphaerella musicola*
RICE	Stalked-eyed fly, *Diopsis spp.,* Army worms, *Spodoptera spp.,* Green leafhopper, *Nephotettix spp.,* Rice sucking bugs, *Stenocoris* spp., *Mirperus spp., Aspavia spp., Riptortus spp., Nezara viridula*	Brown leaf spot, *Cochliobolus miyebeanus*, *bipolaris= (Helminthosporium oryzae*), Rice blast, *Pyricularia oryzae* Witchweeds, *Striga asiatica*
SORGHUM	Sorghum shoot fly, *Atherigona soccata,* Stem borers, *Busseola fusca, Sesamia calamistis, Eldana* sp., Army worms, *Spodoptera spp*	Downy Mildew, *Sclerospora sorghii,* Witchweeds, *Striga spp*.
SOY BEANS	Cotton aphid, *Aphis gossypii,* Sucking bugs, *Anoplocnemis curvipes, Clavigralla tomentosicolis, and others*	Anthracnose, *Colletotrichum truncatum, C. glycines*.
SWEET POTATOES	Sweetpotato weevils, *Cylas spp.,* White fly, *Bemisia tabaci* (as vector for virus)	Sweet Potato Virus Disease Complex
TOMATOES	Leafminers, *Liriomyza spp.,* White fly, *Bemisia tabaci* (as vector for virus), American bollworm, *Helicoverpa armigera* Fruit fly, *Rhagoletis ochraspis*	Root knot nematodes, *Meloidogyne incognita, M. javanica* Damping off, *Pythium spp.,* Early blight, *Alternaria solani,* Wilts, *Fusarium oxysporum f. sp. Lycopersii,* Root and stem rot, *Fusarium solani,* Rots, blight, cankers*, Phoma spp., Phomopsis spp.* Tomato Yellow Leaf Curl Bigeminivirus (TYLCV)
YAMS	Yam mealy bug, *Dysmicoccus brevipes* Yam tuber beetle, *Heteroligus meles* Millipedes, *Chilopoda*	Anthracnose, *Colletotrichum gloeosporioides* Fusarium wilt, *Fusarium oxysporum* Virus diseases complex, Shoe-string Storage rots, *Erwinia carotovora, Penicillium oxalicum, Fusarium spp.*

Source: BLAY et al. (2000)

Table A-5.3: List of Formulations on the Market Not Recorded on Official Imports from 1995-1998

Formulation	Active Ingredient	Retail Price (06/1999) in Cedis	Registration with EPA	WHO Toxicity Class
		1L or Kg		
Delthrin 10 EC	Cypermethrin	28,000	*	II and III
Chemothin 10EC	Cypermethrin	28,000	*	II and III
Thionex 35 EC	Endosulfan	25,000	*	II
Agro-trothion 50 EC	Fenitrothion	24,000	*	
Dipterex 80 SP	Trichlorfon	30,000	no	III
Shidiphos 420 EC		20,000	yes	
Polyram DF	Mitiram	12,000	no	
Deltaphos 262 EC		20,000	no	
Funguran – OH 50 WP	Copper-hydroxide	24,000	*	III
Klerat Pellets	Brodifacoum	8,500	yes	Ia
THAF Flowable Sulfur	Sulphur	20,000	no	III
Chemosate 36 Ol		21,000	no	
Bayleton Ultra disper.	Tradimeton	22,500	no	III

* Other formulations of the same Active Ingredients are registered.

Sources: PPRSD (1999), EPA (1994), Yeboah (1999)

Table A-5.4: Prices and Imports of Pesticides under the KR2-Programme
(in Cedis per Litre or Kilogram)

Pesticide	Wholesale Price KR2 1998/99	Price Reduction (% of Retail Price)	Agreed Quantities		
			1997 (l, kg)	1998 (l, kg)	1999 (l, kg)
Insecticides					
Actellic Super EC	28,000	31.7	4,000	2,850	3,593
Dursban 4E	30,000	21.1	4,000	5,000	4,900
Sumicombi 30EC	26,000	25.7	- -	- -	4,900
Sumithion			- -	- -	8,819
Cyhalon	35,000	7.9	- -	- -	- -
Regent (Fipornyl)	--	--	--	--	2,970
Herbicides					
Stomp	15,000	34.8	2,000	- -	3,248
Satunil	12,000	36.8	6,500	3,600	6,470
Rilof	12,000	33.3	7,000	--	- -
Herbit Plus	15,000	46.4	- -	- -	- -
Round up	18,000	30.8	5,000	5,000	6,370
Lasso	6,000	33.3	- -	- -	- -
Atrazine 80WP	12,000	45.5	- -	- -	5,880
Primextra 50FW	12,000	25.0	- -	- -	- -
Londax	250,000	--	- -	- -	129
Basta	16,000	27.3	5,000	--	- -
Basagram	15,000	31.8	8,000	2,900	- -
Fungicides					
Tilt 250 EC	10,000	37.5	1,000	--	- -
Topsin M	12,000	59.3	3,000	5,150	4,897
Dithane M45	8,000	46.7	5,000	10,000	- -
Agromil MZ	n.a.	--	--	--	1,960
Benlate	15,000	33.3	- -	- -	- -

Source: PPRSD (1999), MoFA (1999a), Retailers Field Survey and Own Investigations.

Table A-6.3: Imports of Pesticides by Brand Name and Active Ingredient

(In Kilogramme or Liters)

					Import Gross Weight					
Class	**Brand Name**	**Formulation**	**Manufacturer**	**Active Ingredient**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
Insecticides										
IA	Phostoxin	3g TABLETS	AIMCO PESTICIDES	Aluminium Phospide	5.698	0	11.467	2.500	0	0
IA	Temik	GRANULES	RHONE-POULENC.	Aldicarb	3.000	0	0	2.010	0	0
IB	Azodrin	E.C.	HINDUSTAN INSECTICIDES	Monocrotophos	0	0	1.000	0	0	0
IB	Callifan	60 E.C.	MILENIA AGRO GENCIAS S/A	Endosulfan	6.672	2.167	0	32.000	33.800	48.000
IB	Degesch Plates	PLATE	DEGESCH AMERIKA	Magnesium Phosphide	720	0	0	0	0	0
IB	Karate	2.5 E.C.	ZENECA	Lambda-cyhalothrin	14.754	23.992	29.400	47.028	33.000	13.000
IB	Super Homai	70 WP	NIPPON SODA CO. LTD.	Thiophanate methyl +Thiran	0	0	0	5.000	0	0
IB	Thiodan	360g GRANUI	HOECHST S. AGREVO LTD.	Endosulfan	11.304	12.925	32.800	11.000	14.000	0
II	Actellic	2.5 E.C.	ZENECA	Pirimiphosmethyl	17.700	1.300	15.158	5.500	0	0
II	Carbamult		Hoechst Schering Agrevo	Promecarb	0	0	0	0	200.000	0
II	Cymbush	10gm E.C.	ZENECA	Cypermethrin	600	0	18.350	52.000	2.000	0
II	Cymethsate	E.C.	ZENECA	Cypermethrin+Diamethsate	5.000	5.000	0	3.750	5.000	0
II	Decis	E.C.	AGREVO S.A.	Deltamethrin	0	24	5.000	11.000	11.500	8.000
II	Evisect S	50 WP	NOVARTIS	Thiocyclam Hydrogen Oxala	4.200	0	3.020	0	0	0
II	Fertigofol		Vector Agro SA:	Fertifenophos	0	0	0	0	12.000	6.000
II	Karate+Dursban	2.5+48 E.C.	ARAB PESTICIDES	Lambda-cyhalothrin plus Chlorpyrifosmethyl	0	8.400	58.800	72.200	0	0
II	Lentrek	E.C.	AIMCO PESTICIDES	Chlorpyrifos	0	1.000	0	0	0	0
II	Lindane	20gm E.C.	AGRO CHEMICALS INDUS.	Gamma BHC	0	300.000	655.600	0	0	0
II	Nurelle	48g E.C.	ZENECA	Cypermethrin+Chlorpyrifos	0	0	5.870	16.000	26.000	10.000
II	Perfekthion	40 E.C.	BASF.	Dimethoate	1.925	0	5.000	10.380	0	0
II	Permethrin		AAKO B:V:		0	0	0	0	6	0
II	Polytrin	C 165 UL	AAKO B.V. Agrides SA:	Cypermethrin	0	0	0	0	34.000	20.000
II	Polytrin	SC	American Cyanamid	Cypermethrin	0	0	0	0	14.000	12.000
II	R-300	3.0% WS	WHITMIRE MICRO-GEN.	Resmethrin	0	0	11.800	14.468	0	0
II	Sherdiphos	E.C.	MITSUI CHEMICALS	Cypermethrin+Triazophos	0	0	0	6.000	20.000	0
II	Sumicidin	30 E.C.	SUMITOMO	Fenvalerate	0	0	10.494	2.500	0	0
II	Sumithion	50 E.C.	SUMITOMO	Fenitrothion	5.000	9.975	16.000	6.500	4.000	0
II	Trebon	40 E.C.	MITSUI CHEMICALS	Ethofenprox	5.200	0	0	0	3.000	0
II	ULV 600 S			Pyrethroids	0	0	0	0	10.000	21.000
II	Unden	20gm E.C.	BAYER	Propoxur	100.000	300.000	602.000	0	0	0
II	Sodium Silicate		Jewnin-Joffe Industry Ltd.		0	0	0	0	95	0
III	Biobit	WP	ABBOT LAB. INCO.	Bacillus thuringiensis	700	250	0	0	0	0
III	Cypercal	P 336 EC	Cypercopal, Gilmore Inc.		0	0	0	0	22.000	103.000
III	Diazinon	40 WP, E.C., (	NOVARTIS	Diazinon	10.220	0	0	609	0	0
III	Dursban	480g E.C.	DOW AGROSCIENCES LLC	Chlorpyrifosmethyl 48gm	0	5.000	37.680	48.300	4.000	6.000
III	Malathion	50 WP, E.C.	ZAGRO ASIA LTD.	Malathion	0	0	0	609	0	0
IV	Pybuthrin	E.C.	AGREVO	Piperonyl Butoxide	1.000	100	0	0	0	2.625
				Sub-Total Insecticides	**193.693**	**670.133**	**1.519.439**	**349.354**	**448.401**	**249.625**

Class	Brand Name	Formulation	Manufacturer	Active Ingredient	1995	1996	1997	1998	1999	2000
Herbicides										
IB	Gramoxone	276g E.C.	ZENECA	Paraquat	2.000	18.560	25.640	2.500	12.000	0
II	Bravo		AAKO B.V.		0	0	0	0	0	10
II	Dual	500 E.C.	NOVARTIS	Metolachlor	14.000	0	0	0	0	0
II	Fusilade	125 E.C.	ZENECA	Fluazifob-butyl	1.440	3.696	4.000	3.000	2.000	0
II	Glyphosphate	360 SC	Sanonda Co Ltd.	Glyphosate	0	0	0	0	3.000	7.000
II	Hyvar X	80 WP	DUPONT AGRIC. PRODUCTS	Bromacil	2.800	2.240	3.238	6.500	2.000	1.200
II	Rilof		NOVARTIS	Piperophos	2.300	0	0	95.002	4.500	0
II	Roundup	36% E.C., GR	MOSANTO CO.	Glyphosate	3.347	3.998	13.240	32.914	23.500	7.000
III	Atrazine	80 WP, E.C.	AAKO B.V.	Atrazine	24.500	22.960	28.700	5.000	2.000	0
III	Basagram	160+340	BASF.	Bentazon+Propanil	5.000	0	0	2.700	25.000	13.000
III	Basta	20gl	HOECHST S. AGREVO LTD.	Glufosinate-Ammonium	5.000	0	0	2.500	0	0
III	Diuron	80 WP	BAYER	Diuron	5.000	3.960	7.044	6.500	1.584	1.000
III	Herbit Plus	60+300 E.C.	HOKKO CHEMICAL INDUST.	Phenothiol	0	0	7.000	0	0	5.000
III	Lasso	480g E.C.	MOSANTO CO.	Alachlor	5.100	0	1.800	15.000	0	0
III	Propanil	40% E.C.	RICECO.	Propanil	0	0	16.000	15.200	0	0
III	Ronstar	250 E.C.	RHONE-POULENC.	Oxadiazon	9.100	0	10.000	28.000	20.000	12.820
III	Satumil	40% E.C.	KUMIAI CHEMICAL CO.	Thiobencarb	6.000	0	9.400	2.500	0	0
III	Stomp	500g	AMERICAN CYANAMID CO.	Pendimethalin	2.000	0	0	2.500	0	0
IV	Garlon	240 E.C.	DOW AGROSCIENCES LLC	Triclopyr	1.000	0	6.160	5.000	2.000	0
IV	Londax	600g GRANUL	DUPONT AGRIC. PRODUCTS	Bensulfuron-methyl	0	0	70	0	0	0
				Thiobencarb+ Propanil	0	0	0	0	0	5.000
				Sub-Total Herbicides	**88.587**	**55.414**	**132.292**	**224.816**	**97.584**	**52.030**
Fungicides										
I	Sodium Pentaborate		Chapman Chemical		0	0	0	0	0	1.500
IA	Bavistin	200g GRANUL	BASF.	Carbendazim	200	0	0	0	0	0
II				Manro Antistani	0	0	0	7.200	0	0
III	Aliette	80 WP	RHONE-POULENC.	Fosetyl-aluminium	720	14.720	0	5.000	0	0
III	Ridomil	25 E.C., WP	NOVARTIS	Metalaxyl	112.000	116.000	48.000	100.000	0	0
III	Sportak Sierra		Agrevo UK Ltd		0	0	0	0	54	60
III	Thianosan		Biesterfeld Group	Thiram	0	0	0	0	20	0
III	Tilt	250 E.C., WP	NOVARTIS	Propicoazole	2.000	0	0	0	0	0
IV	Benlate	50 WP	DUPONT AGRIC. PRODUCTS	Benomyl	630	840	6.000	500	0	0
IV	Dithane M45	WP	ROHM AND HAAS CO.	Mancozeb	18.000	4.200	31.500	31.500	5.000	0
IV	Mancozeb		Agrides SA, Agsin Ptc Ltd.	Mancozeb	0	0	0	0	5.000	0
IV	Maneb		Besterfield Group	Maneb	0	0	0	0	0	12.500
IV	TopsinM	700g WP	ELF ATOCHEM NORTH AMERI	Thiophanate-methyl	0	0	8.150	10.000	0	0
IV	Trimangol	WP	ELF ATOCHEM NORTH AMERI	Maneb	0	55.800	36.000	28.500	12.000	0
	Folicur		Bayer	Tebuconazole	0	0	0	0	0	5
	Folicure	EW 250	Agsin Pte Ltd.		0	0	0	0	0	5
				Sub-Total Fungicides	**133.550**	**191.560**	**129.650**	**182.700**	**22.074**	**14.070**
Nematicides										
IA	Marshall	80 GRANULE	FMC CORP.	Carbosulfan	0	0	1.000	1.000	0	1.000
IA	Mocap	20g E.C.	RHONE-POULENC.	Ethoprophos	0	2.167	0	2.500	0	0
IB	Furadan	3g GRANULE	VIETNAM PESTICIDE CO.	Carbofuran	20.625	20.000	45.000	1.500	20.000	0
IB	Rugby	10g GRANULE	FMC CORP.	Cadusofos	0	0	4.995	0	0	4.000
Growth Regulators				**Sub-Total Nematicides**	**20.625**	**22.167**	**50.995**	**5.000**	**20.000**	**5.000**
IB	Ethephon			Ethephon	0	0	2.000	0	3.500	64
				Total Imports	**436.455**	**939.274**	**1.834.376**	**761.870**	**591.559**	**320.789**

Source: CEPS (Undated)

Table A-8.1: Factors Influencing Current Level of Pesticide Use - Results of an Expert Rating

Factors	Ministries	Research	NGO, others	Total	Range	
	Average	Average	Average	Average	Maximum	Minimum
Price factors						
Higher level of agricultural output prices	3,42	3,75	2,18	3,14	5	-5
Distribution of pesticides via MoFA (KR2-programme)	3,42	3,25	2,91	3,20	5	1
Import and distribution of pesticides throuh COCOBOD	3,17	3,08	3,36	3,20	5	-2
Exemption of pesticides from import duties	4,00	2,42	2,82	3,09	5	2
Exemption of pesticides from VAT	3,83	2,42	2,82	3,03	5	1
Reduction of subsidies on pesticides on farm level	1,25	-0,50	-1,91	-0,34	4	-4
State Policy						
Promotion of intensive crops (incl. bio-pesticides)	0,75	2,00	3,09	1,91	4	-5
Effective implementation of current pesticide legislation	-0,67	-1,50	-0,55	-0,91	3	-3
Effective education and extension on current crop protection	0,50	-0,67	1,18	0,31	4	-4
Current public funding of crop protection and pesticide research	1,58	0,83	1,82	1,40	4	-3
More stringent specifications for export crops on residue issues	-1,17	-2,25	-1,91	-1,77	5	-5
Limitations by import restrictions imposed by government	-0,83	-2,00	-1,82	-1,54	2	-3
Institutional Framework and Information						
Current technical information given by pesticide dealers	3,17	2,42	2,55	2,71	5	2
Introduction of genetically modified crops	-1,92	-2,25	1,00	-1,11	1	-4
More information on non-chemical methods	-2,58	-3,17	-2,09	-2,63	1	-5
Spread of Integrated Pest Management (IPM) extension	-1,58	-3,00	-1,73	-2,11	4	-5
Information on costs of pesticides in relation to turnover	0,92	0,42	0,55	0,63	3	-3
More information on environmental issues	-2,00	-2,92	-0,82	-1,94	1	-4
More information on health costs	-2,67	-3,75	-1,64	-2,71	3	-5
More information on pesticide resistance	-2,33	-2,25	-0,73	-1,80	1	-5
More information on residues in water, soil, food etc.	-3,00	-3,25	-2,00	-2,77	-2	-5
Level of cross-border illegal pesticide trade	2,58	0,92	1,36	1,63	5	-4
Promotion of less hazardous pesticides with higher price	-0,75	-0,92	-1,00	-0,89	2	-4
Urbanisation, increasing use of vegetables, urban agriculture	2,83	2,25	2,73	2,60	4	2

Source: Proceedings of an Expert Meeting, Aburi, 14. September 1999.

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http://www.pesticide-policy-project.de