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Evaluation of government interventions in Ghana's forest product trade: a post-intervention impact assessment and perceptions of marketing implications

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EVALUATION OF GOVERNMENT INTERVENTIONS IN GHANA'S FOREST PRODUCT TRADE: A POST-INTERVENTION IMPACT ASSESSMENT AND PERCEPTIONS OF MARKETING IMPLICATIONS

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DEDICATION

To my sister, Jemima who has made the greatest
contribution towards my education

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PREFACE

This dissertation comprises five chapters. Each chapter constitutes a complete manuscript covering a separate research work. Therefore there is repetition of information that are common to the chapters especially country description and methodology; readers could therefore skip these repeated materials without loss of continuity.

The first chapter of this document describes the Ghana forestry sector. The second chapter is on the framework of government interventions in the Ghana forest product trade and models development for the studies in chapters three, four, and five.

Chapter 3 is on the study of impact of raw material regulation and introduction of air-dry levy as strategies for increased further processing. Chapter four presents the appraisal of government interventions for diversification of species utilization in forest product exports.

The last chapter captures marketing implications of government interventions in Ghana's forest product trade. The study aims to identify marketing needs of companies that might consider going into further processing.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Since the mid 1990s Ghana's forestry sector has been going through reforms geared towards achieving the ITTO Year 2000 Objective for sustainable forest management and forest product trade. The reforms were partly introduced through legal approaches and also through activities under a long-term Forestry Sector Development Master Plan. The legal approaches mainly dealt with strengthening of sector institutions to effectively carry out forest concession administration and management, stumpage fee increases and more punitive actions against forest offences. Reforms with more direct impact on forest product export trade came through the implementation of the Forestry Sector Development Master Plan – reduction in annual allowable cut (AAC), introduction of air-dry levy, and promotion of value-addition and lesser-used species (LUS). These actions have infuriated the forest product industry blaming the government for a collapsing industry as a result of the interventions.

This study evaluated the impacts of the interventions believed to be directly affecting the forest product export trade and perceptions of marketing implications. The study concluded that: -

1. The drop in raw material level has influenced increasing export of kiln-dried lumber and processed lumber molding. The air-dry levy is observed to be working well as a disincentive to export of commodity products by reducing export of air-dried lumber and increasing kiln-dried lumber and sliced veneer.
2. The air-dry levy showed a significant effect with an increase in percent of LUS (used as a measure of species diversification) exported in the post-intervention time period.
3. There is the need to improve machinery upgrade to include CNC technologies,

relationship with buyers, strengthening of the wood inspection authority, flexibility in terms of trade, Internet capabilities, and financial support to the industry.

ABSTRACT

Since the mid 1990s Ghana's forestry sector has been going through reforms geared towards achieving the ITTO Year 2000 Objective for sustainable forest management and forest product trade. The reforms were partly introduced through legal approaches and also through activities under a long-term Forestry Sector Development Master Plan. The legal approaches mainly dealt with strengthening of sector institutions to effectively carry out forest concession administration and management, stumpage fee increases and more punitive actions against forest offences. Reforms with more direct impact on forest product export trade came through the implementation of the Forestry Sector Development Master Plan – reduction in annual allowable cut (AAC), introduction of air-dry levy, and promotion of value-addition and lesser-used species (LUS). These actions have infuriated the forest product industry blaming the government for a collapsing industry as a result of the interventions.

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PROBLEM STATEMENT AND JUSTIFICATION

PROBLEM STATEMENT

Ghana's quest for sustainable forest management has motivated the country's involvement in a number of environmental agreements notable among which is the ITTO Year 2000 Objective. As a result, the Ghanaian forest product industry has had to deal with a number of policy issues impacting the trade. The Forest and Wildlife Policy of 1994 served as a gateway through which major reforms have been carried out – the preparation of the Forestry Sector Development Master Plan and the subsequent implementation of its recommendations. Among the recommendations, those with direct effect on forest product export trade included:

- reduction in annual allowable cut from 1.2 million to 1.0 million m^3 in late 1995,
- introduction of air-dry levy in early 1996, and
- promotion of value-addition and lesser-used species, which saw a big leap in 1999 through the inception of the Woodworking Sector Development Project.

The expectations are that these interventions would be capable of reducing pressure on the forests through reduction of export of commodity products, increased further processing and diversification in species used. Whereas government and environmental groups as well as the ITTO perceive these actions as appropriate for sustainable forest management and forest product trade, the forest product industry has challenged this claim, describing the program as a failure and has mounted intense pressure on government to discontinue.

This study constitutes a post-intervention evaluation of the government's actions in the forest product export trade and perceptions of marketing implications. Considering

the current confusion between government and the industry, it is imperative that such an evaluation is carried out to gain insights into the program's usefulness or otherwise. A far-reaching importance of this study would be the guidance it could offer to other tropical nations seeking to adopt similar measures.

RESEARCH OBJECTIVES

1. To find out the impact of raw material reduction, introduction of air-dry levy, and promotion of value-addition on further processing.
2. To find out the impact of raw material reduction, introduction of air-dry levy, and promotion of value-addition on diversification in species used.
3. To investigate differences in marketing activities existing among companies in different product groups as a way of identifying marketing needs of further processing companies.

A BRIEF DESCRIPTION OF GHANA

This brief description of Ghana is a summary of information from the World Factbook (1999) with some updates:

GEOGRAPHY

Ghana is roughly between longitudes 0^{o} and 3^{o} west and latitudes 5^{o} and 11^{o} north of the equator. Togo borders Ghana on the east with a boundary 877 km, Cote d'Ivoire on the west (668 km) and Burkina Faso on the north (548 km).

The southern border is the Gulf of Guinea (Atlantic Ocean) with a coastline of about 537 km. Ghana has a land area of 22.7 million hectares and a forest cover of 28 percent with a deforestation rate of 1.72 percent (FAO 1999). Half of the country is below 152 meters above sea level, and the highest point, Mount Afadjato is about 880 meters above sea level.

The climate of Ghana is generally tropical with warm and dry conditions in the southeast, hot and humid in the southwest while the north is hot and dry. Ghana's main natural resources include gold, timber, industrial diamonds, bauxite, manganese, fish and rubber. Ghana's Volta Lake used mainly for generating electricity and water transport is the largest artificial lake in the world.

Environmental concerns include drought in the north (that has affected agriculture), deforestation, threats to wildlife and inadequate potable water particularly in the northern sector. In addressing these problems, Ghana is involved in a number of international environmental agreements including biodiversity, climate change, desertification, endangered species, environmental modification, law of the sea, nuclear test ban, ozone layer protection and ship pollution.

PEOPLE

Ghana's population growing at about three percent is approximately 20 million with 54 percent in the youth age group. Life expectancy in Ghana is 57 years and infant mortality rate stands at 78 per 1000. The average male to female ratio is about 0.9. The people of Ghana are 99.8 percent black Africans in major tribal classifications as 44 percent Akan, 16 percent Moshi-Dagomba, 13 percent Ewe, 8 percent Ga and 2 percent other. English is the official language and about 65 percent of the population can read and write.

POLITICS

Ghana's independence from Britain took effect on March 6, 1957. The Republic is currently governed by a constitutional democracy after a number of military interventions in the administration of the country. The country's new constitution, which was approved in April 1992, was developed through national consultative assemblies held in all districts (Anonymous 2002a). Currently, the two main political parties are the National Patriotic Party (NPP) and the National Democratic Congress (NDC). Ghana's legal system is based on English common law and customary law (Anonymous 2002a). Ghana's national flag has three equal horizontal bands of red (top), yellow (middle) and green (bottom) with a large black five-pointed star centered in the yellow band. There are 10 administrative regions with 110 districts (Figure 1.1). Ghana's capital city is Accra and three other largest cities are Kumasi, Tema and Sekondi-Takoradi.

ECONOMY

Despite the rich endowment with natural resources, Ghana continues to rely largely on international financial assistance.

Figure 1.1. Map of Ghana showing Regions and Capital Cities

The country depends mainly on gold, timber and cocoa as major foreign exchange earners. Subsistence agriculture is the main employer taking 60 percent of labor and contributing 36 percent of GDP (Anonymous 2002b). Ghana's GDP amounts to US$

34.47 billion with a per capita value of US$ 1,765. The total debt of the country is about US$ 5.5 billion with a debt service ratio of 24.3 percent and a balance of payment deficit of US$ 80 million. Inflation rate is 15.2 percent and a growth rate of 4.5 percent; the national currency, the cedi (GHC), currently exchanges at GHC 8,000 to US$ 1 (Anonymous 2002b). Since 1983, Ghana has struggled through its economic management with the IMF, under very harsh conditions but with slow progress particularly in infrastructural development.

COMMUNICATION AND TRANSPORT

Ghana's communication infrastructure has seen recent improvement in telephony with the privatization of Ghana Telecom, although there is still room for much improvement (Anonymous 2002c). Also, the airwaves operate private FM radio stations, which are currently proliferating at a faster rate. Although television broadcasting remains largely under state control, a few private stations have emerged mainly as repeaters. There are also cable/satellite services.

Major improvement in Ghana's highways, which started over a decade ago, is still in progress. Currently, almost all the major cities have paved roadways. Railways, however, has probably not responded very well to a recent rehabilitation program (Personal observation). Waterways, including Ankobra and Tano rivers provide 168 km of perennial navigation for launches and lighters while Lake Volta provides 1,125 km of arterial and feeder waterways.

CHAPTER 1

REVIEW OF THE FORESTRY SECTOR IN GHANA

INTRODUCTION

Over the past decade, the Ghana timber industry has experienced major changes that have subjected the industry to severe pressure regarding raw material availability and a struggle for efficient use of limited available timber.

After drafting the 1994 Forest and Wildlife Policy, the Ministry of Lands and Forestry decided to develop a forestry sector development master plan (MLF, 1994). The plan details strategies and steps for their implementation. The intention is to ensure sustainable forest management, and thus, a sustainable forest product trade.

In the mid-1990s, Ghana's forests were under excessive exploitation, illegal harvesting was rampant and there was utter neglect for established harvesting procedures. In addition, forestry institutions had become demoralized and inefficient because of continued underfunding.

As a result, a working group drawn from Government, the private sector and communities developed the Forestry Sector Development Master Plan (FSDMP) (MLF 1996, Ghana Gazette 1996). Before completion of the plan in 1996, interim emergency measures were in operation up to 1995 because of wanton forest destruction that was taking place. These measures were the setting up of task forces to control illegal felling, introduction of a felling permit system for outside forest reserves and introduction of a log export auction system (FD 1994, Ghana Gazette 1996).

Although the working group provided a broad set of strategies, the major framework for the forest sector development emanated from the Year 2000 Objective of

the International tropical Timber Organization of which Ghana is a producer member (ITTO 1990).

The Year 2000 Objective was a declaration made by ITTO member countries in 1990 (with some changes in 1991, 1994 and 1998) to source all exports of tropical timber products from sustainably managed forests by the year 2000. Accompanying this noble objective was the 1998 ITTO Libreville Action Plan with stipulated broad priority areas (ITTO 1998). The areas with direct bearing on the industry were: a) ideal mix of goods and services, b) improvement in use of the resource to give greatest possible social benefit and c) limit timber harvesting to sustainable levels. The central focus of these actions was long-term development of suitable forest-based industries in producing countries.

Although most ITTO member countries managed their own forests according to individual management plans, the Year 2000 Objective has been the main driving force that has spurred ITTO member countries to work towards sustainable forest management within the past decade. The declaration provides broad principles, criteria and indicators (PCI) on which countries can develop plans adaptable to their unique needs.

The Year 2000 Objective highlights major issues focusing on forest products; reducing pressure on the natural forest through harvest limits, the use of an ideal mix of species, and efficient use through value adding processing.

In Ghana, the strategies in use for offsetting pressure on the natural forest involve decreasing the annual allowable cut[1] (AAC) and encouraging diversification of species used. Ghana has also introduced initiatives geared towards improving woodworking

[1] The volume of timber estimated to be available for harvest on a sustainable basis. This is based on what the forest will grow.

skills which improve utilization efficiency. Export of air-dried products is also discouraged in favor of kiln-dried products, which could further promote in-state value-added processing. Some currently preferred species exported as air-dried lumber face levies ranging from 10 to 30 percent FOB[2], depending on rareness of species (MLF 1996b).

In comparison to other African countries, the ITTO has praised Ghana for adhering to the principles of Year 2000 Objectives (Poore and Chiew 2000). The ITTO recently issued a general progress report on the Year 2000 Objective that underscores Ghana's successes (Poore and Chiew 2000). But within Ghana itself, the program has come under criticism from the industry. According to the Ghana Timber Millers' Organization (GTMO), the industry is on the verge of collapse because of rampant government interventions and levies (GTMO 2000).

So far, there has been no scientific study of the impact of the FSDMP on the Ghanaian forest products trade. There is a need for scientific evaluation of the forestry FSDMP to identify it's impacts on the Ghana forest sector. Such an evaluation could serve as a guide for other ITTO member countries currently or considering participating in the Year 2000 program. This research evaluates the impact of government interventions in the forest product trade and the marketing implications.

TRENDS IN THE GHANA FORESTRY SECTOR

General Forestry Sector Description

The forestry sector in Ghana comprises government and private entities involved in administration, development and use of forest and wildlife, wood-using industries and

[2] Free on Board – condition of shipment requiring goods to be placed on board a vessel for an agreed price.

related areas. Important government agencies and other entities are:

- Forestry Department - responsible for protection and management of the forest estate.
- Wildlife Department - responsible for protection and management of wildlife and protected areas.
- Forest Products Inspection Bureau - responsible for certification of product standards in the timber industry.
- Timber Export Development Board - responsible for marketing intelligence on forest products and promotion of improved industrial processing.
- Forestry Commission - responsible for advising the Minister on forest and wildlife policies.
- Forestry Research Institute of Ghana - responsible for undertaking research to solve forestry and forest industry problems.
- Land Owners - on whose behalf the government manages the forest and wildlife, in the national interest.
- Logging companies - which work timber concessions to supply processors with wood raw material.
- Wood-processing companies, which convert timber to secondary wood products, mainly for export.

The Pre-intervention Forestry Sector Situation in Ghana

The Forest and Wildlife Policy, approved in November 1994, was a notable achievement in Ghana, targeting conservation and sustainable development of the nation's forest and wildlife for maintenance of environmental quality and sustainable generation of benefits to all parts of society (MLF 1994). The policy had the following objectives:

i) Management and improvement of Ghana's permanent forest estate for preservation of soil and water, conservation of biological diversity, environmental stability and sustainable production of domestic and commercial products;

ii) Promotion of efficient forest-based industries, in secondary and tertiary processing, to use timber and other products from forests and wildlife and satisfy domestic and international demand with competitively priced products;

iv) Promotion of research-based and technology-led forestry and wildlife management to ensure forest sustainability, socio-economic growth and environmental stability;

v) Development of effective capacity and competence at district, regional and national levels for sustainable management of forest and wildlife.

This Policy was the impetus to develop a comprehensive plan of action intended to guide forest sector policy objectives and strategies to the year 2020 (MLF 1996). This effort brought together three working committees supervised by the Ministry of Lands and Forestry, comprising both the private and public sectors, to prepare development proposals for forest and wildlife management as well as forest industries. Until 1994, detailed clearly defined forest policies specifying goals, objectives and strategies for development of forest and the future direction of the timber industry were not in existence (MLF 1996). At that time low fines and a lack of legal sanctions encouraged illegal forest harvesting. Alienation of forest communities from policy formulation contributed to these conditions although such communities were expected to help in protecting the forests (MLF 1996). As a result, forest degradation intensified through illegal cutting and encroachment for agricultural purposes (Boateng 1994). The situation became worse with concessionaires selectively felling only preferred commercial timber species (FIMP 1994).

Areas requiring urgent attention included policy reforms, legislative reviews, fiscal controls and measures aimed at securing the forest base, incentives and training in the private sector for wood industry development, and community and international collaboration.

Efforts to improve the industry through Ghana's 1983 Economic Recovery Program did help in increasing production but resulted in added pressure on the forests (ERP 1983).

The Government of Ghana had been carrying out a national forestry program through the Forest Resources Management Project (FRMP) with the support of international donors (MLF 1996); the donors included International Development Agency of the World Bank (IDA), the Danish International Development Agency (DANIDA) and the Overseas Development Administration of the United Kingdom (ODA). The main focus of the FRMP had been institutional strengthening of Forestry sector agencies, including infrastructure development, training, development of policy planning, monitoring and evaluation ability (MLF 1996).

After the approval of the forest and wildlife policy in late 1994, agencies continued performing those strategies that had already taken off in the form of interim measures. In addition were initiatives to improve management of the permanent forest estate, further development of collaborative forest management approaches and inventory of off-reserve forest areas (Smith et al. 1995).

Sustainability of Ghana's Forests

Ghana has 266 forest reserves, 216 of which occupy 1,634,100 hectares in the high forest zone (Figure 1.2) (Hawthorne and Abu-Juam 1995).

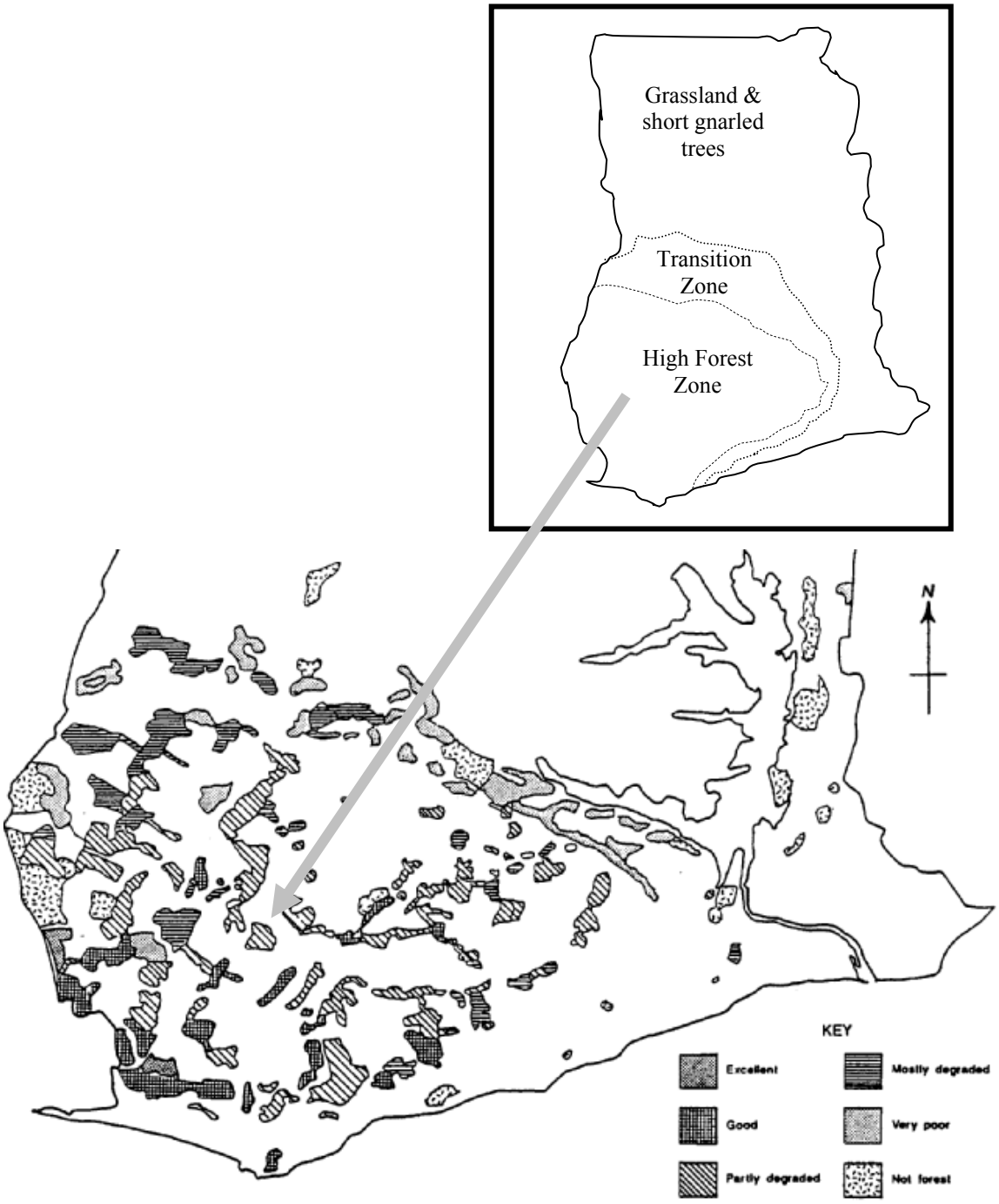

Figure 1.2. Forest Reserves in the High Forest Zone of Ghana
(Source: Hawthorne and Abu Juam, 1995)

The forest reserves were originally established to promote ecological stability, watershed protection and windbreaks, while seeking to guarantee the flow of goods and services for socio-economic development. In 1993, it was estimated that in areas outside permanently reserved forests, there was extreme deforestation pressure, leaving an estimated 400,000 ha of forest cover ("off-reserves") from which comes most timber supply (FD 1993). Within forest reserves, there are some 15,000 ha of timber plantations (mainly **Tectona grandis, Cedrela odorata and Gmelina arborea**) that provide the key source of transmission poles for rural electrification (FD, 1993). Recognizing the economic and environmental benefits from such plantations, private interests and communities have planted trees on an increasing scale around the country.

Based on the forest inventory, which started in 1986, forest reserves in the high forest zone are in classes according to the condition of the estate (Ghartey, 1989; Wong, 1989). Apart from timber-production[3] and protection[4] areas, 32 percent of the forest reserve is in a degraded state (Figure 1.3). There is a need for rehabilitation by natural convalescence[5] of some 122,000 ha and reforestation by conversion of 397,000 ha to timber plantations to increase their productive ability.

Prior to completion of the forest inventory in 1994, the sustained yield or Annual Allowable Cut was at 1.2 million m^3, an average of 100,000 m^3 per month (FD/FIMP 1995). However, the log export boom coupled with low monitoring ability resulted in exploitations significantly above the limit (Figure 1.4) (FPIB 1996).

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[3] Mainly targeted for timber harvesting purposes

[4] Mainly reserved for purposes other than timber production, e.g., ecological, wildlife, watershed protection, etc.

[5] To be left to recover naturally by itself from deforestation shock

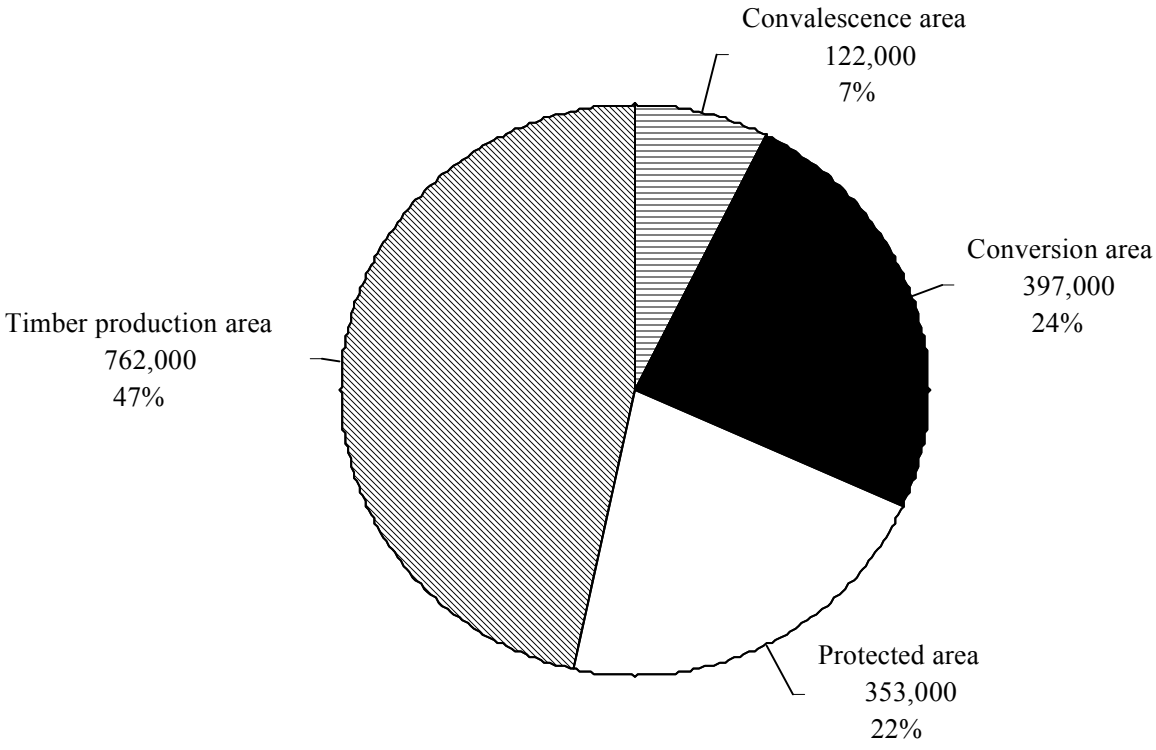


Figure 1.3. Area of Forest Reserves (in hectares and percentage) Showing Management Categories in the High Forest Zone

In late 1995 the Ministry of Lands and Forestry (MLF) temporarily suspended log exports. This was to halt the exploitation trend and to give the FD extra time to tighten felling controls over the off-reserves (FD 1995b). The policy was that log exports could resume only if there was a surplus of timber, not needed for use by local processors.

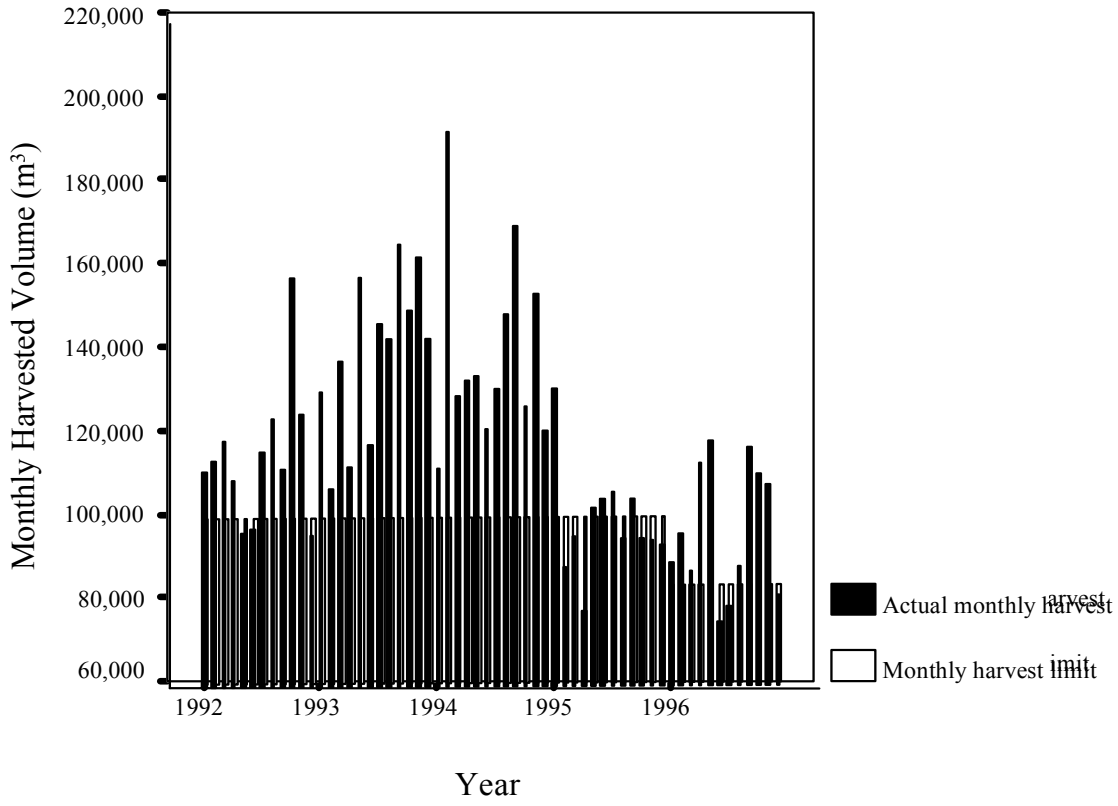


Figure 1.4. Monthly Harvesting Levels from Forests of Ghana (1992-1996)
(Data source: FPIB, 1996).

Figure 1.5 presents figures that emerged from a 1995 revision of annual sustainable yields from the timber production area of forest reserves (FD/FIMP 1995). This revision took into account the need to retain seed trees, protect rare tree species, limit the size of openings in the forest canopy, and protect slopes and stream banks. Three groups were

defined according to the utilization levels of 64 merchantable timbers, namely:

- 15 Scarlet Star species comprising the main traditional timbers now under imminent threat of extinction
- 17 Red Star species consisting of other traditional timbers for which current rates of exploitation present a significant danger of extinction
- 32 Pink Star species - lesser-known species that are in use but not yet at a rate to cause concern for their future.

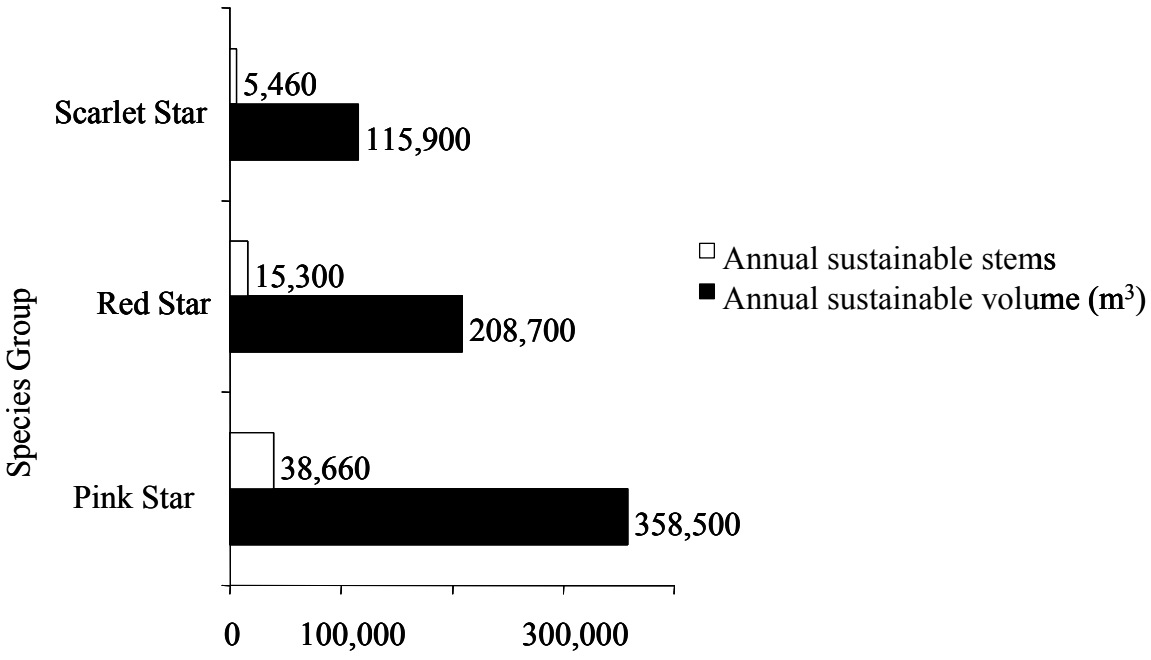


Figure 1.5. Annual Sustainable Stems and Volume of Major Species Categories from Permanently Reserved Forest (Source: Hawthorne and Abu-Juam 1995)

In order to support sustainable production, the policy was that the 32 Scarlet and Red Star species favored by industry should be no more than 0.3 million m^3 a year (FD/FIMP 1995). If promotion and marketing can achieve increased commercial use of 0.2 million m^3 of the Pink Star species, then the total on-reserve harvest could increase to 0.5 million m^3 annually (FD/FIMP 1995).

Forest Protection

The forest protection problem in Ghana is multifaceted. Preferred commercial species have attracted intensive logging in the semi-deciduous zone, a sensitive environment under threat of desertification. Also, illicit logging increased to take advantage of the FD's incapability in checking timber felling and ensuring concessionaires' compliance with prescriptions (FIMP 1994). FAO (1999) identified these problems:

- Slashing and burning of forest and grassland is part of the traditional bush fallow cultivation. Usually, the long fallow would allow enough vegetal cover to develop. However, increasing population growth over the last two decades has not only shortened the fallow period but also increased demand for land. Increased cash cropping, urbanization and development have compounded such a demand.
- Bush burning has been the cause of most forest degradation in the moist semi-deciduous zones. Pioneer trees of little economic merit dominate burned forests and are more prone to fires in the future. Fire could be the greatest threat to the long-term survival of the forested area in Ghana.

Mining and quarrying, especially by small-scale operators, and large-scale mining of bauxite, manganese and gold pose serious threats to forests in the High Forest Zone (FIMP 1994). Because of these impacts, the FD embarked on a forest protection strategy in

1994, aimed at protecting the diversity, quality and sustainability of the forest estate. "Fine-grained protection" as a strategic tool applies to all forest uses, including harvesting, plantation development, farming and mining. The tactic ensures that such disturbances take place only after careful environmental impact evaluation. Fine-grained measures aim at keeping the integrity of the forest ecosystem and its biological content to ensure endemic status of species. "Large-grained protection" forbids disturbance in whole blocks of forests to ensure environmental stability and biodiversity conservation (FIMP 1994, Richards 1995). Figure 1.6 shows location of the wildlife protected forests of Ghana.

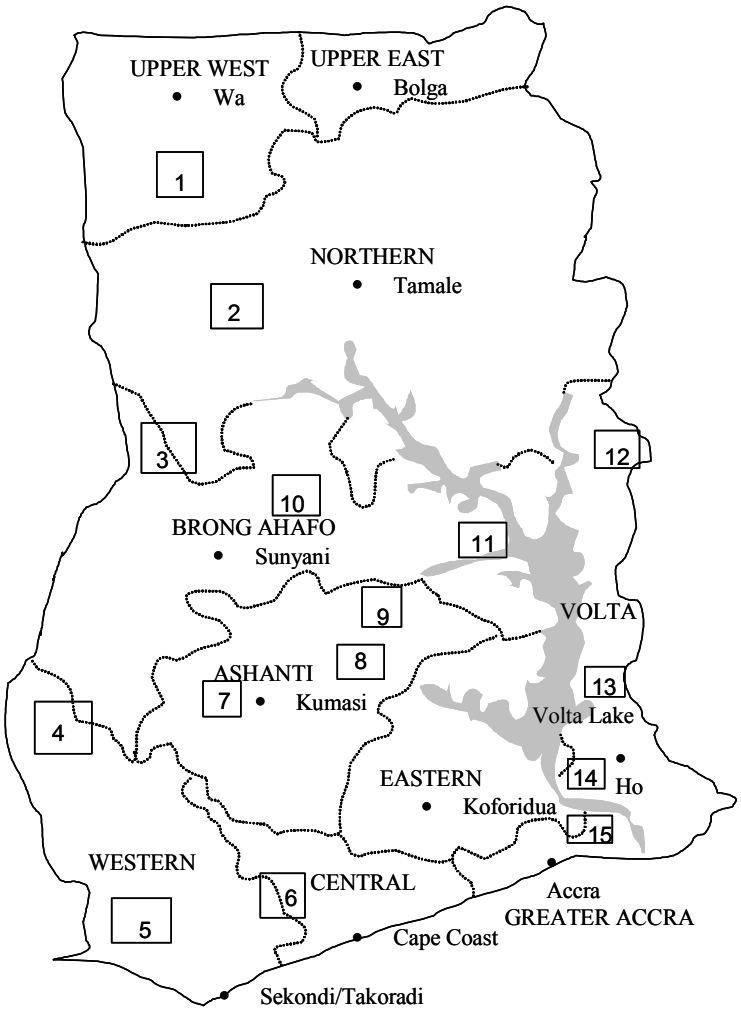
Timber Industry and Wood Processing

The timber industry dominates the forestry sector comprising approximately 250 logging firms and 130 sawmill, veneer and plywood companies (FPIB 1996b). According to FPIB export records, wood processing contributed an estimated 6 percent of GDP in 1996.

The industry has traditionally concentrated on exports, to the neglect of the local market. This condition was limited in 1995 by increased controls on off-reserve harvesting and the temporary suspension of log exports. These actions, in combination with the export levy on air-dried lumber influenced an increase in exports of further processed products while exports of air-dried lumber decreased (FPIB 1996) (Figure 1.7).

Public Participation in Forestry Activities

The Forest and Wildlife Policy stresses public participation in district forest management and protection. Forms of participation are investments in tree planting and wood production, conservation and propagation of wildlife, value-added processing and marketing of finished products (CFMU 1993).



LEGEND	
1. Gbele Resource Reserve (565km^2)	9. Kogyae Strict Nature reserve (360 km^2)
2. Mole National Park (4,840 km^2)	10. Boabeng-Fiema Wildlife Sanctuary (4.4 km^2)
3. Bui National Park (1,821 km^2)	11. Digya National Park (3,478 km^2)
4. Bia National Park (300 km^2)	12. Kyabobo National Park (360 km^2)
5. Ankasa and Nini-Suhien Forest Reserve (490 km^2)	13. Agumatsa Wildlife Sanctuary (3 km^2)
6. Kakum and Assin Atandanso Reserve (350 km^2)	14. Kalakpa Resource Reserve (320 km^2)
7. Owabi Wildlife Sanctuary (13 km^2)	15. Shai Hills Resource Reserve (49 km^2)
8. Bomfobiri Wildlife Sanctuary (53 km^2)	

Figure 1.6. Wildlife Protected Areas in Ghana (Source WD 1996)

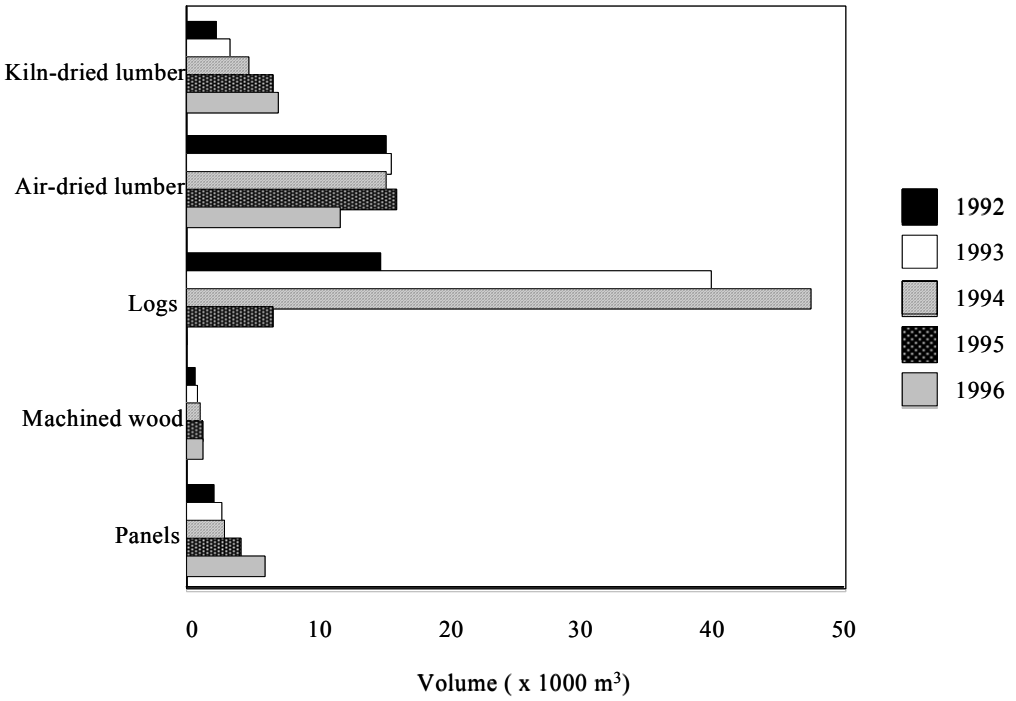


Figure 1.7. Monthly Export Volumes of Major Forest Products (m^3), 1992-1996

To encourage local people to care about the forest and trees, it is important that they take part in decision-making on management of the forest; they must benefit from the use of traditional non-timber products of the forest (FD 1995a). Forests play an important role in the lives of most Ghanaians and, for survival of the forests, it is essential that all Ghanaians become aware. Through their increased awareness, rural residents could be involved in the protection, care and management of forests in their neighborhood (CFMU 1993).

Within the forest reserves, there have been some 397,000 ha estimated suitable for planting, and if attained, the added tree cover would occupy 10 percent of the present area of the forest estate (MLF 1996). Implementation of the tree-growing scheme would largely

be through mobilization of private participation, with the Government providing technical advice, promotional incentives and public education. This would involve people in special projects that would reforest denuded lands and streambanks, reforest understocked forest areas and rehabilitate mined-out lands, plant and care for trees on farms and set up and manage industrial plantations (MLF 1996).

The Post-intervention Forest Sector Situation in Ghana

Some major problems in the Ghana forestry sector were tackled using legal approaches (Avoka 1998):

The Passage of the Timber Resources Management Act No. 597 in December 1997.

This law corrected an anomaly in the 1962 law (Act 124), which did not enjoin any forest sustainability responsibilities to concessionaires operating in the forests. Act 547 requires operators to enter into a Timber Utilization Contract (TUC) with government in which is embodied forest sustainability responsibilities. To qualify for a TUC, a Timber Rights Evaluation Committee (TREC) must certify that a concessionaire is capable of reforesting 10 percent of an area granted as concession; and as incentive, the planted timber is owned by the concessionaire. TREC must also ensure that concessionaires have efficient processing facilities to reduce waste, professional foresters on staff, plans to offset likely environmental impacts and agreements with land owners to meet social responsibilities.

Legislative Instrument (LI) on Act 547 for Stumpage Fees and Royalties

This LI generally raised stumpage fees according to star rating of species. Scarlet star (highly used) species attracted 20 percent FOB of air-dry lumber prices, red star (normally used) species had 10 percent while pink star (lesser used) species had five (5) percent FOB as stumpage fees. The motive was to penalize excessive use of the popular

species and encourage more use of LUS. Also, increased prices meant improved efficiency in utilization of raw material.

Transformation of the Forestry Department into a Forest Service

In late 1999, the Forestry Department was removed from the civil service and made semi-autonomous to enable better conditions of service and well-motivated staff. The action was also expected to generate private sector interest in partnership with the Forest Service for reforestation programs.

Strengthening of Forestry Commission

In order to improve the level of coordination among the forestry sector institutions, the Forestry Commission was in 1999 made the umbrella institution with the responsibility of managing the three main divisions – Forest Services Division (FSD), Timber Industry Development Division (TIDD) and Wildlife Services Division (WSD) (Ghana Gazette 2000a). The eleven-member board of the Commission carries the responsibility for planning for the protection, management and development of forest and wildlife resources in a sustainable manner.

Advances in Forest Certification

Ghana's preparation towards forest certification, which dates back to 1996 was field tested in March 2000. This field-testing was carried out with support from the Natural Resources Institute of the U.K. The work culminated into a "Draft of a field standard and checklist for forest certification in Ghana" containing over a hundred indicators of good forest practices (Ghana Gazette 2000a, b). Ghana hopes to implement these sustainability standards in preparation for a third-party certification in the long run.

Implementation of other interventions has been through activities under Phase I of the forest sector development master plan summarized in appendix 1.1.

SUMMARY AND CONCLUSION

Ghana's forestry sector has had to face difficult situations due to measures taken since 1994 to correct the unsustainable forest practices; this emanated from increasing population leading to increased urbanization and encroachment of forest lands resulting in loss of tree cover. Unsustainable logging and farming, rampant forest fires and improper mining activities also contribute immensely to the problems.

The Government of Ghana, therefore, found it necessary to put in place measures to ensure that the remaining forests are sustainably managed. The reasons for the reforms in 1994 included: (i) to bring about sustainable forest management, (ii) to conserve wildlife resources, (iii) to raise environmental awareness, (iv) to make the timber industry more efficient, and (v) to offer landowners optional benefits for exploiting their lands.

The reforms were partly introduced through legal approaches and also through activities under a long-term Forestry Sector Development Master Plan. The legal approaches mainly dealt with strengthening of sector institutions to effectively carry out concessions administration and management, stumpage fee increases and more punitive actions against forest offences. In developing the forestry sector development master plan, industry specialists proposed steps to deal with the problems. First, regularization of concession allocation and timber harvesting rights, increased royalty rates and enforced industrial standards seeking to limit production and export of commodity products; after this, surviving mills are expected to improve efficiency leading to sustainable management of available timber supplies. Second, investment incentives, skill development, greater

diversification of production and marketing should begin to foster sustainable domestic and export demand. With the prospect of expanded raw material supplies from plantation forests, planning for sustainable value-added production could be possible.

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CHAPTER 2

A CONCEPTUAL FRAMEWORK OF GOVERNMENT INTERVENTIONS IN FOREST PRODUCTS TRADE AND IMPLICATIONS FOR GHANA

INTRODUCTION

As Ghana's government strives to develop policies to make efficient use of limited raw materials, ascertaining the performance of such actions is important. The focus of this research is to examine the impact of government actions that affect the forest product export trade. Figure 2.1 represents the conceptual framework of this study. This chapter discusses the elements in the conceptual model.

GOVERNMENT INTERVENTIONS

Actions taken by government since 1995 have directly affected wood product exports. This section describes these interventions.

Raw Material Regulation

Suspension of Log Exports

Until the end of 1995, the ports of Ghana exported significant volumes of logs, mainly to Far Eastern countries (FPIB 1996). It became alarming when total extractions from the forest exceeded the then allowable cut of 1.2 million cubic meters; however, since a greater percentage of exports were lesser-used species, there was not immediate pressure to reverse this trend (FPIB 1996). By 1994, there was a rapid rise in log exports, primarily due to allowable cut restrictions instituted in the Far East.

For example, in Malaysia, a major global supplier of tropical timber, the annual allowable cut was 71,200 hectares under the 5th Malaysia Plan covering the period 1986-1990.

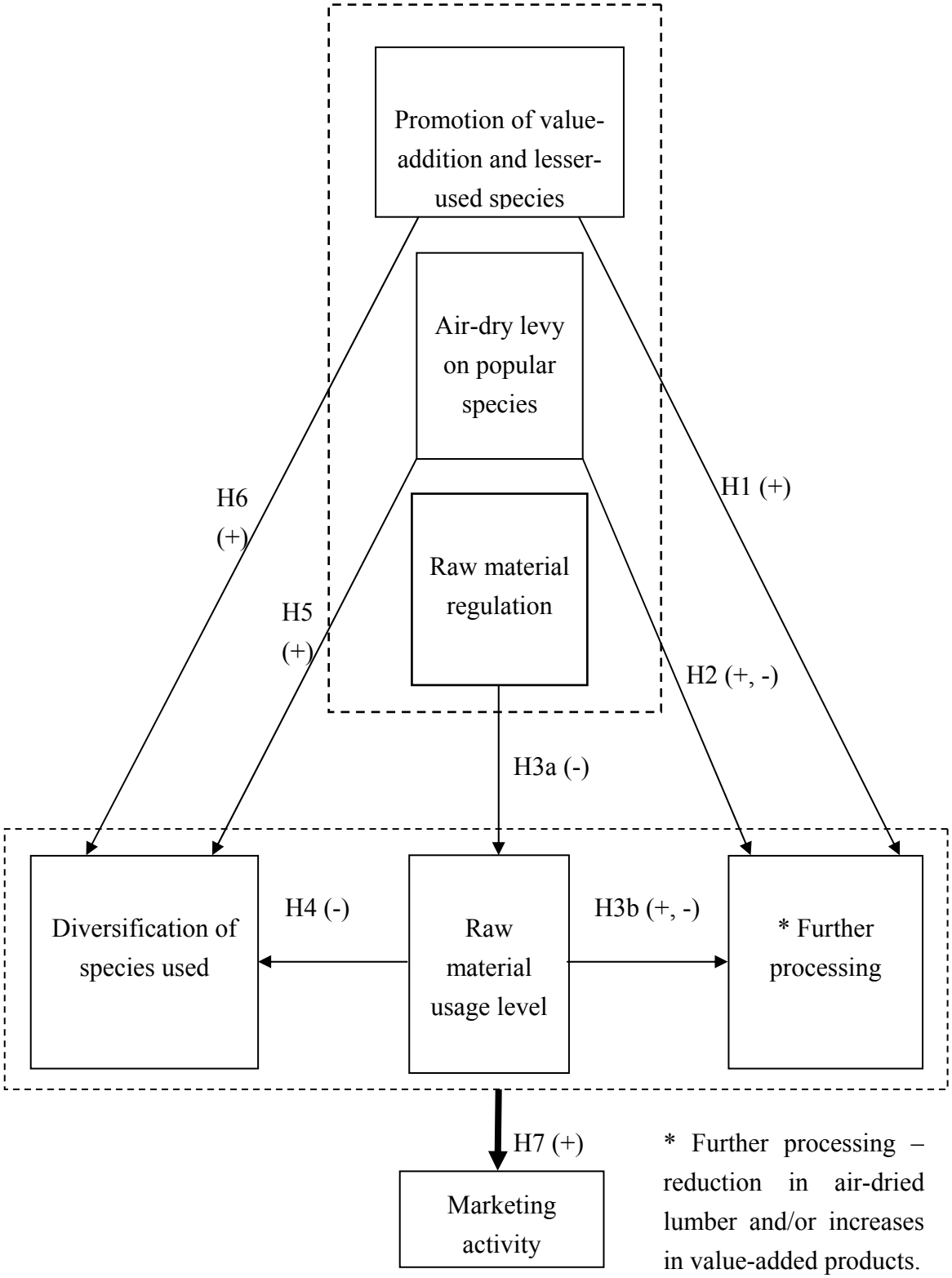

Figure 2.1 Framework of Government Interventions in Ghana Forest Product

Industry

This was reduced to 52,250 hectares under the 6th Malaysia Plan (1991-1995) and 46,040 hectares under the 7th Malaysia Plan (1996-2000), respectively (MPI 2000). Even in light of Far East AAC reductions, log export increases from Ghana led to over supply relative to what Ghanaian buyers could accept.

Unfortunately, many species were susceptible to biological attack and logs deteriorated in only two weeks after felling, even with usual protection measures. As a result, large quantities of logs degraded beyond merchantable limits (FPIB 1995).

There were large inventories of logs at the port and in the forest. This raised enormous environmental concerns, which triggered suspension of log exports by the government. Log exports had already reduced raw material availability for domestic processors before its suspension in late 1995 and the suspension of exports gave some relief to wood processor. However, discontent developed among loggers who complained of low prices at the local markets which became the only markets left at the time.

Reduction of the Annual Allowable Cut (AAC)

The suspension of log exports coincided with the development of a national strategic master plan for the forest sector. The committee charged with developing this plan considered the lack of forest sustainability due to excess exploitation beyond the allowable limit, and subsequently decided to reduce the annual allowable cut (AAC) level from 1.2 million to 1.0 million cubic meters (MLF 1996). This action was in consonance with the International Tropical Timber Organization (ITTO) Year 2000 Objective to which Ghana is a signatory (ITTO 1990). This Objective is a global effort to reduce

deforestation and better manage tropical forests. As a result of enforcing the Objective, many mills were faced with the difficulty of procuring raw materials, especially those without concessions who were buying timber on the open market.

Promotion of Value Addition

Through the Ghana Investment Promotion Center, incentives are in place to attract direct foreign investment and/or partnership with existing local companies to invest in value-adding wood processing. Incentives come in the form of customs import duty exemptions, income tax incentives, tax holidays, location incentives and capital allowances. Others include carry-forward of losses and guarantees of freely convertible currencies for dividends, net profits, overseas loan servicing, and "Free Zones" that do not come under certain national trade controls (Ghana Gazette 2001).

Other areas of promotion include employee skills improvement (particularly, in kiln drying) by recruiting specialists from abroad to conduct training seminars and troubleshooting at the processing units (Ghana Gazette 1997a). In addition, the Ghana Wood Industry Training Center is equipped with modern facilities and is continually building its skilled personnel training capacity (Ghana Gazette 1997b). Also, a centralized shared facility for small-scale producers has been developed to help pool resources to provide modern centralized technical services and basic infrastructure to smaller companies (Ghana Gazette 1998).

The Government, through its forest sector agencies, the Forest Products Inspection Bureau (FPIB) and the Timber Export Development Board (TEDB), (now combined into the Timber Industry Development Division (TIDD) of the Forestry Commission) also supported trade missions in the mid-1990s. These were carried out in

Ghana's major markets including the United Kingdom, Italy, Spain, Germany, the United States and the Far East (Ghana Gazette 1995a, 1995b). TIDD has a market intelligence office located in London, U.K. The office conducts market intelligence and carries out promotion and lobbying for the Ghana industry (Pleydell 2000). Through the London office, Ghana has been well represented at environmental forums and industry-oriented gatherings. Furthermore, Ghana is collaborating with research institutions such as Timber Research and Development Association (TRADA), U.K. in skills and trade development.

A major step towards encouraging downstream processing is the creation of the Woodworking Sector Development Program (WSDP). The Woodworking Sector Development Program is designed to improve overall performance of the Ghanaian wood sector. The overall objective of the program is 'to raise the growth rate of the Ghanaian economy by stabilizing and increasing export revenue through promotion of exports of value-added products in the woodworking industry' (Vernon 1999).

Implementation of the project began in January 1999 with the objective to identify and assist Large Scale Enterprises (LSEs) and Small to Medium Enterprises (SMEs) capabilities to advance the value-added sector. According to the first half-year report of WSDP for the year 2000, the project's activities involve two types of interventions:

- Provision of technical assistance, training and equipment support to individual firms and training institutes to promote tertiary wood processing.
- Payment of subsidies, incentives and grants, namely the Export Incentive Scheme (EIS), the Small Producer Scheme (SPS) and Kiln and Value-adding Equipment Grants (KVG), to companies for processing Lesser-used species (LUS) into value-added products for export.

The Technical Assistance Program (T/A) is an integrated program focused primarily on SME's. The program seeks out international experts/consultants for the T/A and local consultants who will counterpart with the international experts. WSDP-registered firms are asked to indicate their T/A needs or requirements for assistance. Through skill development and enhancing production techniques the T/A mainly concentrates on using raw materials effectively. Another goal is to help companies adopt quality standards through improved production and management skills. The T/A also administers training for new skills and techniques required in utilizing alternative indigenous forest products and materials, such as bamboo and rattan (cane) which reduces pressure on solid wood processing to sustainable alternatives.

Under the Small Producer Scheme (SPS) the focus is on assistance to the SME's in the wood processing industry. The SPS enables firms to acquire equipment which will enhance the companies' operational capabilities and efficacy in the production of value-added products. Participants in the Kiln and Value adding Equipment Grant (KVG) are encouraged to acquire further specialized value-adding equipment. The objectives of KVG are to further advance value addition currently being achieved by prospective beneficiaries and to significantly increase efficiency in the conversion process and reduce waste in the production of value-added wood products.

Originally, the specialized equipment that qualified for KVG included conventional kilns. However, there is presently a moratorium on kiln purchasing due to excessive kiln capacity that currently exists in Ghana. Typical equipment for the KVG would be specialized sawing equipment to increase yield, molding, jointing, shaping and turnery, finishing, and packaging equipment, etc.

Promotion of Lesser-used Species (LUS)

Due to raw material issues, including pressure on a few highly desired species, the government decided to try to encourage industry to broaden its raw material base by diversification in use of species. Products of most timber-size Ghanaian tree species are not in high demand in export markets unless they are in log form (FPIB 1996). Market intelligence in the Far East showed that logs from some LUS from that region were used as core stock for plywood manufacturing and were in high demand in the U.S. market. An initiative to further market awareness and demand for LUS was the Export Incentive Scheme under the WSDP. The Export Incentive Scheme (EIS) provides incentives for the increased use of LUS in the production of machined products, such as doors, moldings, profile boards, flooring and furniture parts. Under the EIS, participating companies exporting any of these products from LUS receive an incentive of 10 percent of the Free-on-Board (FOB) value of the products at the time of export.

Introduction of the Air-dry Levy

Perhaps, the one action by the government that impacted the industry most was placing an air-dry export levy on nine highly desired species in March 1996 (MLF 1996). These species comprise about 80 percent of Ghana forest products exports (FPIB 1996). The species and FOB levies are as follows:

- Afromosia (**Pericopsis elata**) – 30%
- Black Hyedua (**Guibortia ehie**) - 15%
- Odum (**Milicia excelsa**) – 15%
- Wawa (**Triplochiton scleroxylon**) – 10%
- Mahogany (**Khaya spp**.) – 10%
- Makore (**Tieghemella heckelii**) – 10%
- Sapele (**Entandophragma cylindricum**) – 10%

- Utile (**Entandophragma utile**) – 10%
- Edinam (**Entandophragma angolense**) – 10%

The air-dry levy was intended to motivate domestic value-adding, especially kiln drying, since kiln drying is the first step in adding value. In the long run, the air-dry levy was believed to be a driver to create jobs for forest communities and reduce forest exploitation (Year 2000 Objectives).

MODEL DEVELOPMENT

Hypotheses

Intuitively, promotion of value addition promoted by trade missions, skills development, support for equipment upgrades and various incentives including tax holidays and "free zones" should positively impact further processing, hence:

H_1: Promotion of value addition will increase further processing (i.e., increase in kiln-dried lumber, panels, furniture parts, moldings, floorings and dowels) significantly.

Since the air-dry levy de-emphasizes export of the nine most popular air-dried lumber species, it is likely that the industry will react by re-channeling such species from air-dried lumber production into further value-adding processing (kiln-drying), thus:

H_{2a}: Introduction of the air-dry levy will increase further value-adding processing.

H_{2b}: Introduction of the air-dry levy will have a negative impact on the export of air-dried lumber.

Suspension of log exports will make logs available to the domestic processing industry. However, the fact that many of those logs were lesser-used species (usually not

preferred), coupled with AAC reductions, could actually reduce the volume of available raw materials for domestic processors. This could compel the industry to process current species further to add additional value, therefore:

H_{3a}: Raw material regulation will reduce the level of raw material use, which will in turn, increase further processing.

H_{3b}: Raw material regulation will reduce the level of raw material use, which will in turn, decrease air-dried lumber production.

The reduction in AAC will drive the industry to find replacement raw materials in order to maintain production levels. LUS could make up this shortfall, therefore:

H_4: Reduction in the AAC will decrease traditional raw material availability with a resultant increase in species diversification (i.e., increased used of LUS)

As air-dried lumber manufacturers lose market share of the popular species due to the air-dry levy, the next available alternative for maintaining their production volumes will be to find markets for and expand the use of LUS, thus:

H_5: The air-dry levy will have a positive effect on with species diversification and increased use of LUS.

Promotion of LUS, including manufacturer incentives, could motivate processors to seek new markets for these LUS species. Therefore it is expected that:

H_6: LUS promotion will have a positive impact on species diversification and increased use of LUS.

Government interventions can affect species composition, raw material availability, and product mix in the forest sector. These are key factors that determine marketing mix and strategic market planning. Marketing emphasis is expected to shift from commodity products made of popular species to further processed products made from a diversity of currently less popular species. As a result, marketing activities of companies responding to the interventions would have to be more vigorous than the non-responsive companies that would continue to sell commodity products, therefore:

H_7: Differences in the marketing activities and strategies will develop between companies that sell traditional commodity products and companies that shift to value-added/LUS markets.

Hypothesis Testing

Four main effects from government interventions were evaluated (Figure 2.1):

1) Increased further processing (i.e., reduction in air-dried lumber and/or increases in kiln-dried lumber, panels, furniture parts, moldings, floorings and dowels)
2) Reduced raw material level
3) Diversification of species
4) Variation in marketing activities

However, the framework (Figure 2.1) indicates that raw material level, which subsumes the effect of raw material regulation, also impacts further processing, diversification of species and variation in marketing. Therefore, in this study raw material level is used as a predicting variable rather than a dependent one. Its use in this sense will be more valuable in policy planning since the impact of raw material on forest product exports is one of the main issues in the Ghanaian industry.

Increased Further Processing

The factors controlling further processing include promotion of value addition, raw material level changes and imposition of the air-dry levy. Therefore, these factors are independent variables that influence the dependent variable "Further Processing".

Time series data on promotion of value addition is not available. Although such promotions have been carried out over the years on a small scale, a more organized large-scale initiative started in January 1999, therefore, a dummy variable was used for promotion.

The industry is faced with problems resulting from the impacts of raw material level reductions and the air-dry levy. To investigate the impact of these two variables on volumes of products exported, an analysis was conducted (with promotion of value-addition factored in as a dummy variable) "Impact of Raw Material Regulation and Air-dry Levy as Strategies for Increasing Export of Further Processed Forest Products – The Ghanaian Experience." The results of this analysis can be found in Chapter 3.

It should be noted that **raw material level, presence or absence of air-dry levy** and **WSDP** are being used as predicting or independent variables for **Volume of product exported** (the dependent variable). It may seem proper to express the relationships in a

general linear multiple regression model. However, since the data involved is time series data, the usual assumptions allowing for use of linear regression for model building cannot be met. These assumptions include normal distribution, independent observations and constant variance (Hair et al. 1998).

Instead linear regression, Box and Jenkins (1976) recommend the use of Autoregressive Integrated Moving Average (ARIMA) model building procedures, which do not consider the linear regression assumptions in dealing with time series data. Specifically, the form of ARIMA procedure needed would be **transfer function and intervention modeling**. This will allow impact assessment of a given input on a time series. Transfer function modeling is popular for researching most production flow forecasting, policy analysis and business studies (Box and Tiao 1975).

Following is a summary explanation of transfer function modeling. A basic model depicting influence of an input time series, R (raw material level) on another time series, V (volume of a product exported) at time, t can be stated as (after Bowerman and O'Connell 1993):

$$V_t = f(R_t) + N_t$$

Where, N_t is some 'noise' that adds on to the effect of R_t to produce a change in V_t. Variables, V_t and R_t need to be stationary (stable) before they are used in the analysis. Time series data are stabilized using transformation methods such as natural log, square roots and differencing. For instance, under the assumption that a first difference of V_t and R_t are stationary, the following is obtained:

$$z_t = V_t - V_{t-1}, \text{ and}$$

$$z_t^{(R)} = R_t - R_{t-1}$$

where, z_t and $z_t^{(R)}$ are stationary forms of V_t and R_t respectively.

The transfer function consists of numerator and denominator parameters which estimate lagged effects of the input and output respectively on the current state of the output. The N_t component of the simplified model regarded as noise (comprising all other effects not accounted for in the model) is estimated via ARMA modeling to capture influences of past disturbances and seasonal patterns in the output itself that are useful in predicting the output.

In general a transfer function model is stated as follows (after Bowerman and O'Connell 1993):

$$z_t = \mu + [C\omega(B) / \delta(B)]B^b z_t^{(R)} + N_t$$

where, z_t = stationary V_t while $z_t^{(R)}$ represent stationary R_t.

μ = a constant (usually excluded unless significant, i.e., unless t-value > 2).

C = unknown scale parameter.

b = # of periods before $z_t^{(R)}$ begins to affect z_t.

B = backshift operator, where $BV_t = V_{t-1}$

$\omega(B) = (1 - \omega_1 B - \omega_2 B^2 - \ldots \omega_s B^s)$, estimating numerator effects over *s* lags of $z_t^{(R)}$ that are significant in predicting z_t.

$\delta(B) = (1 - \delta_1 B - \delta_2 B^2 - \ldots \delta_r B^r)$, estimating denominator effects over r lags of z_t itself that are significant in predicting z_t.

Depending on the values taken by b, s and r, the forms of numerator and denominator effects in the model are determined. When inputs are more than one variable, the final transfer function model is additive of individual input models.

The noise component of the model, N_t is modeled using Autoregressive (AR) and Moving Average processes (MA). Generally, (after Box and Tiao 1975):

$$N_t = \theta(B)/\varphi(B)a_t$$

Where, $\theta(B) = 1 - \theta_1 B - \theta_2 B^2 - \ldots \theta_q B^q$ are moving average polynomials in B of degrees q

$\varphi(B) = 1 - \varphi_1 B - \varphi_2 B^2 - \ldots \varphi_p B^p$ are autoregressive polynomials in B of degrees p

a_t = white noise (normally distributed, independent, zero mean and variance σ^2)

For seasonal data:

$\theta(B) = \theta_1(B)\ \theta_2(B^s)$, where s = 12 for monthly data and s = 4 for quarterly data

$\varphi(B) = \varphi_1(B)\varphi_2 B^s$

In many situations, independent variables turn out to be, for example, policy interventions, which do not have any data to be used for modeling. Dummy variables are used to model such interventions. Examples are the dummy variables in this study are the air-dry levy (L) and the WSDP (W). The pre-intervention period has a value "0" signifying absence of the intervention whereas the post-intervention gets a value of "1." The effect of a dummy variable, L_t on V_t can be described as a step (i.e., permanent shift in level of the series) or as a pulse (a temporary shift). Such patterns of change determine the intervention model for estimating impact of L_t on V_t.. Box and Tiao (1975) recommend some preliminary models as foundation points in building models based on these shifts. The following is a description of various types of shifts and their corresponding models by Bowerman and O'Connell 1993):

- Abrupt start and permanent effect [CS_t], where C is estimate of effect and S_t represents a step.
- Gradual start and permanent effect [$(C/1-\delta B)S_t$]
- Linearly changing without limit [$(C/1-B)S_t$]
- Abrupt start and abrupt decay [CP_t], where P_t represents a pulse
- Abrupt start and gradual decay [$(C/1-\delta B)P_t$]

- Abrupt start and gradual decay to a permanent level $[(C_1/1-\delta B)P_t + (C_2/1-B)P_t]$

In this study, the impact of intervention, L_t is expected to be gradual and permanent, hence its basic model should be:

$$V_t = C/1-\delta B)S_t + N_t$$

It should be noted that since the dummy variable is "0" during pre-intervention era, the term $C/1-\delta B)S_t$ in the model amounts to zero, and the output is basically the ARMA model on the series V_t which is equivalent to N_t.

The basic intervention model translates into transfer function notation as:

$$z_t = [C\omega(B) / 1- \delta(B)]B^b z_t^{(L)} + N_t$$

Where, $z_t = \varphi(B)V_t$ and $z_t^{(L)} = \varphi(B)S_t$, where $S_t = 0$ or 1 (for pre- and post-intervention respectively); $\omega(B) = 1$; $\delta(B) = 0$ and $b = 0$.

Finally, the individual models can be put together to express the effect of R, L and W (WSDP) on V. Thus, in general:

$$z_t = ([C_R\omega_R(B) / \delta(B)]B^b z_t^{(R)}) + ([C_L\omega_L(B) / 1-\delta(B)]B^b z_t^{(L)}) + ([C_W\omega_W(B) / 1-\delta(B)]B^b z_t^{(W)}) + N_t$$

Choosing appropriate models in practice for predicting outputs can be cumbersome and needs a mastery of the Box and Jenkins procedures. However, forecasting software such as the SPSS Decision Time 1.0 (SPSS 1999) saves researchers the trouble of manually building appropriate models. All that is required is to specify the dependent and independent variables. The software makes provision for using several independent series data (referred to as predictors) and dummy variables (referred to as interventions) to model the effect on a given dependent variable. The parameter estimates, standard errors and t-values are automatically obtained. Alongside these results

are all necessary model assessment statistics and information such as the autocorrelation and partial autocorrelation functions as well as model diagnostics information.

Diversification of Species

As previously mentioned, the forest products markets focus on a few popular species (Tissari 2001). Extensive resources have been invested in promoting lesser-used species in Ghana though mounting evidence indicates that these promotion efforts have not been as successful as hoped. Accordingly, one component of this study was to ascertain whether continued support of these programs is worthwhile.

Just as in the case of value-added promotion, LUS promotional activities actually commenced with the inception of the Woodworking Sector Development Project (WSDP) in 1999. Therefore, the dummy predicting variable, WSDP represented by W (pre-intervention era = 0 and post intervention era = 1) can also be used in tracking developments in LUS promotion. As shown by Figure 2.1, it would also be conceptually acceptable to include **Raw material level** as a predicting variable since the shortage of raw material could compel the industry to make use of what is available – in this case, the lesser-used species. Also, **air-dry levy** will discourage the use of popular species for air-dry lumber. As a result, the immediate alternative will be lesser-used species. These relationships are discussed in Chapter 4, "Appraisal of Government Interventions for Diversification of Species Utilization in Forest Product Exports – Lessons from Ghana."

Therefore, the only change in the general model for this study from the previous study will be the dependent variable, z_t representing diversification of species, thus:

$$z_t = ([C\omega(B) / \delta(B)]B^b z_t^{(R)}) + ([C\omega(B) /1-\delta(B)]B^b z_t^{(L)}) + ([C\omega(B) /1-\delta(B)]B^b z_t^{(W)}) + N_t$$

Where, $z_t^{(W)}$ stands for stationary W_t and N_t is the noise obtained from ARMA process.

Marketing Implications

Government interventions would invariably affect industry marketing activities. As an industry engages in further downstream processing, it becomes more competitive and knowledgeable in the marketing of such value-added products. Since the desire of the government is to encourage further processing, it would be valuable to identify marketing successes and weaknesses of companies whose major products are in the further processed category. This could identify necessary programmatic enhancements and/or assistance.

Historically, the Ghana forest product trade was characterized as being engaged in trade of highly demanded, low-priced raw materials with marketing activities receiving little attention. In view of current higher production costs, global competitiveness, and the trend towards further processing, companies are reexamining the need to enhance their marketing activities.

These include positive product considerations (e.g., high quality, raw material supplies, etc.), buyer or customer relationships, effective distribution channels, flexible pricing, efficient planning, and appropriate market sensing strategies to work around opportunities and weaknesses. Companies conforming to the drive towards value addition will need to be more marketing-oriented. Therefore, comparison of pre/post intervention perceptions of such companies is helpful in identifying marketing needs. To achieve this objective Chapter 5 discusses ”Marketing Implications of Government Interventions in Forest Product Trade – Perceptions of the Ghanaian Industry.”

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CHAPTER 3

IMPACT OF RAW MATERIAL REGULATION AND AIR-DRY LEVY AS STRATEGIES FOR INCREASING EXPORT OF FURTHER PROCESSED FOREST PRODUCTS – THE GHANAIAN EXPERIENCE

INTRODUCTION

Ghana timber industry exports can be categorized into three major groups: **lumber and/or timbers**, **panels** and **machined products**. In spite of a broad product mix, the industry has been commodity-based, selling mostly lumber, timber-sized products and veneer. Until 1997, the dominant forest product exported from Ghana had been air-dried lumber, when it was overtaken by kiln-dried lumber. Other products in the lumber and timbers group include boules (lumber with wanes), broomsticks and railroad ties. In the panel group, rotary veneer ranks highest in volume, but sliced veneer is higher in value. A recently introduced product in this category is curl (decorative) veneer. This is now the highest-value Ghanaian forest product in terms of dollars per unit cubic meter. Plywood was among the earliest products produced in Ghana. Presently, plywood exports are facing pressure as result of competition from the Far East. There is, however, sufficient local demand, primarily the growing domestic real estate development industry.

The machined product category comprises the most products and is yet the worst-performing category. Included are furniture parts, processed lumber moldings, profile boards, hardwood floorings, dowels, machined finger jointing, window boards, and doors.

In January 1996, the Ghana Ministry of Lands and Forestry directed that Ghana's annual allowable cut (AAC) be reduced from 1.2 million to 1.0 million cubic meters. The motive was to curb excessive exploitation of the natural forest, which had reached an

alarming level at the time. To be able to cover costs and make a profit, the industry had to consider adding value to the limited raw material.

A further directive given to the then Forest Products Inspection Bureau (now part of TIDD) was to place a levy (ranging from 10-30 percent FOB depending on species rarity) on nine popular species, if exported as air-dried lumber. It took effect in the beginning of March 1996. These species account for over 80 percent of total export volume. The Ministry's rationale for the levy was that continued use of air-dried, limited popular species for lumber production was gradually decimating the value-adding industry by siphoning off basic raw materials on which it depends. Added to the two strategies was the inception of the Woodworking Sector Development Project (WSDP) in January 1999 to promote value-addition and increased use of lesser-used species.

The policies were considered to be effective in relieving pressure on natural forests and increasing further processing. However, the industry became outraged by these directives and has since been pressuring the government for a reversal of the decisions. Nearly a decade after implementation, the government claims success, but, according to industry associations, the exercise is a failure and they have called for an independent evaluation of the policy effects and immediate withdrawal of the measures.

OBJECTIVES

This study explores some possible direct outcomes of the Ministry's decisions, that is, whether there is a significant impact on further processing after the interventions were instituted. Therefore the study examines the following hypotheses:

H_1: Promotion of value-addition (that is, inception of WSDP) will increase the export of value-added products significantly.

H_{2a}: Introduction of the air-dry levy will increase the export of value-added products significantly.

H_{2b}: Introduction of the air-dry levy will decrease the export of air-dried lumber significantly.

H_{3a}: Reduced raw material level will increase the export of value-added products significantly.

H_{3b}: Reduced raw material level will decrease the export of air-dried lumber significantly.

Findings from the study could lead to recommendations that may help to determine the future direction of the industry in Ghana as well as offering guidance to other tropical countries yet to embark on similar measures.

RESEARCH REVIEW

Reducing the Annual Allowable Cut (AAC)

Forest management, especially in the tropics, faces a number of dilemmas including:

- Popular endemic species, which are under intense pressure, have difficulty growing artificially. For example, **phytolyma** insects attack seedlings and young plants of **Milicia excelsa** (Cobbinah 1986) and the juvenile **Terminalia ivorensis** species dieback in Ghana (FORIG).
- In recent years (for example, 1983) forest fires have ravaged through most tropical forests.
- FAO reports have pointed out the subsistence nature of agriculture (shifting cultivation) among forest communities and increase of urbanization in the tropics.

Because of these challenges, continuous adjustment of the AAC has become a tool to slow down depletion of forests. Reductions in AAC for ensuring sustainable management of forests have come under intense attack in Ghana. Reports suggest that reductions have not yielded the desired results (Majidcooke 1995).

Hyde et al. (1996) recommend that direct policies and those with negative spillover effects that limits land tenure, have high stumpage fees and reduce annual allowable cut need to be reconsidered. They suggest that more reasonable and effective approaches are value-adding technology for forest products and research directed towards plantations and community well-being.

The Need for Kiln-drying Wood

Moisture accounts for at least 75 percent of wood-manufacturing problems; therefore, reduction of wood-related problems correlates with a reduction in moisture content (MC) (Wengert 2001). Since wood is a hygroscopic material, it picks up and loses moisture depending on the moisture gradient between the wood and its immediate environment. According to Wengert (2001) average U.S. relative humidity in homes and offices hovers in the range of 30-40 percent. This is an equivalence of 6-7 percent MC. Therefore, it is essential that any finished product meant for a U.S. home or office must be in the recommended MC range to avoid any gain or loss of moisture.

According to the Northern Hardwood Initiative (NHI) (2001), increasing the value of lumber requires improving utility and minimizing quality loss. Utility can be increased through drying by improving the:

- Resistance to biological attack by insects, bacteria, and fungus
- Volume/weight ratio

- Appearance
- Gluing properties
- Finishing properties
- Machining and assembly properties
- Phytosanitary reasons
- Stability for storage and shipping

Another important consideration is that shipping costs can be significantly reduced if the moisture content (MC) is reduced through drying. Drying can typically reduce the weight of lumber by approximately 40 percent (NHI 2001).

Kiln drying in particular can enhance desirable properties wood, including dimensional stability, workability, and hardening (e.g., as is required for tools), and promoting better absorption of treatments or adhesives (EIA 1994) and also to gain electrical resistance (Simpson 1991).

One major reason for encouraging kiln drying as a means for adding value is its higher price compared to green wood with the same specification. Kiln drying also offers the opportunity of creating employment through further processing of the dried wood.

Many export destinations have strict pest controls. Green wood is subject to many types of fumigation scrutiny, which can cause delivery delays. For example, The United States Animal and Plant Health Inspection Service (APHIS) controls imported green wood products (Flynn 1994).

Application of Levies in Forest Products Trade

Levies and charges in the forest product sector may come in many forms but can generally be classified as developmental, environmental, countervailing, and anti-

dumping levies or duties. Whereas Developmental levies are usually arrived at through a consensus to help in funding activities such as research and development (R&D), marketing and promotion, residue testing, and animal health programs (AFFA 1999), the remaining types of levies are usually imposed for punitive purposes to deter illegal activities or to steer the industry in a policy-driven direction.

In Australia, a developmental levy ranging from 3.5 cents to 29 cents per cubic meter, depending on type, is imposed on logs delivered to a processing plant or exported and on certain imported forest products to support their Forest and Wood Products Research and Development Corporation (FWRDC).

. Private sector activities may in one way or the other impinge on the environment, which need government intervention to protect the interests of the larger public. The government therefore uses various instruments such as environmental levies to mitigate undesirable activities. In this situation, levy assessment often focuses on the relationship between taxes levied and consumption because levying products with inelastic demand may not improve the situation unless proceeds are channeled into correcting the problem (ESCAP 1998).

“A countervailing duty (CVD) is a measure a country may take against another to offset (or countervail) practices or policies perceived to give one side an unfair trade advantage” (Softwood Lumber Issue 2002). A countervailing duty seeks to remove the advantage enjoyed by the incoming foreign product due to subsidy from its home government. “Dumping occurs when foreign exporters sell their goods in international markets at prices lower than the price in their home market (referred to as "normal value"), or at prices below full cost of production” (WTO 2002). In order to remove the

effect of dumping, the disadvantaged nation could defray the cost difference by way of charging anti-dumping duties. A classic example of countervailing and anti-dumping duties were those slapped on Canada by U.S. in May 2002 over softwood exports which has placed the two countries in unending legal battle (CBC News 2002).

In Ghana the forest product industry is continuously battling government over an air-dry levy that many consider to be environmentally driven since proceeds are used in funding reforestation. There is also a 10 percent reconstruction export levy, providing temporary funding for a three-year national budget deficit.

Considerations for Downstream Wood Processing

Direction of the Global Industry

The report on the review of progress towards the ITTO Year 2000 Objective has argued the need to develop timber industries in countries with forest resources. During the past decade, most producing countries have steadily increased their downstream processing. However, according to the ITTO pre-project study 25/99(1) carried out by UNCTAD/WTO, Africa has lagged other regions, accounting for only 1 percent of the total trade in furniture, builders' joinery and profile boards from ITTO producer countries. This production was mainly from Ghana and Cote d'Ivoire. Asia accounted for 83 percent with Malaysia and Indonesia as the major players. Latin America's portion of 16 percent was due almost completely from Brazil, which alone contributed 83 percent of the region's performance.

There was a predicted growth in the furniture and other further processed wood products in 2001-02 from 24 percent in 1997 to 28 percent. However, there is concern that without support, some countries will be unable to bridge that gap (Tissari 2001).

Industry Readiness

Vlosky et al. (1998) suggest that forest-sector development goes beyond simply examining forest resources, current industry capabilities and the market in creating economic development through the growth of value-added processing. Added components include an analysis of regional economic effects of value-added industry growth, socio-economic and demographic reasons, work readiness of the potential employee base, needed employee skills, and employee training program development.

Looking at Africa, socio-economic, demographic and skill development problems remain unsolved. The irony is that places like Ghana and Cote d'Ivoire, which rank highest in forest sector development, are among the least endowed with the resource. Ghana and Cote d'Ivoire have per capita forest areas of 0.5 and 0.4 ha, respectively, compared to Gabon (13.5), the Central African Republic (9.0) and the Congo (7.5) (FAO 1999).

In Ghana, efforts to address these issues include establishment of up the Wood Sector Development Project, and a Wood Industry Training Center. The creation of "Wood Villages" as shared facilities is also underway. Kozak and Hatridge (2000) recommend shared facilities as a means of developing a value-added industry. However, they caution that without guidance, leadership and regional interest, a shared facility could be an expensive waste of valuable resources.

Assessment of Industry Needs

Developing a value-added industry is an expensive venture; therefore, implementation should come after needs assessment has taken place. There should also be a deliberate effort to set up well-coordinated aiding structures for ensuring success.

Vlosky and Chance (1996) outline the approaches adopted by six states in the U.S. in developing their value-added wood products sectors. Programs included marketing, forest management, industry loans, industry grants, tax incentives, resource analysis, export support, labor training, management training and product development. The government, specialized institutions, universities and nonprofit organizations helped in these programs. In their research, twelve goals were judged by development agencies involved in the forest product industry. The top six priorities were to increase employment, attract new value-added industry, support rural economic development, increase market share, increase export opportunities and attract new industry in general.

Technological Considerations

Tissari (2001) identifies five categories of processing technologies. These are (1) users of basic portable tools and universal woodworking machines, (2) users of basic woodworking machines to produce in small batches, (3) users of basic woodworking machines to produce larger batches using low-cost mechanization and jigs suitable for serial production, (4) users of special-purpose machines, and (6) users of integrated machining lines. Targeting millers in the third category for support could boost further processing in slow producing areas (Tissari 2001).

METHODOLOGY

Data

Information on Ghana forest products industry used in this study came from the export records of TIDD. It is comprised of monthly data on volume of ten major forest products exported from 1992 to 2001. The products include air-dried and kiln-dried lumber, panels (plywood, rotary and sliced veneers) and machined products (processed

lumber molding, profile board, furniture parts, dowels and flooring). There are 120 monthly data points.

Analysis

The goal of the study is to find out whether interventions under consideration had any contribution to changes in patterns rather than to develop a model for forecasting performance of any of the dependent variables. A model for forecasting would not need the pre-intervention data since it has probably lost influence on trends in the trade. Hence its inclusion may amplify the noise component.

The SPSS Decision Time 1.0 package using Autoregressive Integrated Moving Average (ARIMA) modeling will be used in this analysis. Three variables of interest are volumes of product exported, V (dependent), raw material level, R (metric predictor) and air-dry levy, L (dummy predictor).

The ARIMA model in this study follows those of Bowerman and O'Connell (1993) and Box and Tiao (1975) discussing transfer function and intervention models. Using notations representing variables in this study, the combined model can be written as:

$$z_t = ([C_R\omega_R(B) / \delta(B)]B^b z_t^{(R)}) + ([C_L\omega_L(B) / 1\text{-}\delta(B)]B^b z_t^{(L)}) + ([C_W\omega_W(B) / 1\text{-}\delta(B)]B^b z_t^{(W)}) + N_t$$

The noise component of the model, N_t is modeled using Autoregressive (AR) and Moving Average (MA) processes. Generally, after Box and Tiao 1975:

$$N_t = [\theta(B)/\varphi(B)]a_t$$

Where, $\theta(B) = 1 - \theta_1 B - \theta_2 B^2 - \ldots \theta_q B^q$ are moving average polynomials in B of degrees q

$\varphi(B) = 1 - \varphi_1 B - \varphi_2 B^2 - \ldots \varphi_p B^p$ are autoregressive polynomials in B of degrees p

a_t = white noise

For seasonal data:

$\theta(B) = \theta_1(B)\ \theta_2(B^s)$, where s = 12 for the monthly data

$\varphi(B) = \varphi_1(B)\varphi_2 B^s$

The transfer function component with stationary raw material series, $z_t^{(R)}$ is used to model the impact that changes in raw material level might have on export volume of a major forest product from Ghana, V_t where:

where, z_t = stationary V_t (volume of a major product exported)

μ = a constant (usually excluded unless significant, i.e., unless t-value > 2).

C = unknown scale parameter.

b = # of periods before $z_t^{(R)}$ begins to affect z_t.

B = backshift operator, where $BV_t = V_{t-1}$

$\omega(B) = (1 - \omega_1 B - \omega_2 B^2 - \ldots \omega_s B^s)$, estimating numerator effects over *s* lags of $z_t^{(R)}$ that are significant in predicting z_t.

$\delta(B) = (1 - \delta_1 B - \delta_2 B^2 - \ldots \delta_r B^r)$, estimating denominator effects over r lags of z_t itself that are significant in predicting z_t.

To model the impact air-dry levy might have on export volume of a major forest product, z_t from Ghana, a dummy step variable, $z_t^{(L)}$ is used. Since $z_t^{(L)}$ is expected to have a gradual start and permanent effect on z_t then;

$z_t = \varphi(B)V_t$ and $z_t^{(L)} = \varphi(B)S_t$, where $S_t = 0$ or 1 (for pre- and post-intervention respectively), $\omega(B) = 1$; $\delta(B) = 0$ and b = 0. The dummy variable, $z_t^{(W)}$ (defined as in $z_t^{(L)}$) captures the impact of the inception of WSDP.

A caution with intervention analysis is getting correct dates of the interventions. There may be a 'dead time' or a delayed response to the date of intervention or a period where the system responded before the known date. Choosing an inappropriate date could mask a possible effect of an intervention.

An exploratory examination of a series in this study revealed that the value-added products responded late to the introduction of the air-dry levy. This is because value-adding equipment is capital investment, therefore it took time for industry to buy and install. A sensitivity analysis of gradually shifting the date from March 1996 revealed late response of nearly a year, that is, until January 1997.

The SPSS Decision Time 1.0 package noted for modeling and forecasting was used for the analysis of the data. A downward trend in the volume of air-dried lumber and a rise in value-added products were expected during the post-intervention period. This would differ from the trend in the two series in the pre-intervention era. Also expected was a systematic change in the behavior of the time series after the introduction of the intervention.

Outliers

The export performance (by volume) of the Ghana forest product trade is greatly influenced by agent-buyer activities. Agency buying is characterized by periodic issuance of bulk contracts that create impulses in the pattern of exports. As a result, time series of the volume of products may exhibit periodic spikes that appear as outliers. Since the impact of these spikes cannot be ruled out, "outliers" were included in the data analysis of this study. Hair et al. (1998) recommend the inclusion of outliers in data analysis if the researcher is sure of the source. As a consequence of the inclusion of these apparent

outliers, the use of residual plots in assessing the resultant models may show such spikes. However, the Box-Ljung Q statistic will be used to determine randomness and absence of patterns in the residuals (SPSS 1999).

RESULTS

Time Series

Raw material levels stayed within the annual allowable cut (AAC) of 1.2 million cubic meters (about 100,000 m3 per month) until 1992, when export of logs, mainly those of lesser-used species, gained market access to Asia. Then the level rose to almost double by early 1994. When log export was suspended in late 1995, the new level of AAC of 1.0 million cubic meters immediately followed. Since then raw material level has been under strict monitoring to avoid going beyond the current AAC. Figure 3.1 represents the raw material flow pattern of the timber industry from 1992 – 2001.

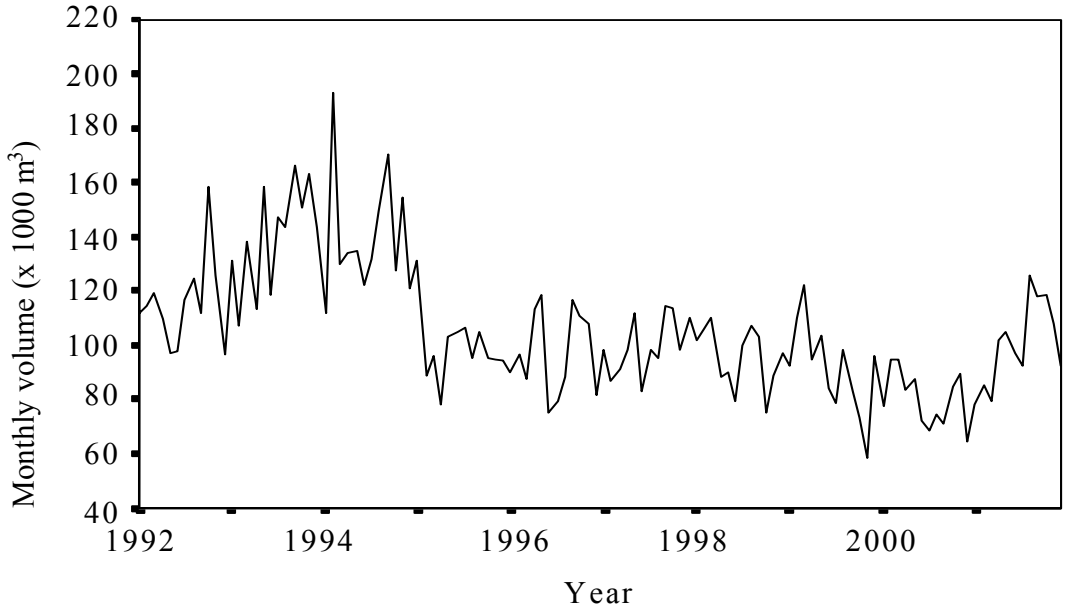


Figure 3.1. Monthly Volume of Raw Material Harvested from the Forest in Ghana from January 1992 – December 2001.

An initial plot of time series for forest product export show changes in trends in air- and kiln-dried lumber. Figure 3.2 shows air-dried lumber exports immediately falling after implementation of the interventions, while in kiln-dried lumber, there was a large increase about a year after implementation. After three years, exportation of kiln-dried (value-added) surpassed air-dried lumber.

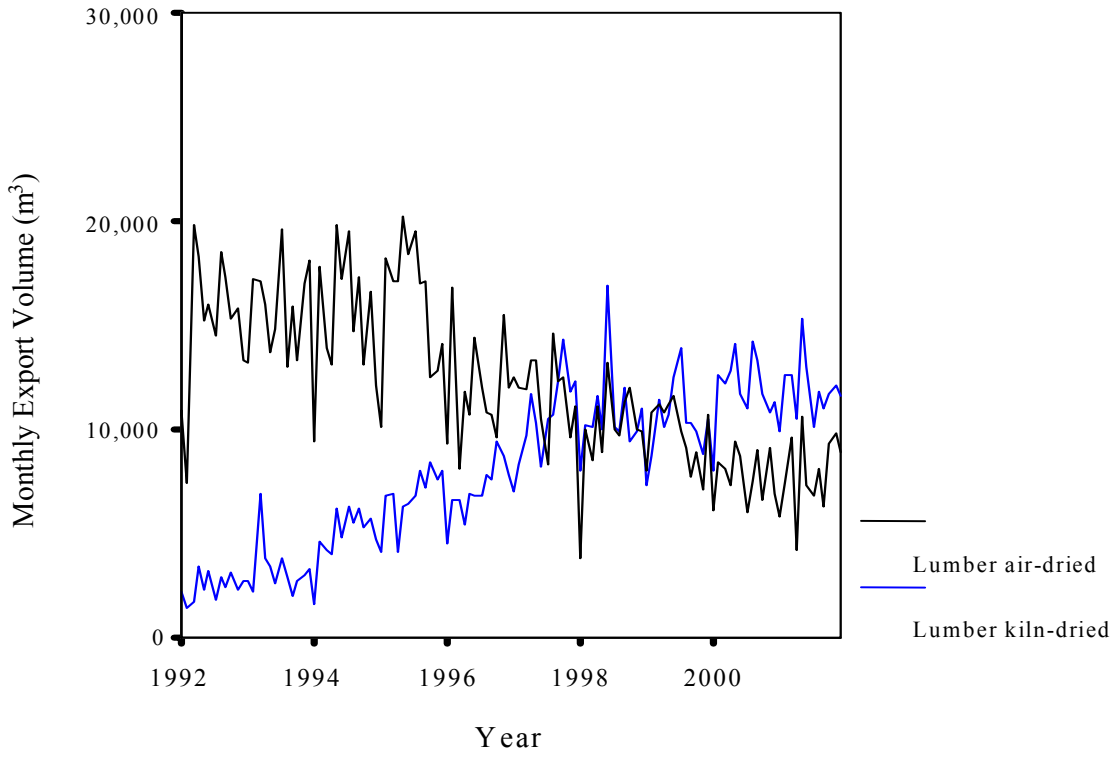


Figure 3.2. Volume of air- and kiln-dried lumber exported from Ghana from January 1992 – December 2001.

Figure 3.3 displays a plot of time series for export volumes of major panels including plywood, sliced and rotary veneers. Examination of the plots shows that increasing trends exist for all three products. Plywood exports from Ghana increased after the 1995 measures in the industry but plummeted with the Far Eastern crises in 1997.

Exports picked up again in early 1999, mainly to Australia, and continued with entry into the U.S market in 2000. Slice veneer exports, mainly to Italy, have maintained a gradual rise within the period under study. Rotary veneer followed troughs and crests in the pre-intervention era, but sales of peeled 'ceiba'as core-stock to the U.S. market has put the trend on ascendancy in the post-intervention period.

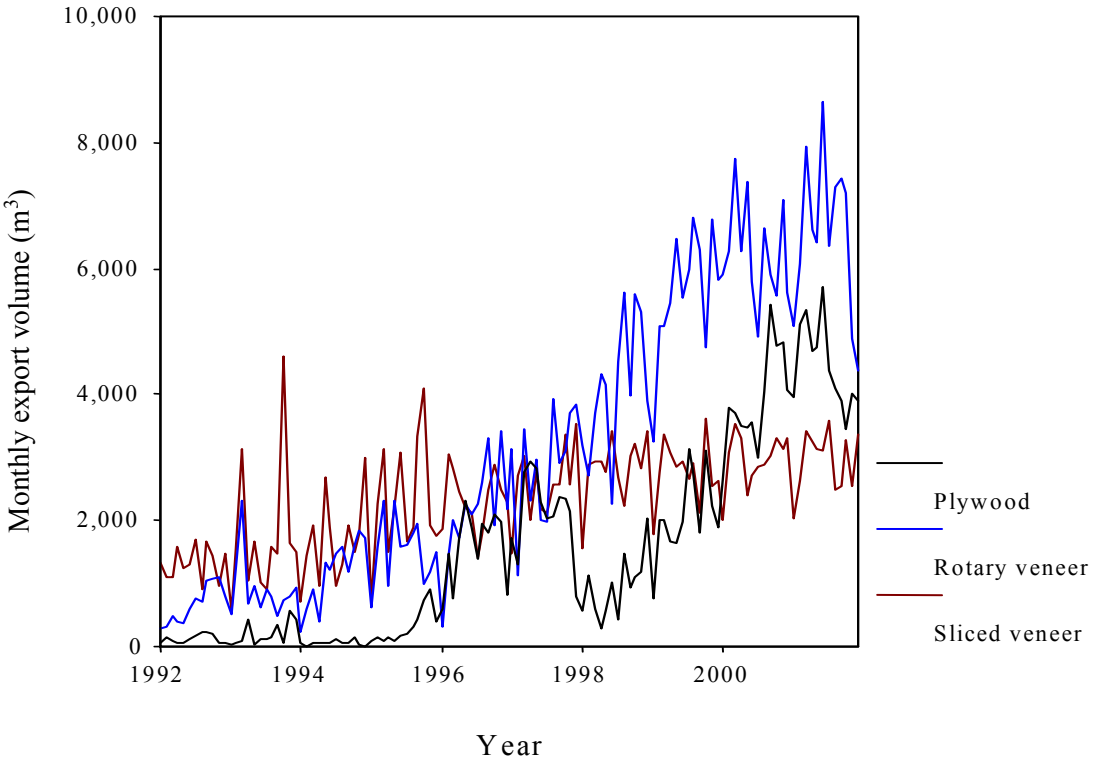
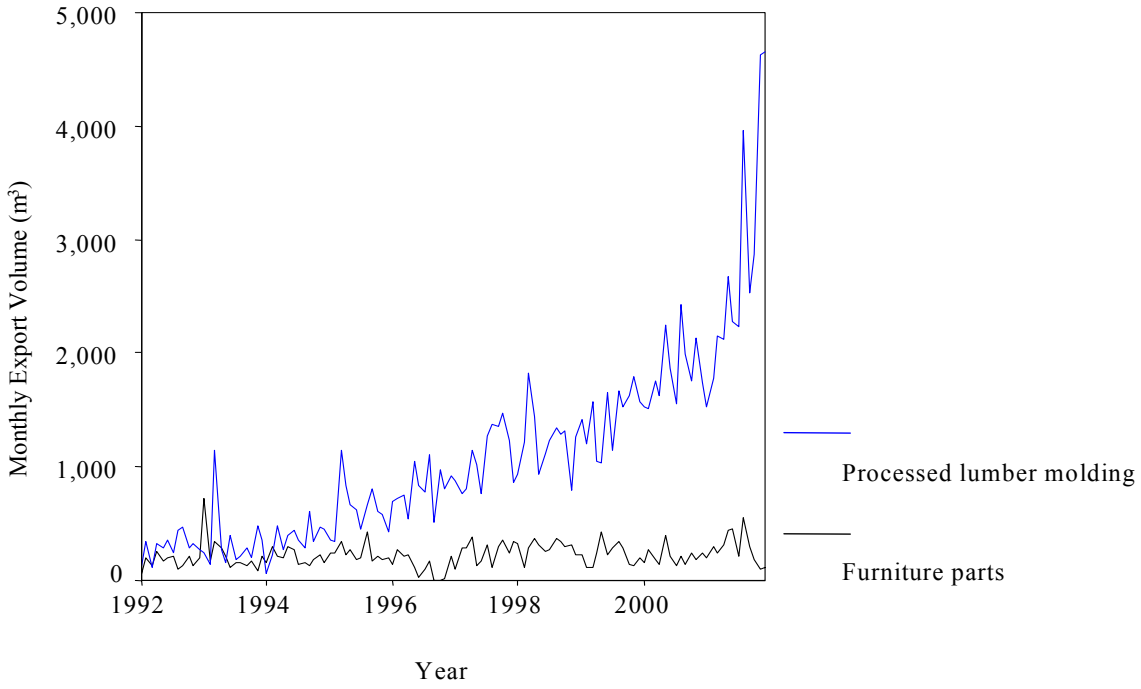


Figure 3.3. Volume of Plywood, Rotary and Sliced Veneers Exported from Ghana from January 1992 – December 2001.

Figures 3.4a and b display export time series for the machined category products. Figure 3a shows trends for furniture parts to the U.K. market (increasing) and processed lumber moldings to France (somewhat stable), whereas Figure 3b displays time series for flooring to and profile boards to Italy, and dowels to U.K.

(a)



(b)

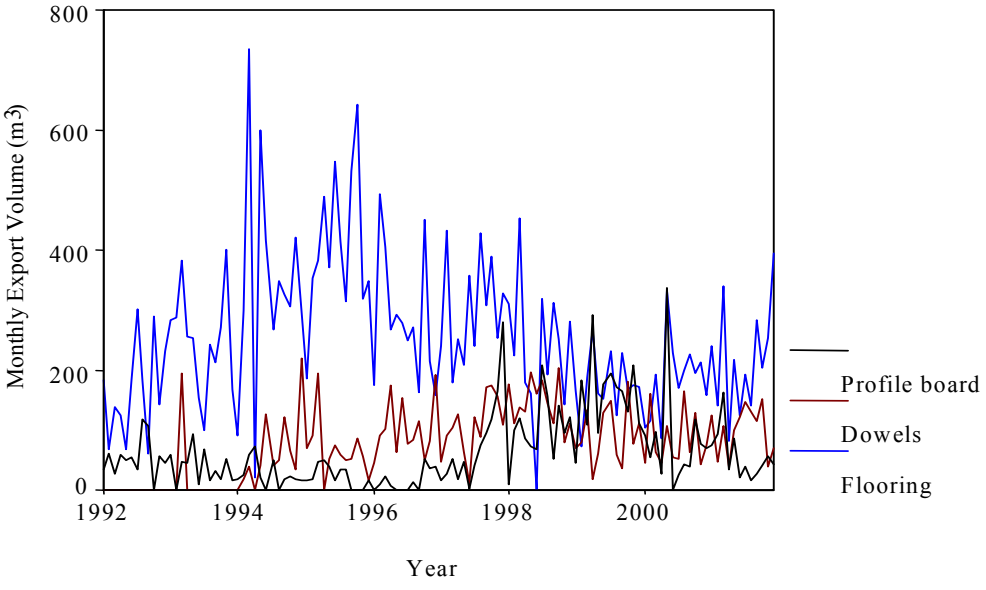


Figure 3.4a, b. Volume of Furniture Parts, Processed Lumber Molding, Dowel, Flooring and Profile Board Exported from Ghana from January 1992 – December 2001.

Influences of Government Intervention

To estimate the extent of effect of predictor variables, transfer function and intervention ARIMA modeling analyses were conducted. For air-dried lumber, a good-fit model for the series was ARIMA (0,1,1)(1,0,1) model and only the air-dry levy appeared to be useful as a predictor for inclusion in the model. Examination of the model parameters showed that the air-dry levy caused a decrease in the average monthly export of air-dried lumber in the post-intervention period. Table 3.1 summarizes the results of the analysis (See model assessment details in appendix 3.1).

Table 3.1. Parameter Estimates of Air-dry levy as a Predictor of Volume of Air-dried Lumber Exported from January 1992 – December 2001 from Ghana – West Africa.

Model Parameters	Estimate	Standard error	t-value
Air-dry Lumber, difference order: 1			
Autoregressive seasonal lag 1	0.8893	0.1322	6.725
Moving average lag 1	0.9043	0.04374	20.67
Moving average seasonal lag 1	0.7305	0.2087	3.5
Air-dry levy, difference order: 1			
Numerator lag 0	-3968	1085	-3.658

From Table 3.1, air-dry levy intervention caused an average monthly decrease in air-dried lumber export by about 4,000 m3. The decrease as indicated by a t-value of –3.658 was highly significant. From Figure 3.1, the pre-intervention average monthly shipment of air-dry lumber was about 16,000 m3. Therefore, the decrease amounted to about 25 percent.

For kiln-dried lumber (Table 3.2), an ARIMA (1,1,0)(0,1,0) model emerged as the best fit to the series, with both predictors accepted on the model as useful in predicting volume of kiln-dried lumber exported. Table 3.2 shows that the air-dry levy significantly

increased the average monthly volume of kiln-dried lumber exports by 32 percent. However, in the case of raw material level, both negative and positive relationships with kiln-dried exports were significant. At lag 0, there was a negative relationship, and reduction (as in Figure 3.1) in raw material level caused an average monthly increase of 38 percent in kiln-dried lumber exports. At lag 4, a positive relationship was observed, and a drop in raw material level accounted for a 25 percent reduction in kiln-dried lumber export.

Table 3.2. Parameter Estimates of Air-dry Levy and Raw Material Level as Predictors of Volume of Kiln-dried Lumber Exported from January 1992 – December 2001 from Ghana, West Africa.

Model Parameters	Estimate	Standard error	t-value
Logarithm of Kiln-dried Lumber, difference order: 1, seasonal difference order: 1			
Autoregressive lag 1	-0.3908	0.09796	-3.989
Logarithm of Raw material level, difference order: 1, seasonal difference order: 1, delay 10			
Numerator lag 0	-0.379	0.08405	-4.509
Numerator lag 4	0.2514	0.08719	2.883
Air-dry Levy, difference order: 1, seasonal difference order: 1			
Numerator lag 0	0.3218	0.143	2.251

From Table 3.3, an average monthly rise of 36 percent in volume of processed lumber moldings exported was associated with changes in patterns of raw material level but the air-dry levy did not influence the patterns of shipments of this product.

Table 3.3. Parameter Estimates of Air-dry Levy and Raw Material Regulation as Predictors of Volume of Processed Lumber Moldings Exported from January 1992 – December 2001 from Ghana, West Africa.

Model Parameters	Estimate	Standard error	t-value
Logarithm of Processed Lumber Moldings, difference order: 1			
Constant	0.02151	0.004772	4.508
Auto-regressive lag 1	-0.7057	0.08443	-8.358
Moving average lag 2	0.7575	0.08569	8.839
Logarithm of Raw material level, difference order: 1, delay 3			
Numerator lag 0	-0.3636	0.09679	-3.756
Denominator lag 1	-1.064	0.06409	-16.6
Denominator lag 2	-0.8347	0.07365	-11.33

The raw material level did not impact export of furniture parts (Table 3.4). Although air-dry levy accounted for an average monthly increase of about 60 m3 in the post intervention era, the variance explained by the model (that is, $R^2 = 0.07$) is too low to be reliable.

Table 3.4. Parameter Estimates of Air-dry levy and Raw Material Level as Predictors of Volume of Furniture Parts Exported from January 1992 – December 2001 from Ghana, West Africa.

Model Parameters	Estimate	Standard error	t-value
Furniture Parts			
Constant	191.2	13.32	14.35
Air-dry Levy			
Numerator lag 0	59.38	18.83	3.153

Among the panel products, only sliced veneer indicated some level of association with the intervention strategies despite the increases observed in plywood and rotary veneer from the initial plots. The role of raw material level in sliced veneer shipments

was not significant. However, the air-dry levy was responsible for an average monthly increase of about 700 m3 (Table 3.5), which works out to be about a 50 percent increase compared to the pre-intervention monthly average of about 1,400 m3.

Table 3.5. Parameter Estimates of Air-dry Levy and Raw Material Level as Predictors of Volume of Sliced Veneer Exported from January 1992 – December 2001 from Ghana – West Africa.

Model Parameters	Estimate	Standard error	t-value
Sliced Veneer			
Constant	1961	145.9	13.43
Auto-regressive seasonal lag 1	0.3487	0.09057	3.849
Moving average lag 7	-0.4143	0.08716	-4.754
Air-dry Levy			
Numerator lag 0	713.1	184.4	3.867

Influences Due to Past Trends

Among the ten major products studied, five (that is, dowels, profile boards, floorings, plywood, and rotary veneer) did not have a significant export relationships with the intervention strategies (see model assessment details in Appendix 3). A study of their stochastic structures reveals a strong association with past disturbances and or seasonal variations in their patterns. From the five products found to be associated with the interventions, only kiln-dried lumber exports were related to both interventions.

DISCUSSION

As indicated by the results of this study, only four of the 10 major products studied showed significant association with the intervention strategies. Following is a discussion of the impacts of the two interventions (raw material level reduction and the air-dried levy) as well as the effects of past trends.

Raw Material Level Reductions

Raw material level modifications had no discernable influence on air-dried lumber. As a result of the log export ban in 1995, logs destined for export were made available to the domestic industry. More lesser-used species (LUS) logs going into air-dried lumber and panel production may have distorted any effect raw material level changes might have on the two products to signal a significant relationship. The positive association of kiln-dried lumber to raw material level was probably a result of the Far East crisis in 1997. The crisis reduced exports in most products aside from the severely affected panel products during that period. Since raw material level, too, was also on a downward trend, the relationship with kiln-dried lumber results indicate a positive relationship. Considering the overall effect in 2001 however, there was a 13 percent (that is, 0.2514 + [-0.3790] = -0.1276) increase in kiln-dried lumber due to a decrease in raw material level. Producers of kiln-dried lumber might have thought it wise to add value in the wake of reducing raw material availability.

In the panel group, a reason why raw material level did not show a significant impact may be because rotary veneer and plywood are mainly produced in species (LUS) which were not affected by the AAC reduction due to their relative abundance. Moreover, there could have been more inflow of LUS from the suspension of log exports. It is also possible that decorative (sliced) veneer, which uses popular species, could not be affected significantly by the AAC reduction due to inflow of logs denied air-dried lumber (as a result of the levy).

The machined products group was mostly unaffected to raw material level changes, except in processed lumber molding. Probably, this group relies on factors other

than raw material level (e.g., advanced machinery and skills, etc.), which are not readily available in the industry. Therefore variation in raw material levels could not significantly shift export trends in the machined products category, especially in the more downstream products. However, in processed lumber molding, which is basically an S4S kiln-dried lumber (that is, planed all four sides), raw material level was responsible for a 36 percent increase. This is the new diversification direction for kiln-dried lumber exporters.

Air-dry Levy

Introduction of the air-dry levy impacted the nine most popular species that formed the backbone of air-dried lumber exports, thus creating a strong negative relationship between air-dried lumber and the air-dry levy. Subsequently, kiln-dried lumber producers took advantage of the release of those popular species and increased production, thus resulting in a significant positive relationship with air-dry levy.

In the panel group, the nine popular species being driven by air-dry levy have limited roles in the production of rotary veneer and possibly plywood. As a result, the increasing levels in the two products did not show a significant relationship to the introduction of air-dry levy. On the other hand, sliced veneer, which depends on the nine species because of its decorative use, was highly significantly related to the air-dry levy.

The machined product category, as in the case of raw material level, remained unresponsive to the air-dry levy, hence confirming the group's independence in relation to the strategies.

Influences Due to Past Trends:

The past influences amount to the noise component in the model, which captures several factors that might affect patterns of the time series. For example, price, supply and demand cycles, quality levels, market crisis, competition and, more importantly marketing strategies, could be major underlying factors contributing to the noise component in the model. Therefore, the patterns of export trends in the panel products were possibly dictated by dominant suppliers in the global market such as Indonesia. In such situations, whatever regulatory measures are applied to the domestic industry without due regard to market influences may not be effective.

CONCLUSION AND RECOMMENDATION

This research concluded that air-dried lumber reduction was significantly and negatively related to the air-dry levy but had no significant relationship with raw material level. The air-dry levy and raw material level together had significant influence on only air-dried lumber, kiln-dried lumber, sliced veneer and processed lumber molding out of the ten major products studied. It was observed that products that are further downstream (profile boards, dowels, flooring and furniture parts) as well as rotary and plywood production could not be significantly affected by the strategies.

The resultant drop in raw material level has influenced the increase in kiln drying and processed lumber molding. The air-dry levy is observed to be working well as a disincentive to primary processing by reducing air-dried lumber and increasing kiln-dried lumber and sliced veneer. However, the two strategies seem to be limited in driving the industry to the ultimate goal of increased exportation of high-end value-added products. If immediate support could be given to the industry to acquire appropriate machinery and

skills, the strategies could ensure a more efficient transformation process to the desired goal of optimum value-addition. It is therefore recommended that the air-dry levy and the current level of raw material be maintained.

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CHAPTER 4

APPRAISAL OF GOVERNMENT INTERVENTIONS FOR DIVERSIFICATION OF SPECIES UTILIZATION IN FOREST PRODUCT EXPORTS: LESSONS FROM GHANA

INTRODUCTION

Although Ghana's forests contain a multitude of tree species, very few are marketed to domestic or export markets. Historically, this situation has created problems in sustainably managing the country's forests. Concessionaires who have been given felling rights by the government target highly preferred species and leave the less preferred ones either standing or felled and left in the forest.

When forest canopies are opened by human activity such as shifting cultivation and natural disasters such as fire and flood, the pioneer species that replace disturbed forests are predominately LUS. As a result, Ghanaian forests, particularly non-reserved forests are regenerating with an abundance of non-marketed LUS. This preponderance of LUS creates another problem by increasing species density to such an extent that selective felling may be costly due to increasing distance between trees of the same species. In light of a rapidly dwindling inventory of overcut popular forest species, the promotion and sustainable management of LUS can be a solution to sustaining the industry's raw material supply. To date, marketing LUS from Ghanian forests has been extremely difficult.

ITTO member producing countries (of which Ghana belongs) have been making efforts in recent years to improve the level of utilization of LUS to more closely align production with species composition of their forests. As a result, significant resources have been invested in promoting LUS. In addition to assistance received from ITTO,

Ghana has received aid from the European Union in the form of grants to develop the Woodworking Sector Development Project (WSDP). The WSDP has primary responsibility of promoting LUS in the country.

Recent reductions in Ghana's annual allowable cut (AAC) and the introduction of a levy on air-dried exports of popular species has resulted in industry criticism of what is viewed as excessive government regulations. These actions are aimed at improving raw material supply without hampering forest sustainability. Government policymakers believe that these regulations can motivate the industry to reduce its over-dependence on popular species.

This study investigates how these policy changes affect the level of species diversification in the industry. Specifically, the establishment of WSDP, the reduction in AAC and the introduction of the air-dry levy were examined.

OBJECTIVES

The research objectives were to ascertain: 1) Whether there was an overall change in the use of lesser-used species from pre- to post-intervention periods; and; 2) The individual impacts of the Woodworking Sector Development Program, raw material level and air-dry levy on use of lesser-used species.

HYPOTHESES

A reduction in the AAC would be expected to result in a reduction in raw material availability compelling the processing industry to develop markets for forest products made from LUS.

H_1: Reductions in raw material levels by lowering the AAC will promote species diversification.

The air-dry levy is directed at discouraging the use of popular species that were manufactured into air-dried lumber. As a result of the levy, air-dried lumber manufacturers will turn to the use of LUS.

H_2: The air-dry levy will increase species diversification.

The formation of the Woodworking Sector Development Project is specifically targeting the increased use of LUS in an effort to reduce pressure on popular species.

H_3: WSDP activities will increase species diversification.

RESEARCH REVIEW

Composition of Forests and Level of Utilization

Youngs and Hammett (2001) state that in a typical tropical forest there are many, often hundreds of different tree species within a hectare of land. Chudnoff (1984) lists 159 tropical forest species in America, 111 in Africa and 117 in Asia, all of which are known to have commercial value. In the Philippines lesser-used species (LUS) make up about 25 percent of forests (Rojo 1990). Yeom (1984) indicated that only 5 percent of the total volume is removed in American and African forests while Southeast Asian forests, richer in commercial species, produce a higher yield of 14 percent. Improved utilization of the underutilized species may offer increased opportunities on a global scale for both needed products and sustainable forests (Youngs and Hammett 2001). Limited utilization of the lesser-used species is identified as a negative factor when considering management of tropical forests (Youngs 1989).

Problems with LUS

Youngs and Hammett (2001) reported that the problem of underutilization of forests has also been recognized in temperate forests and that special research attention is

needed in this area (IUFRO 1997). Problems with LUS include 1) difficulty in identification of timber species, 2) inadequate data on physical and mechanical properties, 3) incorrect marketing into wrong end uses, 4) poor grading and 5) irregular or inadequate supply (Eddowes 1980).

There are opportunities subject to clearly defined needs including a) dissemination and application of currently known technology, b) an assured supply of timber, c) marketing, d) conversion technologies for these woods, and e) support for the small industries that will likely be the starting point in utilization (Addae-Mensah et. al 1998).

Availability of technical information, availability of small trial volumes and low trial prices are major problems associated with LUS (Eastin and Wright 1998). Common problems in processing with such species are the presence of silica and extremely high densities (Loehnertz et al. 1996).

Tissari (2001) notes that though international timber trade is dominated by a few popular species, the trade of manufactured products is more reliant on technical and aesthetic properties. Therefore, although it may seem logical that continuation of relying on popular species may hold an advantage, there is little evidence supporting it as the underlying reason for customer manufactured product purchases. In fact, Karki (2000) found that in Munich, Germany, species places second to design as a marketing factor influencing furniture purchases. Moreover, it is often observed that many products produced from the popular species, particularly builders' joinery and profiled wood, end up being painted. In such circumstances, technical properties such as machining, sanding, glue bond, surface finish, pH and coating ability would be of more concern.

Unfortunately, much research in the literature addresses anatomical and strength properties of tropical timber species and often assumes that utilization demand could be extrapolated from such data. The ITTO Project PD47/88 Rev.3 (1) is an example of research noted to have taken a wider coverage. The five-year project had 8 main objectives:

1) to select suitable LUS in terms of occurrence, silviculture, technical properties and whether or not plantable,
2) to collect, identify and authenticate LUS for herbarium reference and prepare a field guide for their identification,
3) to determine basic working properties,
4) to assess properties for specific end-uses,
5) to develop and promote value-added products,
6) to conduct piloting and verification of technologies,
7) to disseminate information obtained to the wood industry, and
8) to prepare a manual on the properties and uses of LUS in the Philippines.

According to the ex-post evaluation report (Smith 2000), the implementing agency, Forest Products Research and Development Institute (FPRDI) conducted twenty-three (23) separate studies in achieving these objectives. The studies were carried out on properties like anatomy, strength, chemistry, durability, sawmilling, seasoning and preservation, machining, gluing, finishing, pulping and peeling. Apart from this, utilization studies were actually carried out in the manufacture of furniture, parquet, picker sticks, cement board, transmission poles, pallet*s* and millwork.

The Way Forward

Regarding the outlook of these species, diverse opinions are noted among researchers. Freezailah (1984) recommends that the problem of lesser-used species (LUS), which commands about 93 percent composition of tropical species, needs to be addressed in the context of trade development and cautions a poor outlook. Another school of thought recommends the conversion of existing mixed stands of tropical forest into plantation forest (Bethel 1984, Choong et al. 1993). However, whereas it may seem like an isolated case, it may be worthwhile to caution a word of advice. In the early 1960's, Ghana embarked on an operation in a bid to eliminate uneconomical tree species in order to make room for commercially 'elite' ones in order to increase productivity. Girdling with poison, thousands of trees were killed but the operation had to stop due to the dangers it posed to the environment. Today, the then LUS such as **Ceiba pentandria** and **Daniela ogea**, which were being eliminated, have become the mainstay of rotary veneer production in Ghana and highly preferred on the U.S. market (FPIB 2001).

There are some suggestions for circumventing the problems with LUS. Skog et al. (1997) propose that woods with similar properties be grouped and sold together while Simpson and Baah (1989) recommend grouping such species by specific gravity for kiln drying to offset the problem of supply of the individual species.

METHODOLOGY

Data

Data for this study was extracted from export records of the Timber Industry Development Division of the Forestry Commission of Ghana, which includes volume of all species by major product exported from Ghana from 1992 to 2001. Fifty-three species

were included in the study, of which twenty-seven are LUS (Table 4.1). The products studied include air- and kiln-dried lumber, plywood, rotary and sliced veneer, processed lumber molding, profiled boards, furniture parts, dowels, and flooring.

Table 4.1a. Lesser-used Species Exported from Ghana from 1992 to 2001

LESSER-USED SPECIES	
Common Name	**Latin Name**
Adasema	**Chrysophylum spp.**
Aprokuma	**Antrocaryon nicraster**
Atabene	**Chrysophylum perpulchrun**
Ayan	**Distemonanthus benthamianus**
Bodwe	**Ongokea gori**
Bombax	**Bombax buonopozense**
Canarium	**Canarium schwenfurthii**
Cedrela	**Cedrela odorata**
Ceiba	**Ceiba pentandra**
Celtis	**Celtis milbraedii**
Chenchen	**Antiaris toxicara**
Dahoma	**Piptadeniastrum africanum**
Danta	**Nesogordonia papaverifera**
Denya	**Cylicodiscus gabunensis**
Entedua	**Copaifera salikunda**
Esia	**Petersianthus macrocarpus**
Gmelina	**Gmelina arborea**
Hoturohoturo	**Hannoa klaineana**
Ogea	**Daniellia ogea**
Ohaa	**Sterculia oblonga**
Otie	**Pycnanthus angolensis**
Potrodom	**Erythrophleum spp.**
Sinuro	**Alstonia boonei**
Subaha	**Mitragyna ciliata**
Tetekon	**Gibertiodendron spp.**
Tweneboa	**Cordia nillenii**
Wawabima	**Sterculia rhinopetala**
Yaya	**Amphimas pterocarpoides**

Table 4.1b. Popular Species Exported from Ghana from 1992 to 2001

POPULAR SPECIES	
Common Name	**Latin Name**
Afromosia*	**Pericopsis elata**
Akasaa	**Chrysophyllum giganteum**
Albizia	**Albizia ferruginia**
Asanfina	**Aningeria spp.**
Avodire	**Turreanthus africana**
Candollei	**Entandophragma candollei**
Edinam*	**Entandophragma angolense**
Ekki	**Lophira elata**
Emire	**Terminalia ivorensis**
Guarea	**Guarea cedreta**
Hyedua*	**Guibortia ehii**
Koto	**Pterygota macrocarpa**
Kusia	**Nauclea diderrichii**
Mahogany*	**Khaya spp.**
Makore*	**Tieghemela heckelii**
Mansonia	**Mansonia altissima**
Niangon	**Heretiara utilis**
Odum*	**Milicia excelsa**
Ofram	**Terminalia superba**
Papao	**Afzelia bella**
Sapele*	**Entandophragma cylindicum**
Teak	**Tectona grandis**
Utile*	**Entandophragma utile**
Walnut	**Lovoa trichilioides**
Wawa*	**Triplochiton scleroxylon**

* - Levied Species

There were 120 cases of monthly data, of which 51 came from the pre-intervention period.

Analysis

Measuring Species Diversification

In order to examine diversification in the use of species, an exploratory analysis was carried out. Diversification of species used by the timber industry could intuitively be expressed as increases in:

1) number of species,
2) volume and or number of lesser used species, or
3) number of species per unit volume

However, these measures could be inadequate for the following reasons:

Number of Species: Immediately after the reduction in the AAC, producers would typically try to maintain their raw material and sales levels by convincing their buyers to try various LUS. As a result, there was a dramatic increase in the number of species listed in the export records but most of these shipments were small trial volumes as low as one cubic meter. In this case, it would be misleading to indicate species diversification solely using the number of species as an indicator. After this trial period (1996-2000), the number of species exported returned to pre-intervention levels (Figure 4.1). It should be noted that the relatively high number of species in 1994 was due to log exports of LUS to the Far East where they were processed, primarily into rotary peeled veneer. The decline in 1995-1996 was due to the governments ban on log exports which was instituted at this time.

Volume and/or Number of Lesser-used Species: These indicators could be useful, but the effect would be masked if only a few of the LUS contributed significantly to the total volume produced and exported. In such a situation, if export volumes in LUS increased in the post-intervention time period, a false impression that there is increased species (across all LUS) diversification could be created.

Number of Species per Unit Volume: Arguably, species diversification should not be based only on the number of species or volume. The two should be linked to indicate the relative quantity exported among the species.

Accordingly, in this study, the proportion of each LUS (i.e., percent LUS) relative to total volume of exports was considered appropriate in determining species diversification. In order to avoid the problems discussed earlier, individual species

exported in pre- and post-intervention were examined. It was found that all LUS used in the pre-intervention period remained in use, but in increased volumes, in the post-intervention time period.

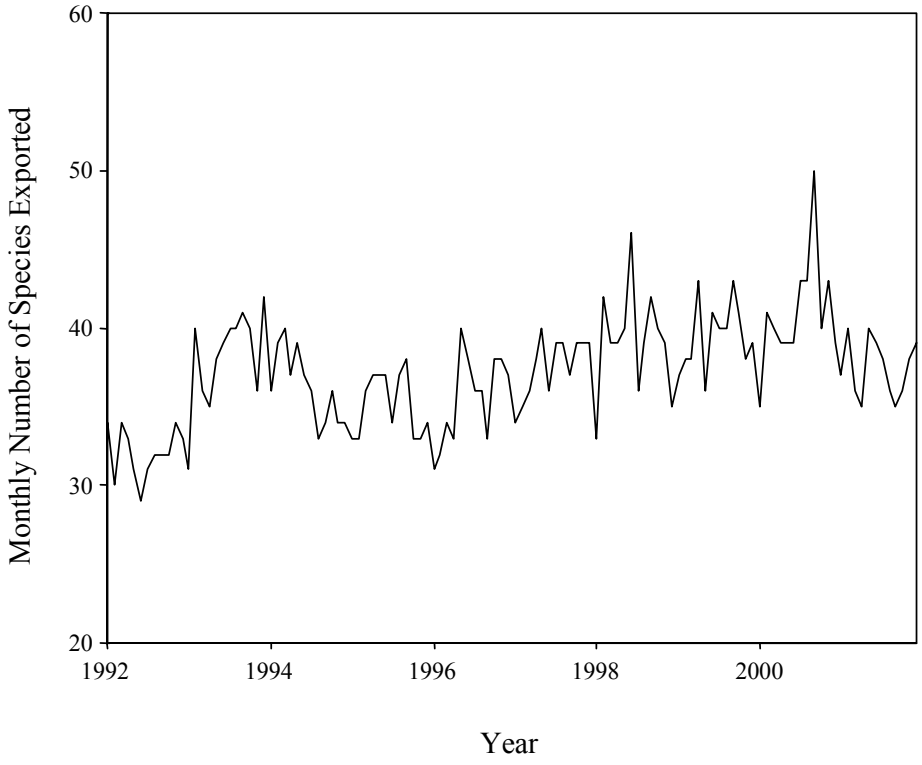

Figure 4.1. Number of Species Exported from Ghana from 1992-2001

In addition, there were ten new species in very small volumes being exported ranging from one to forty-two m^3 per month in the post-intervention period. Thus, the number of species did not change dramatically over study period but the volumes of most of the existing LUS did increase. This was accompanied by a decrease in exports of popular species.

This transition of volume from popular to lesser-used species appeared to be masked by the large volumes of wood material exported in the form of logs in the pre-intervention period. When log exports were excluded from the pre-intervention data, the

volume transition became more evident (Figure 4.2a - d). Since all LUS from the pre-intervention period were retained with increases in volume in the post-intervention period, coupled with reduced volumes in popular species, the use of percent LUS (dependent variable) is an appropriate indicator for species diversification.

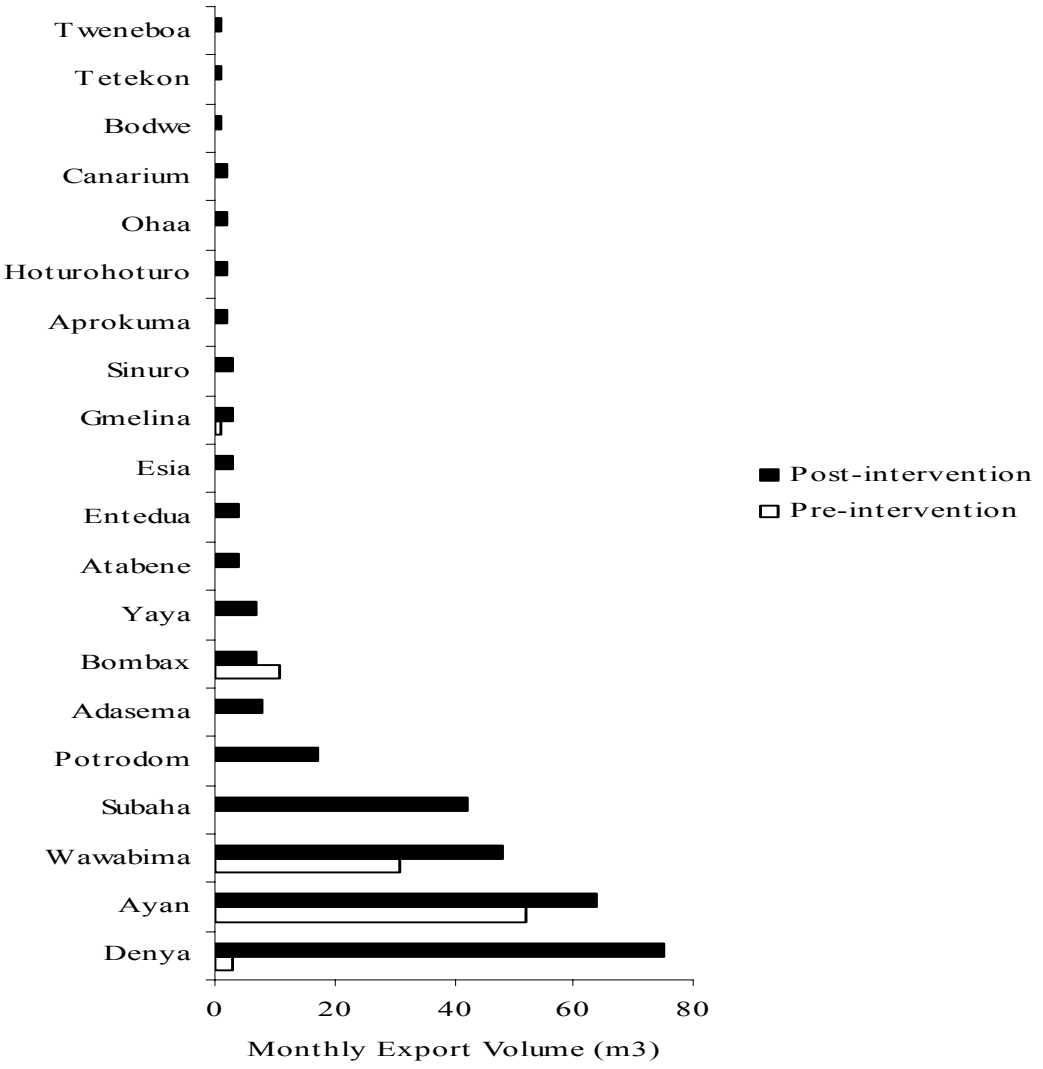

Figure 4.2a. Pre/post Comparison of Species Performance in Products other than Logs – Lesser-used Species (Low Volumes)

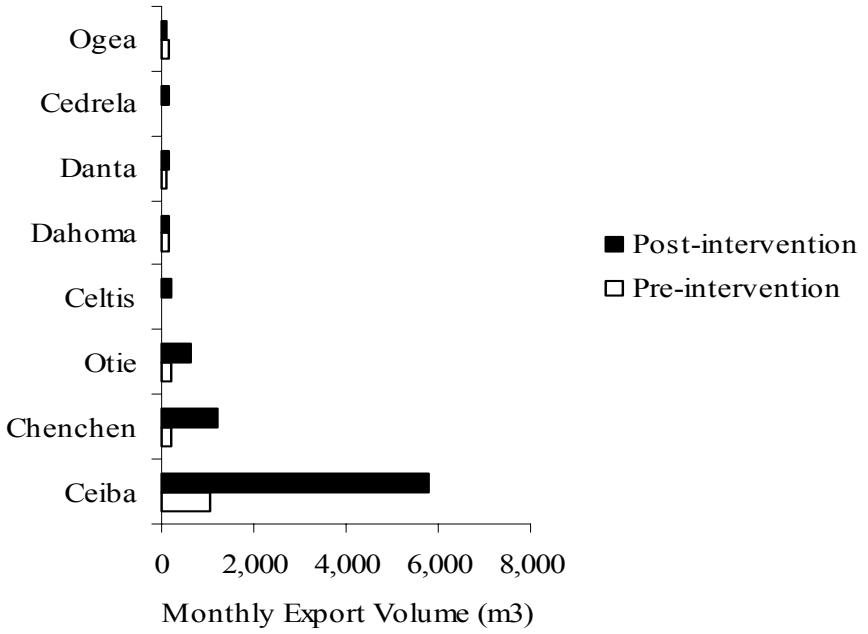

Figure 4.2b. Pre/post Comparison of Species Performance in Products other than Logs – Lesser-used Species (High Volumes)

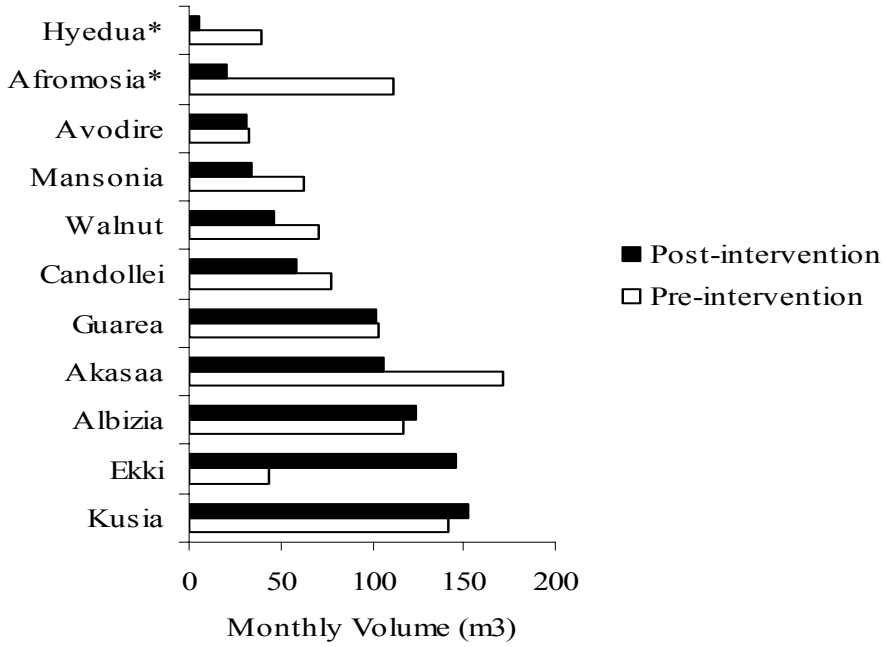

Figure 4.2c. Pre/post Comparison of Species Performance in Products other than Logs – Popular Species (Low Volumes)
* - Levied Species

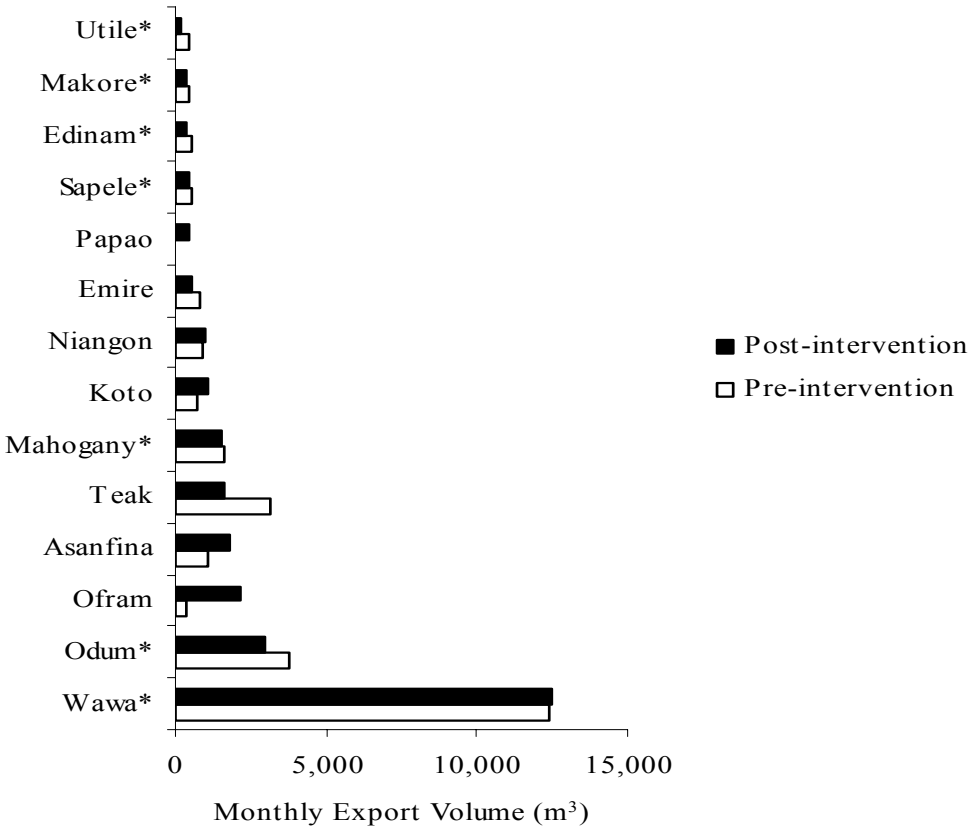

Figure 4.2d. Pre/post Comparison of Species Performance in Products other than Logs – Popular Species (High Volumes)
* - Levied Species

Modeling Government Interventions

The goal of the study was to ascertain whether government interventions contributed to these changes in species and volume export patterns. SPSS Decision Time 1.0 software Autoregressive Integrated Moving Average (ARIMA) modeling was used in this analysis. The four variables of interest are (1) proportion of LUS of total volume of all species exported, i.e., **Percent LUS**, P (dependent), (2) **raw material (AAC) level**, R (metric predictor), (3) **air-dry levy**, L (dummy predictor), and (4) **Woodworking Sector Development Project (WSDP)**, W (dummy predictor).

The ARIMA model in this study applies Bowerman and O'Connell (1993) and Box and Tiao (1975) transfer function and intervention models. Using notations representing variables in this study, the combined model can be written as:

$$z_t = \mu + [C_R\omega_R(B) / \delta(B)]B^b z_t^{(R)} + [C_L\omega_L(B) / 1- \delta(B)]B^b z_t^{(L)} +[C_W\omega_W(B) / 1- \delta(B)]B^b z_t^{(W)} + N_t$$

The noise component of the model, N_t is modeled using Autoregressive (AR) and Moving Average (MA) processes. Generally, after Box and Tiao 1975:

$$N_t = [\theta(B)/\varphi(B)]a_t$$

Where, $\theta(B) = 1- \theta_1 B - \theta_2 B^2 - \ldots \theta_q B^q$ are moving average polynomials in B of degrees q

$\varphi(B) = 1- \varphi_1 B - \varphi_2 B^2 - \ldots \rho_p B^p$ are autoregressive polynomials in B of degrees p

a_t = white noise

For seasonal data:

$\theta(B) = \theta_1(B)\ \theta_2(B^s)$, where s = 12 for the monthly data

$\varphi(B) = \varphi_1(B)\varphi_2 B^s$

The transfer function component with the stationary raw material series, $z_t^{(R)}$, is used to model the impact that changes in raw material levels might have on percent LUS, P;

where, z_t = stationary P_t (proportion of LUS in volume exported or percent LUS)

μ = a constant (usually excluded unless significant, i.e., unless t-value > 2).

C = unknown scale parameter.

b = # of periods before $z_t^{(R)}$ begins to affect z_t.

B = backshift operator, where $BV_t = V_{t-1}$

$\omega(B) = (1 - \omega_1 B - \omega_2 B^2 - \ldots \omega_s B^s)$, estimating numerator effects over *s* lags of $z_t^{(R)}$ that are significant in predicting z_t.

$\delta(B) = (1 - \delta_1 B - \delta_2 B^2 - \ldots \delta_r B^r)$, estimating denominator effects over r lags of z_t itself that are significant in predicting z_t.

The $z_t^{(L)}$ term in the model captures the impact the air-dry levy might have on percent LUS, z_t. This is a dummy step variable expected to have a gradual start and permanent effect on z_t, therefore:

$z_t = \varphi(B)V_t$ and $z_t^{(L)} = \varphi(B)S_t$, where $S_t = 0$ or 1 (for pre- and post-intervention respectively)

$\omega(B) = 1$; $\delta(B) = 0$ and $b = 0$.

The term, $z_t^{(W)}$ models the effect of WSDP on percent LUS, z_t and its parameters are as defined in $z_t^{(L)}$.

An exploratory examination of the series in this study to check for 'dead time', early or delayed response to the date of intervention, revealed no such incidence. This was necessary to suppress any elusion of significant impact from the interventions.

An upward trend in Percent LUS was expected during the post-intervention period. This would be expected to differ from the trend in the pre-intervention period. Also expected was a systematic change in the behavior of the time series after introduction of the intervention.

RESULTS

Figure 4.3 is the plot of time series depicting the proportion of lesser-used species relative to total volume of all species exported from 1992 to 2001. It is observed from 1993-1995 that over half of total volume shipped was from LUS but this was mainly in

log form. Since log exports were suspended in 1995, a pre/post intervention comparison of species diversification will have to exclude logs from the pre-intervention era.

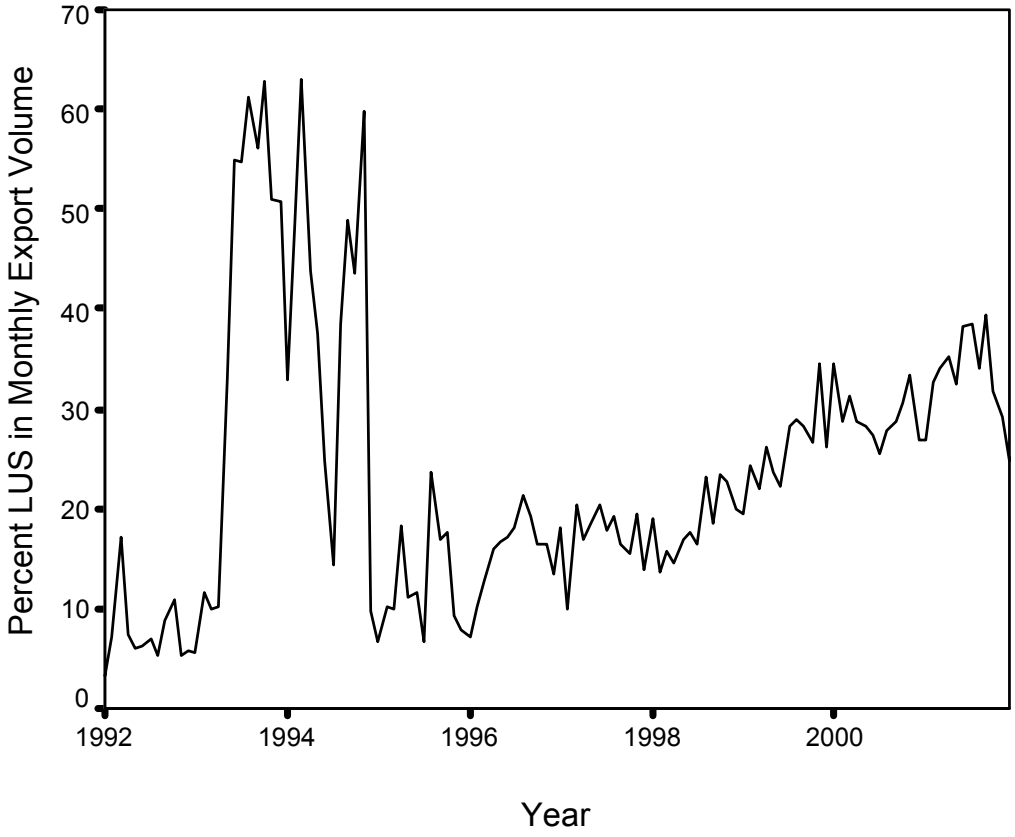

Figure 4.3. Percent Lesser-used Species of Total Volume of all Species Exported from Ghana from 1992-2001

Figure 4.4 shows the same data but with logs removed from the pre-intervention data. This supports the supposition that most of the LUS shipped in the pre-intervention period were in log form. After suspension of log export in late 1995, followed with the air-dry levy in early 1996, percent LUS in products other than logs picked up from a dormant level in the pre-intervention era and maintained an increasing trend. In 1999 WSDP was introduced but there are no signs of spikes in the increasing trend of the series in 1999 and thereafter.

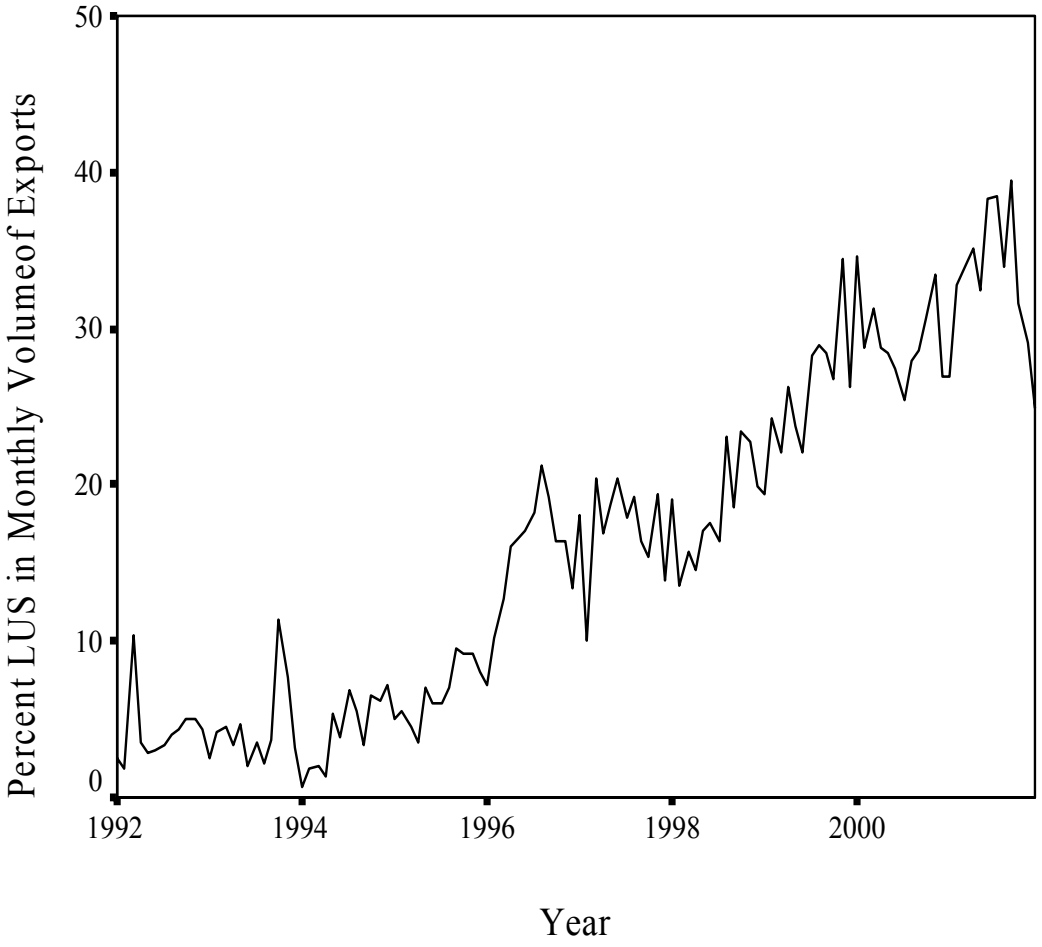

Figure 4.4. Percent Lesser-used Species of Total Volume (Less Logs) of all Species Exported from Ghana from 1992-2001

In the pre-intervention period, a lack of harvesting monitoring and control from the forest sector agencies led to exploitation of the forest beyond the permitted allowable cut of 1.2 million m^3. Figure 4.5 indicates the decrease in raw material level as a result of the new allowable cut restrictions of 1.0 million m^3 introduced in late 1995.

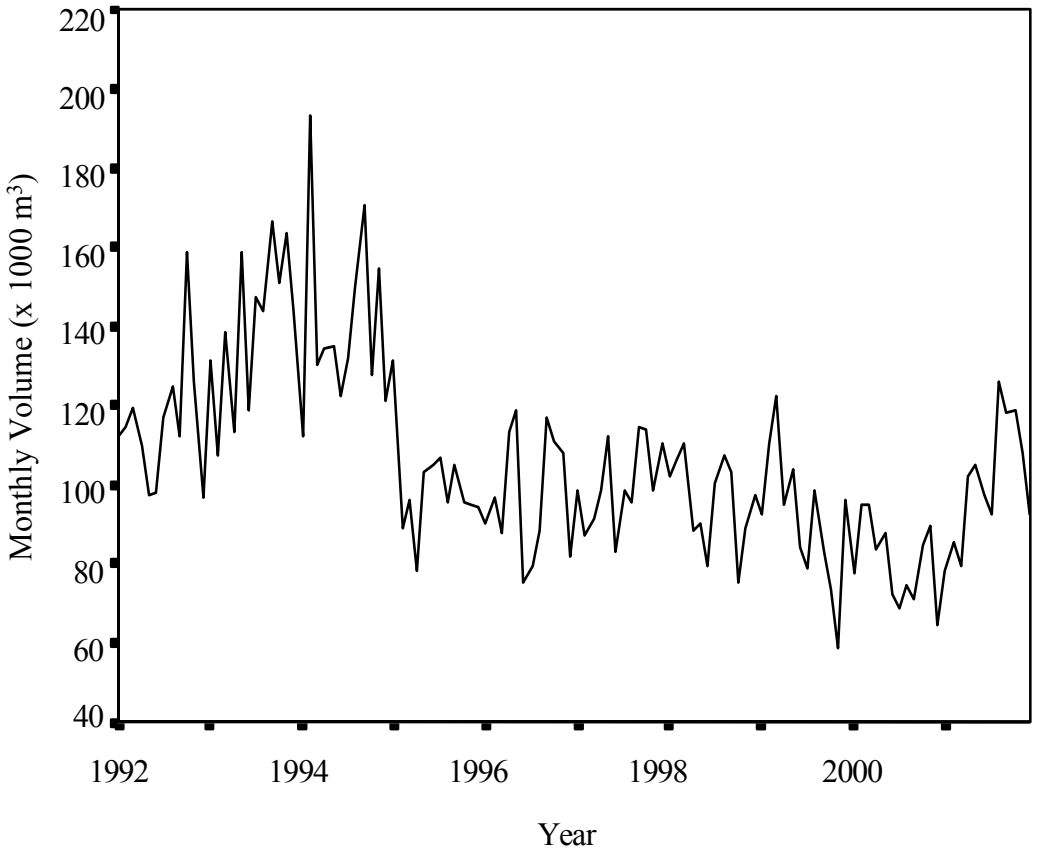

Figure 4.5. Monthly Volume of Raw Material Harvested from Forests in Ghana from 1992-2001

Once the Percent LUS series was fit with the ARIMA (0,1,1) model, the air-dry levy emerged as the only significant intervention. From Table 4.2, it is observed that introduction of the levy in the post-intervention period is associated with a 98 percent increase in the square root of Percent LUS as indicated by the model estimate (see Appendix 4.1 for model assessment details). The WSDP variable did not have a significant contribution to the model and was subsequently omitted.

Table 4.2. Parameter Estimates of Air-dry Levy Predicting Square Root of Percent LUS in Total Volume of Species Exported from Ghana (1992-2001).

Model Parameters	Estimate	Standard error	t-value
Square root of Percent LUS, difference order: 1			
Moving average lag 1	0.6441	0.07456	8.638
Air-dry levy, difference order: 1			
Numerator lag 0	0.9803	0.3244	3.022

The strong link of Percent LUS to the air-dry levy might suggest a relationship with products that have a direct association with the air-dry levy, namely air- and kiln-dried lumber. In addition, rotary veneer and plywood, which depend mainly on LUS, may also show relationships with Percent LUS.

When the series of these products were used as independent variables in a model estimating percent LUS (dependent), only air-dried and kiln-dried lumber were significant with ARIMA (0,1,4) as a good fit (see appendix 4.3 for model assessment details). As shown in Table 4.3, kiln-dried lumber was positively related and was correlated to an increase of nearly 54 percent in percent LUS. In the case of air-dried lumber, there was an inverse relationship resulting in an apparent impact of 30 percent increase in percent LUS (air-dried lumber was reduced).

Implementation of the WSDP did not result in any significant influence on the trend in Percent LUS. At the time that this study was conducted (i.e., 2001), the WSDP program was only two years old. Although substantial assistance had already been allocated to participating companies, it appears too early to see an impact on percent LUS. However, according to the 2nd half year report for 2002, the Project has led to over 8,000 m^3 of LUS being exported by participating companies. This is already in excess of a target total volume of 7,500 m^3 of LUS to be supported over the project's four-year life.

Table 4.3. Parameter Estimates of Air- and Kiln-dried Lumber Predicting Percent LUS in Total Volume of Species Exported from Ghana (1992 – 2001).

Model Parameters	Estimate	Standard error	t-value
Logarithm of Percent LUS, difference order: 1			
Moving average lag 1	0.4639	0.08627	5.378
Moving average lag 4	0.2104	0.08516	2.471
Logarithm of Lumber air-dried, difference order: 1, delay 7			
Numerator lag 0	-0.3011	0.1459	-2.064
Logarithm of Lumber kiln-dried, difference order: 1, delay 7			
Numerator lag 0	0.5384	0.1467	3.67
Numerator lag 3	0.2674	0.1225	2.183

DISCUSSION

Although increased use of lesser-used species might have been expected from the need for raw material due to AAC reductions, percent LUS was not significantly affected by the implementation of raw material regulation. This infers that the industry would not have changed its behavior with regard to LUS if the air-dry levy was not introduced as an additional measure with the AAC reduction. Interestingly, some air-dry lumber producers still pay the levy to export the nine popular species. In effect, the sole reduction of annual allowable cut would have possibly resulted in increased competition between air-dry lumber and other products for raw material. However, introduction of the levy clearly transitioned the nine popular species from air-dried to kiln-dried lumber production. This resulted in an increased use of LUS for air-dried lumber.

Kiln-dried lumber manufacturers do not face any restrictions as to which species they can export without the levy. Therefore, as new markets emerge for LUS, producers can quickly take advantage of these market opportunities. The strong positive association of the volume of kiln-dried lumber to percent LUS might also be as a result of rising

costs of the popular species. Over the study period, local prices of LUS logs were as low as 30 percent of those of popular species.

Also, rising energy costs is continually driving increased drying of low-density species, which require few days to dry compared to medium to high-density popular species which can take a month or more to dry. Of late, low-density LUS such as **Ceiba**, **Subaha**, **Chenchen**, **Cedrela**, **Gmelina**, **Ayan** and **Otie** have gained market acceptance.

Air-dried lumber producers do not have the same market options as their kiln-dried lumber counterparts. The air-dry levy coupled with the difficulty of getting large-volume contracts in the available LUS has forced many producers to either close down entirely or go into production solely for the domestic market. Also in the past there existed "Export Trading Companies" which did not have concessions or mills of their own but they could export and make profit just by buying logs from the open market and contracting sawing. Most of these companies were air-dried lumber producers and, as a result of the air-dry levy, most have forced out of business. As air-dried lumber exports decline with the exit of producers, remaining mills increasingly will depend on LUS for survival.

Rotary veneer and plywood production depends on LUS but these two products did not show significant relationship changes with percent LUS. As found in chapter 3, market forces, rather than the component raw materials largely drive export trends of these products. As more LUS gained market accessibility, so went exports of the two products but their patterns did not closely follow that of percent LUS.

Finally, with regard to the hypotheses tested in this study:

H_1: Reduced raw material level will increase species diversification

H_2: Introduction of the air-dry levy will increase species diversification

H_3: WSDP will increase species diversification

Of the three hypotheses studied, only H_2 was accepted. The air-dry levy was found to be significant and positively relating to percent LUS (used as a measure of species diversification) whereas a reduction in AAC and the establishment of the WSDP did not result in any significant relationship.

Further investigation into products driving the increasing trend of Percent LUS in the post-intervention period pointed to air- and kiln-dried lumber. Air-dried lumber had a significant negative relationship with Percent LUS such that, as the volume of air-dried lumber exports declined in the post-intervention period, more LUS went into manufacturing this product. In the case of kiln-dried lumber, there was a positive relationship; hence, as volume of kiln-dried lumber increased in the post-intervention period, there was increased use of LUS.

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CHAPTER 5

MARKETING IMPLICATIONS OF GOVERNMENT INTERVENTIONS IN THE GHANAIAN FOREST PRODUCT TRADE: THE INDUSTRY PERCEPTION

INTRODUCTION

Over the past decade, the Ghana forest products industry has embarked on a difficult transformation from exporting low-value commodity products to one which produces high-value semi- and finished products. This transition is necessary because of declining raw material availability of traditionally popular species and the high incidence of manufacturing and exporting air-dried lumber.

Amidst an abundant raw material supply until nearly a decade ago, the forest sector in Ghana essentially produced and exported any products it wanted to. At the beginning of the 1990s, log trading was popular because it was easy to become rich overnight by felling a valuable mahogany or other high value species tree and transporting it to the harbor for cash sales. The government halted the trade in logs when signs of shortages first appeared in the mid-1990s. Following the log export suspension, two regulations, an annual allowable cut (AAC) reduction and implementation of an air-dry levy, hastened a move from selling basic products to that of further processing. Promoting lesser-used species and activities for value addition facilitated this move.

Currently, many tropical timber-producing countries are developing value-adding wood products sectors that compete with the Ghanaian product mix. The Ghanaian industry is thus placed in a mix of competitors who, in many cases, are already advanced in specialized skills to manufacture value-added products. To compete effectively, the industry needs to develop competitive advantages.

A way of developing competitive advantage is to examine what industry is doing in terms of marketing to identify market needs and enhance what is already being done correctly. This identification process often reveals where resources need to be committed to strengthen an industry. Accordingly, this study examines the wood products industry perceptions of how marketing activities are being changed concurrent with the industry's government-led transition to adding value. The objectives of this study were: 1) To ascertain the impact of government interventions in terms of changes in marketing activity of the industry; 2) To identify current marketing needs of the industry and; 3) To identify current marketing strengths of the industry.

RESEARCH OVERVIEW

The Need to Strengthen Competitiveness

Changes in policies that affect trade have three main effects including changes in production capacity, changes in incentive to produce specific commodities and changes in demand (Collins 1998). Previous to implementing policies intended to shift the industry from primary to secondary product processing, the Ghana timber industry depended on the export of raw materials, notably round logs. Up until the mid 1990s, there was little competition because of the high demand for logs especially from the Far East. Today, after a log ban was implemented, and government interventions were made to curb commodity production, Ghana is in a position of having to develop competitive positioning to participate in the value-added sector.

In identifying sources of competitiveness for U.S. secondary wood products, Hoff et al. (1997) stressed that a multidisciplinary research approach combining engineering and economic analysis is needed. In addition, information on how firms can use

innovative marketing arrangements, management and other technologies to deliver what consumers want at the lowest possible cost is part of identifying competitive advantages.

Marketing efforts that are likely to affect competitiveness include product design, market intelligence, distribution channels, and customer service (West and Sinclair 1992). Encouraging value-adding calls for an increased emphasis on marketing, product differentiation, quality and higher margin products (Syme 1990). In addition, globalization has 'neutralized' international boundaries making information available to firms to compete, enabling them to effectively. Consumers now have increased access and are able to contact many competitors in a short time (Capen and Glazer 1987).

Needs Assessment and Forecast

Entry into value addition markets is often challenging. There is the need to examine proper positioning and prerequisites for performance. In a study that can offer valuable insight into adding value in Ghana, Vlosky (1996a, b) studied the perceived characteristics and profile of the hardwood component and furniture manufacturers in the Southern U.S. and found factors that impede or promote success in adding value in these industries. Success factors, in order of importance, were found to be product quality, long-term customer relationships, and high-level of customer service. Also included are company reputation, product availability, fair pricing, fast response to customer inquiries, knowledgeable salespersons, and flexible delivery. Of lesser importance were access to markets, distribution capabilities, marketing skills, payment terms, credit terms, and computer capabilities. The highest ranked factors that impede industry development include raw materials procurement, consistent raw material supply, volatile pricing, underutilized capacity, and promotion. Other factors include competition from regional

suppliers, competition from in-state suppliers, delivery problems, over-capacity, and competition from overseas suppliers.

Jensen and Pompelli (2000) conducted a study on how marketing and related business needs vary across industry sub-sectors, business experiences, firm size and marketing in the Tennessee forest product industry. They found that: 1) finding and identifying potential buyers for products, 2) getting help with promoting products and 3) conducting market research are the most needed forms of training and assistance. It was also found that needs for marketing assistance is not uniform across firms of differing size. The findings also showed that assistance in marketing for expansion into international markets is needed.

A study of the Canadian solid-wood-products industry provided a view of the 21st century in which there would be important variations in markets, products and technology (Shuler and Meil 1990). Globalization, technological advancement and improved communication would influence these trends. The expectation in this study is the wood product industry will change as follows:

a) Smaller economic units
b) Increased vertical and horizontal integration
c) Market diversification
d) Large multinational corporations
e) Shift from commodities to engineered wood products
f) Resource-neutral conversion and product technology
g) Shift from structural to semi structural and non-structural applications

h) Shift to environmentally acceptable products and conversion technologies

i) Customers in future will be better-informed looking for good value for their money.

Developments in Forest Products Trade

Two fairly recent developments that have the potential to influence wood trade are certification and its associated chain-of-custody and eBusiness. Certification is gaining momentum globally in the forest sector. According to a press release by the Forest Stewardship Council (FSC 2001), the global timber industry's acceptance of their certification scheme exploded during the first two months of 2001. FSC's accredited bodies certified 331 companies, representing a 30 percent growth from 2000. The total number of certified companies increased to 1,405 from 1,074 at the end of December 2000. These companies received a chain-of-custody certificate, which is a license to handle and label timber products with FSC's "checkmark and tree" logo - a strong marketing tool with perceived long-term benefits. Hansen and Punches (1999) identify three means of certification. "First party" is self-certification by a company and "second-party" certification is conducted under the auspices of an association. Both are potentially limited to instill consumer confidence because of conflict of interest. The independent "third-party" approach is viewed by most as the only credible means to audit a company's forest management and chain-of-custody practices. In addition, some countries such as Sweden and Indonesia are developing national certification schemes. Ghana is trying to develop a national scheme in preparation for the FSC "third-party" certification.

The forest product industry is fast embracing eBusiness/eCommerce, thus taking advantage of the rich marketing and trade opportunities provided by the Internet and

electronic communication in general. The U.S. paper and forest products industry buys and sells more than $400 billion worth of products yearly, and it is predicted that a third of these transactions will be conducted on-line in the next few years (Anonymous 2000). The products with early-adoption potential include building materials, printing and writing papers, recovered fiber and timber (Anonymous 2000). Even after the dot.com bubble burst in the late 1990s, forest sector web business exchange sites are active on the Internet including Forest Express, Forest Web, ForestIndustry.com, PaperLoop.com and E-Fibre.com (Anonymous 2000).

METHODOLOGY

In summer 2001, a focus group discussion with representatives from the major sectors of the Ghana forest product industry resulted in the development of a survey instrument that was the foundation of this research. There was at least one representative from mill management, production, shipping and documentation, marketing, and industry specialists present at the session. The goal was to identify real marketing issues currently affecting the industry.

Further survey refinement and implementation followed the Total Design Method (TDM) recommended by Dillman (1978). Categorical questions captured demographic and geographical data. Respondents were to rate their agreement on questions regarding marketing issues by using Likert-type scales. Also, respondents were asked to compare pre- and post-intervention periods before and after government interventions were instituted and to assess how the conditions of the two periods affected their businesses. There were also questions on how respondents would want to take advantage of developments in present-day marketing.

This research instrument was pre-tested to check for biased, misleading or confusing questions and to corroborate the quality and comprehensiveness of information received. Questions were as detailed as possible to clearly direct respondents.

Sample Design

The sample used in this study was from mills in Ghana that have been in existence from before December 1995 to the present. This was to ensure that the selected participants experienced both periods, pre-and post-government intervention. A census of one hundred and twenty companies was taken from the records of the Timber Industry Development Division, TIDD (Forestry Commission). Because of the research-averse nature of the industry, all identified companies received copies of the questionnaire to ensure a favorable response. The sample key respondents consisted of management and personnel in charge of marketing in the company. A cover letter on the survey addressed to the managing director explained the need for such a team effort in responding to the survey as people with knowledge of both pre- and post- situations were required.
Of the 120 questionnaires sent out, there were none returned as undeliverable Forty responded and all were usable in the analysis resulting in a response rate of 30 percent. However, between-group (air- and kiln-dried lumber, panels and machined wood producers) samples were small. These were eleven (11), thirteen (13), ten (10) and six (6), respectively. It is worth mentioning that the low numbers reflect the low presence of some groups in the Ghanaian industry. For instance, there are only thirteen (13) panel processing companies out of which ten (10) responded. A similar situation exists for companies with machined wood as the major product area.

Non-Response Bias

The Ghana forest product industry has many inefficient "mom and pop" mills which harbor the general misconception that researchers are in some way responsible for excessive government controls. It is therefore difficult to carry out research that has links to the government. Usually, it is their foreign counterparts who agree to take part in research work. Since this study did not match respondents to survey responses, it was difficult to test statistically how such 'mom and pops' fared in responding to this survey. Considering responses from phone-in reminders, it appears the bias is present in the low response rate from that group, who are generally known to be air- and kiln-dried lumber producers.

Geographically, the Ashanti Region is the heart of the industry, and about two-thirds of the forest products industry remains in this region. The other regions involved with the forest product industry that qualified for sample frame requirements in this study were Western, Eastern and Brong Ahafo regions. There was no significant bias by comparing respondents and non-respondents geographically by region.

RESULTS

Respondent Profile

Figure 5.1 shows the geographic distribution of respondents indicating their mill locations. Based on the regional distribution of the forest products companies in Ghana, all regions were adequately represented.

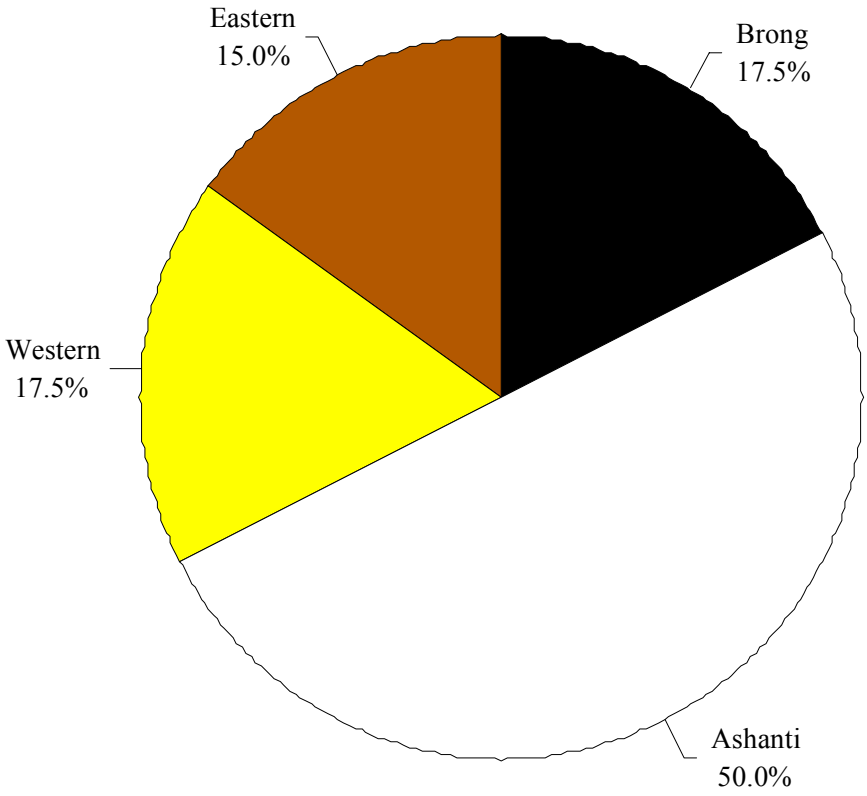


Figure 5.1. Geographic Distribution of Respondents (n = 40)

Figure 5.2 depicts the distribution of respondents by decade of incorporation. This demographic was an important part of the study, enabling selection of only those mills that existed before the government interventions. Most responding companies were established in the 1980s followed by the 1960s. The 1970s and 90s had equal respondents.

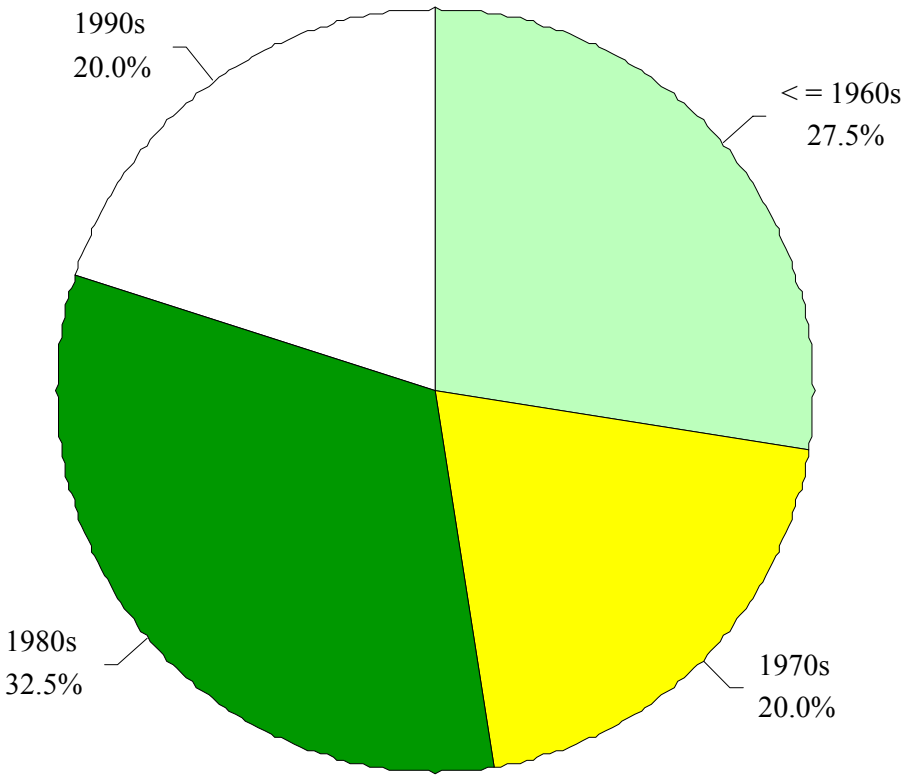


Figure 5.2. Distribution of Respondents by Decade of Incorporation (n = 40)

Figure 5.3 shows the distribution of respondent companies by product area. Respondents ranked the product area which yields the highest revenue for their company. Kiln-dried lumber was the highest revenue earner followed by air-dried lumber, panel products, and machined products, respectively.

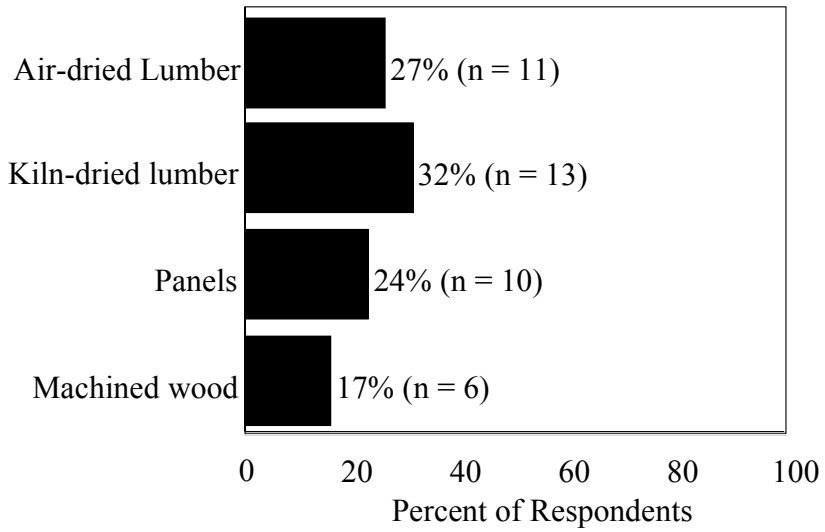


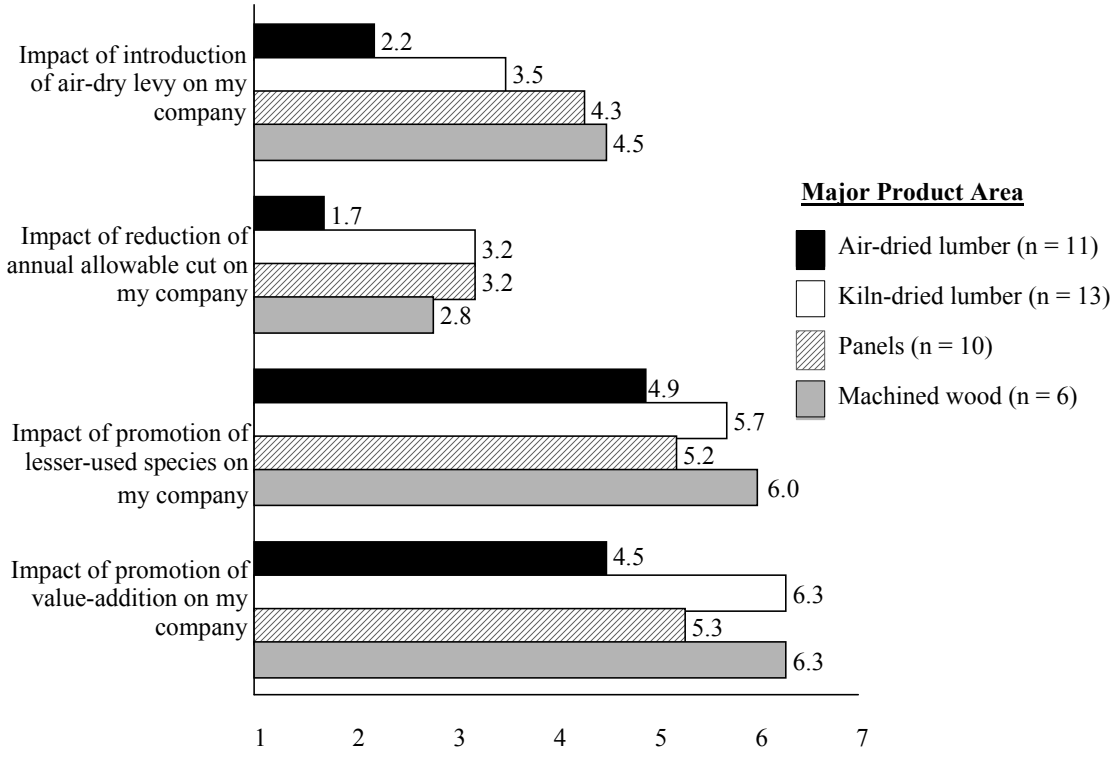
Figure 5.3. Distribution of Respondents by Product Area (n = 40)

General Impact of Government Interventions

Respondents, by major product group, were to rate, on a 7-point scale (1 = Highly negative, 2 = Somewhat negative, 3 = Slightly negative, 4 = No impact, 5 = Slightly positive, 6 = Somewhat positive, 7 = Highly positive), the general impact of recent government interventions on their businesses. The low response numbers associated with the groups (i.e., product areas) restricts the use of one-way ANOVA for comparison. In lieu of that a descriptive comparison of the means is carried out to gain insight into how the groups implement marketing activities.

As seen in Figure 5.4, all producers perceived the air-dry levy negatively, but the degree of negativity was higher among air-dried and kiln-dried lumber producers; however, air-dried lumber producers were more negative than all others. With regards to the government's reduction in the annual allowable cut (AAC), all groups rated it as negative, but air-dried lumber producers were more negative. Perceptions about promotion of lesser-used species (LUS) was generally positive among all groups

although machined products manufacturers were the most positive. Also value-added promotion was positive among all groups with kiln-dried and machined products producers viewing this action it as more positive than air-dried lumber and panel producers.



(Scale: 1 = Highly negative to 4 = No impact to 5 = Highly positive)

Figure 5.4. Overall Impact of Government Interventions (n = 39)

Responses to Government Actions

On a scale [1 = Large decrease (over 20 percent), 2 = Moderate decrease (11-20 percent), 3 = Slight decrease (6-10 percent), 4 = No change (± 5 percent), 5 = Slight increase (6-10), 6 = Moderate increase (11-20 percent), 7 = Large increase (over 20 percent)], respondents were asked to indicate how their production volumes have changed in response to the government interventions.

Figure 5.5 shows that all groups experienced a reduction in raw material usage. Export of kiln-dried lumber increased for all groups, but those who export it as their major product were higher on average. There was a general increase in the export of lesser-used species, but machined products producers had the lowest average. All the groups increased export of machined products except air-dried lumber producers whose response indicated 'no change."

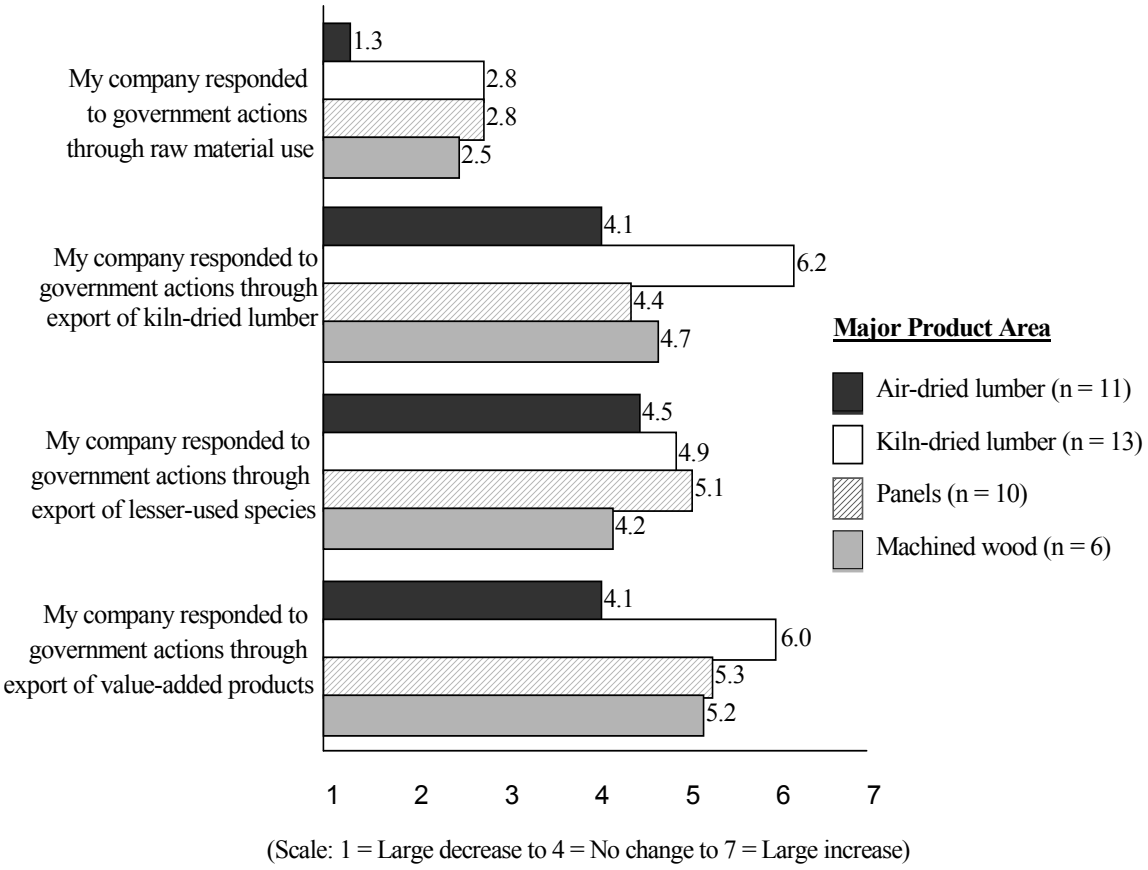


Figure 5.5. Changes in Export Volumes in Response to Interventions (n = 38)

Pre/post Comparison of Value-Added Product Exports

In the further downstream manufacturing of value-added products, which need a high degree of skill and specialization (that is, profile and window boards, furniture parts, doors, and flooring and decking), 70-80 percent of the respondents indicated "not applicable", indicating that they were not value-added products exporters in either time period. Approximately two percent of respondents reported post-intervention exports below their pre-intervention levels, 12-18 percent of respondents reported exporting above pre-intervention levels, and 3-5 percent saw no change. In the further processes products (that is, kiln-dried lumber and processed lumber moldings), 33-48 percent were "not applicable," 5-8 percent exported below pre-intervention levels, 53-60 percent exported above, while about 8 percent remained at the pre-December 1995 levels.

Table 5.1. Pre/post Intervention Comparison of Value-added Products (n = 40)

	Not applicable	< before 1995	No change	> before 1995
	……(percent)……..			
Kiln-dried lumber	32.5	7.5	7.5	52.5
Processed lumber moldings/Finger-jointed	47.5	5.0	7.5	60.0
Profile/Window boards	72.5	2.5	5.0	20.0
Furniture parts	82.5	2.5	2.5	12.5
Doors	80.0	0.0	5.0	15.0
Flooring/Decking	75.0	2.5	5.0	17.5

Overall pre/post Comparison of Use of Value-Adding Equipment

Regarding the use of value-adding machinery, Table 5.2 somewhat reflects the observations made in Table 5.1, with one striking difference, the low use of the Computer Numerical Control (CNC) router.

Table 5.2. Pre/post Comparison of use of Value-adding Equipment (n = 40)

	Not Applicable	< before 1995	No change	> before 1995
	……(percent) …..……			
Kiln-drier	28.2	5.1	10.3	56.4
Molder/Finger-jointer	50.0	0.0	5.0	45.0
Planer/Jointer	62.5	0.0	5.0	32.5
Spindle Molder	80.0	0.0	7.5	12.5
Sander	70.0	0.0	5.0	25.0
Computer Numerical Control (CNC) Router	87.5	0.0	5.0	7.5

Relationships with Buyers

This study characterizes the relationships between companies and their buyers relative to the relationships that existed pre-intervention. Relationship indicators include the ease of getting contracts, buyers' interest and trust, pre-financing large recurring orders that require large initial investments, joint business ownership, and the ease of claims settlement. Other indicators are buyers' willingness to help in clearing varied stocks at reduced prices, networking for product specialization, and reduced pre-shipment inspect.

There was a general sentiment across the four major product group manufacturers of stable contract acquisition, but all the groups disagreed with the suggestion that buyers are willing to pre-finance or enter partnerships (Figure 5.6).

On ease of claim settlement, lumber producers tended to rate this attribute higher. Panel and machined products manufacturers agreed that stable claim settlement procedures occur. Stock clearance was stable for all groups. Respondents in all product categories strongly agreed that, compared to the period before December 1995, pre-shipment inspection is increasing. Apart from air-dried lumber producers, all others on the average agreed to increasing networking for product specialization.

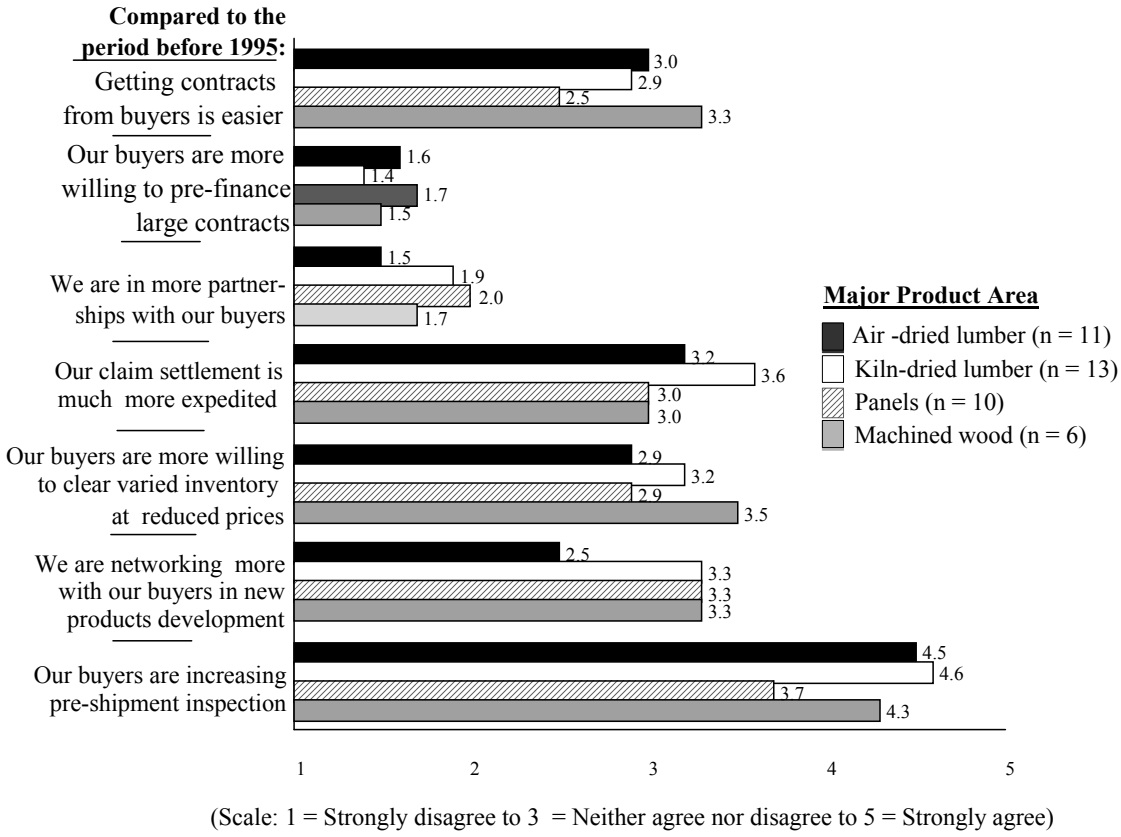


Figure 5.6. Comparison of Relationship with Buyers by Product Area (n = 40)

Flexibility in Terms of Trade and Payment

Terms of trade or INCOTERMS refer to the various delivery conditions used in trade such as Free on Board (FOB), Free Alongside Ship (FAS) and Cost Insurance and Freight (CIF). Terms of payment include Letter of Credit (L/C), Telegraphic Transfer (T/T) and Cash against Documents (CAD).

Respondents disagreed with the suggestion that there is increasing acceptance of other terms of trade and payment apart from the usual FOB and L/C, respectively relative to pre-intervention conditions. However, Figure 5.7 shows that as products become more specialized, there is a shift to a higher level of agreement for both terms of trade and payment.

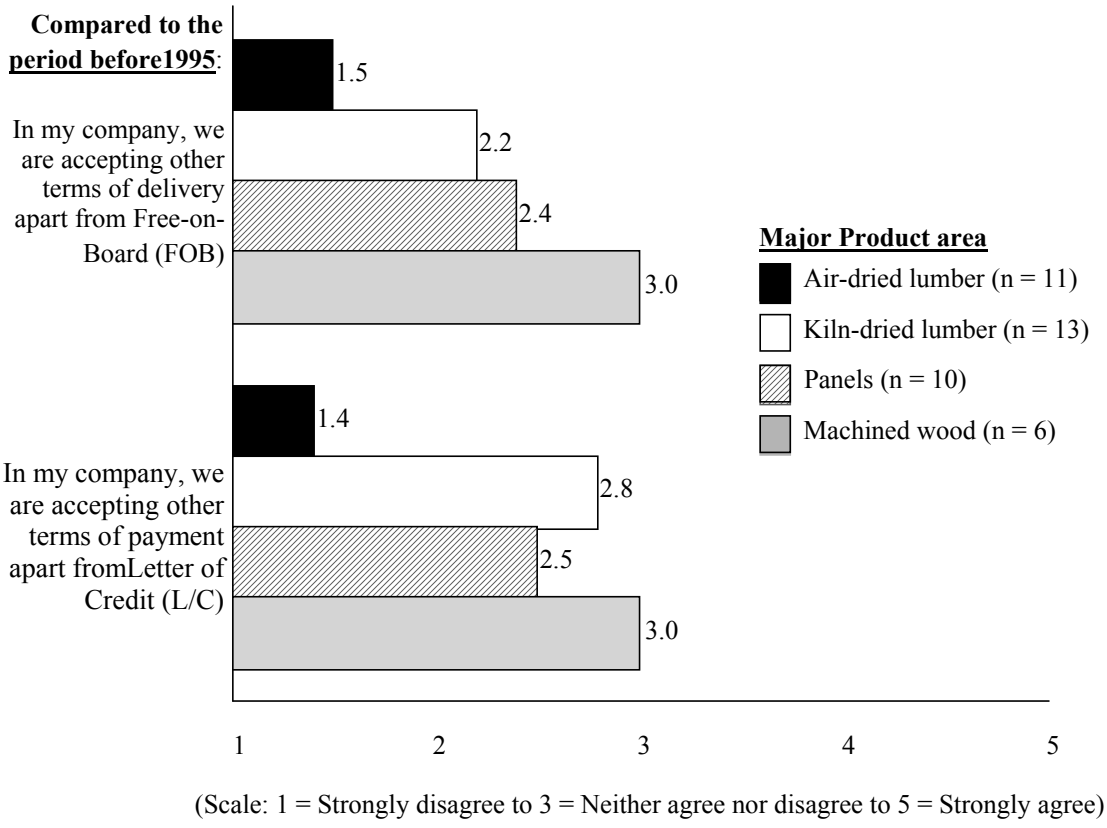


Figure 5.7. Comparison of Flexibility in Terms of Delivery and Payment by Product Area (n = 40)

Production Issues

Almost all product groups agreed to the following suggestions about production issues: Compared to the period before December 1995:

- Raw material quality is seriously degrading.
- Shortage of raw material is much more of a problem.
- Raw material suppliers are becoming increasingly unreliable.
- Skill improvement in value adding has increased greatly.
- Total yield based on log input is much more improved.

However, when viewed as average ranking, air-dry lumber producer respondents

did not realize much improvement in skill nor yield on log input. Also, machined products producers on average did not experience many problems with raw material quality. They also felt that yield improvement was slight (Figure 5.8).

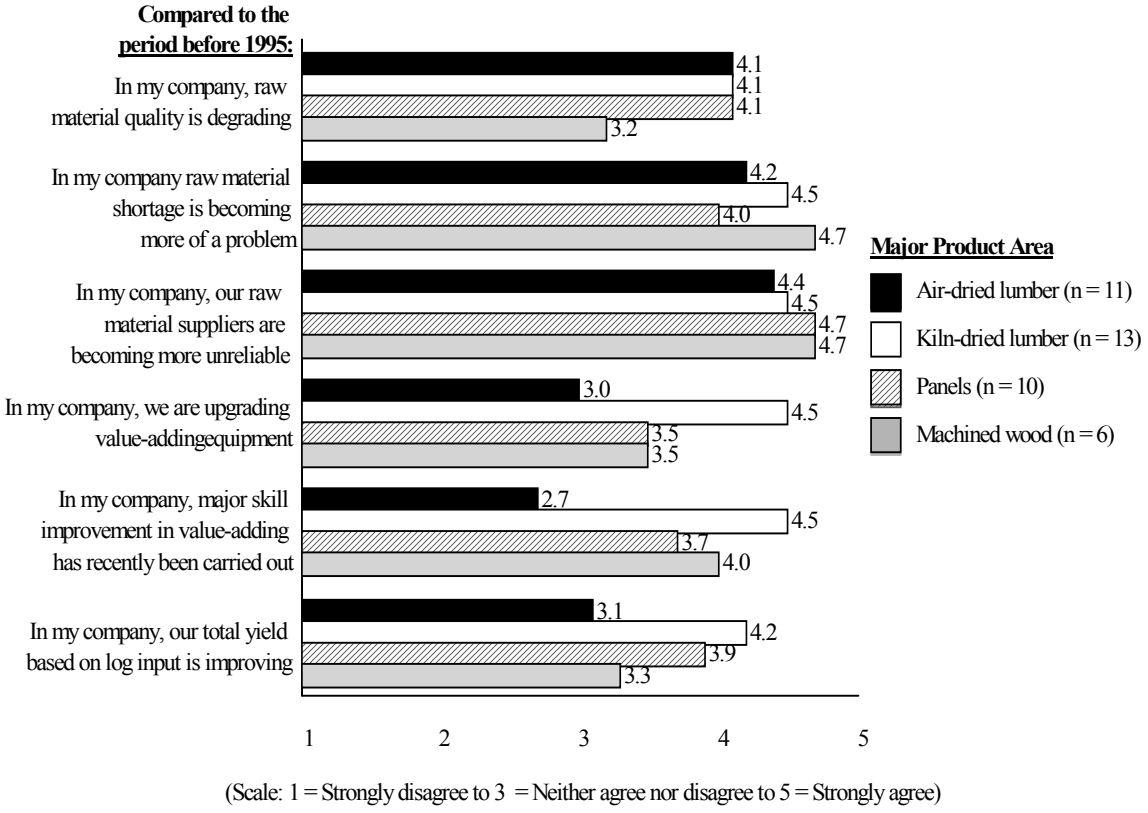


Figure 5.8. Comparison of Perceptions on Production Issues by Product Area (n = 40)

Pricing Approaches

The study also asked respondents to consider three pricing approaches. These were government guiding selling prices (minimum prices from market intelligence for price advisory purposes), pricing based on good quality image in the markets and pricing based on 'cost-plus' approach.

Although there was general disagreement to the claim that there is reduced dependence on government guiding selling prices, Figure 5.9 shows that air-dried lumber

producers disagreed more than others product group manufacturers. There was unanimous agreement to the suggestion that companies are increasingly relying on a quality image and on a 'cost-plus' approach in pricing their products. However, in all three pricing strategies, average 'agreement levels' increased as products became more specialized.

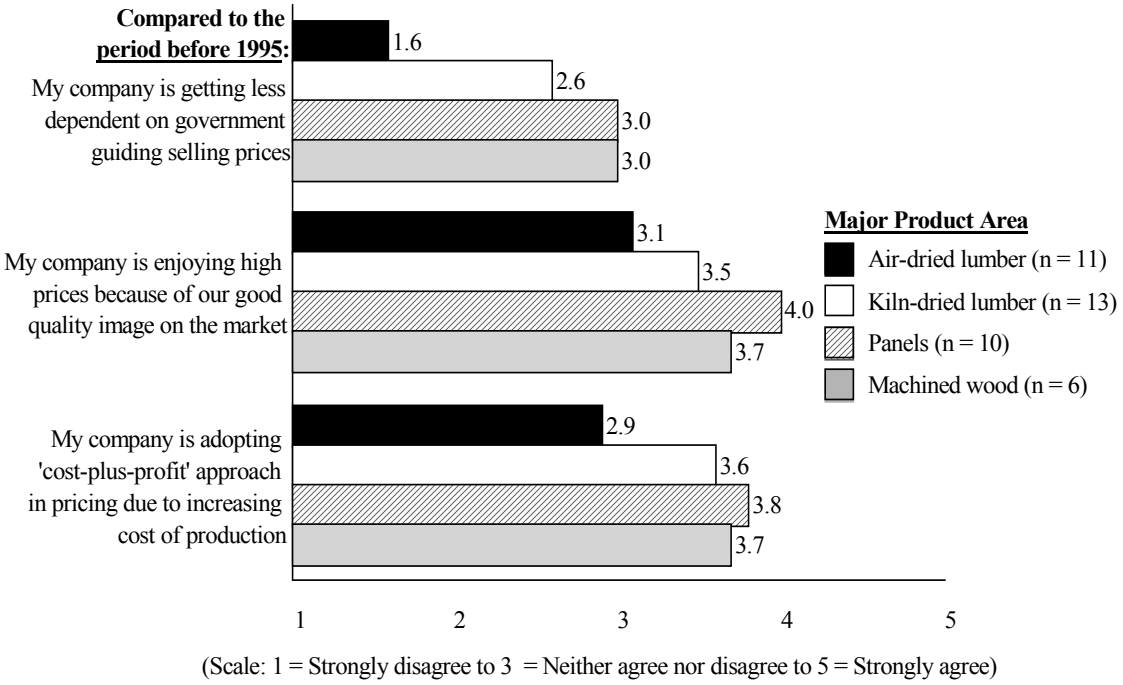


Figure 5.9. Comparison of Pricing Approaches by Product Area (n = 40)

Distribution

Three issues were examined in the area of distribution. These were types of packaging, delivery and channels used. Whereas air-dried lumber made more use of break-bulk, the other producers appeared to use more containerized packaging (Figure 5.10). With regard to delivery methods, air-dried and machined products producers

engaged more in partial-delivery than kiln-dried and panel producers, with machined products producers exclusively dealing in partial-delivery contracts. All groups used more of 'direct' and 'agents' regarding type of channel.

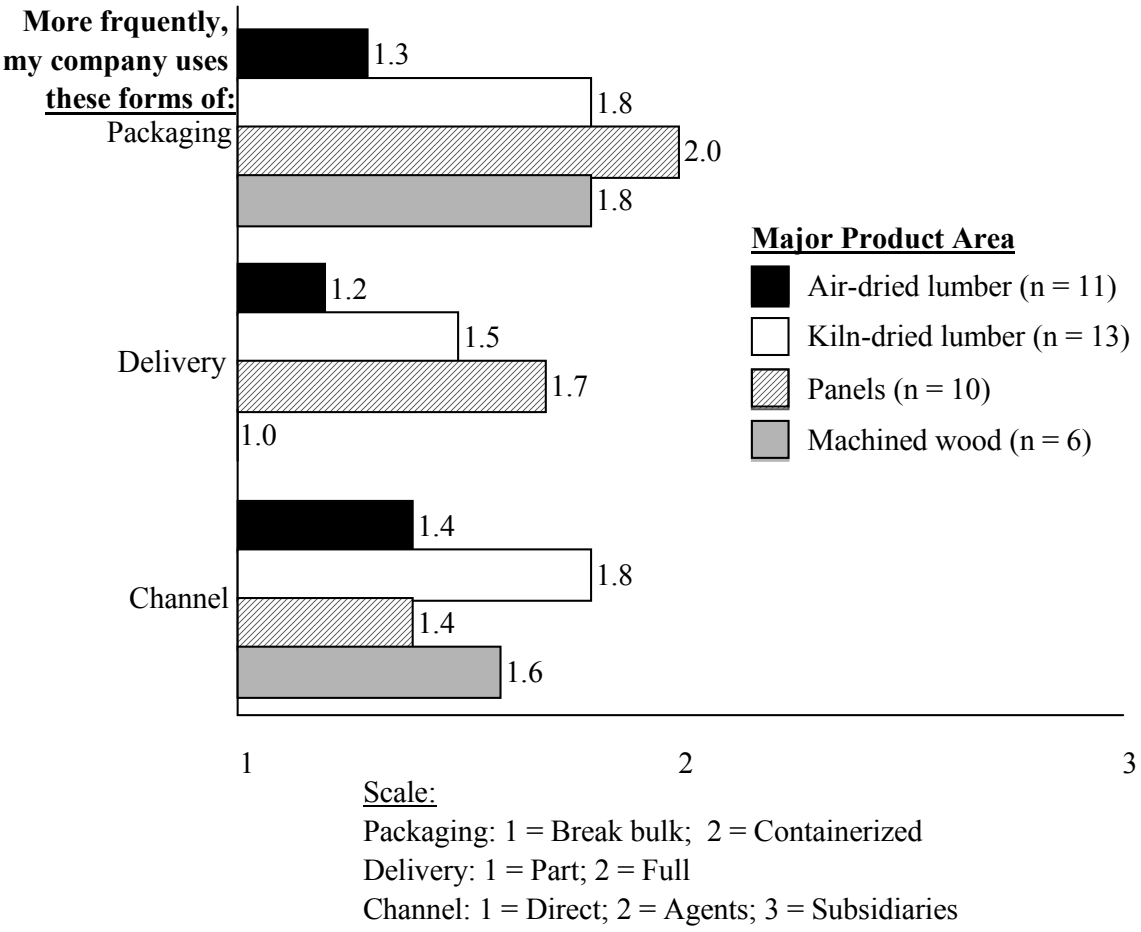


Figure 10. Comparison of Types of Packaging, Delivery and Channel Used by Product Area (n = 40)

Communication and Promotion

The most used form of promotion by respondents was personal calling followed by word-of-mouth (Figure 5.11). Only a few respondents use the Internet and other forms of communication to promote their products such as brochures and advertising.

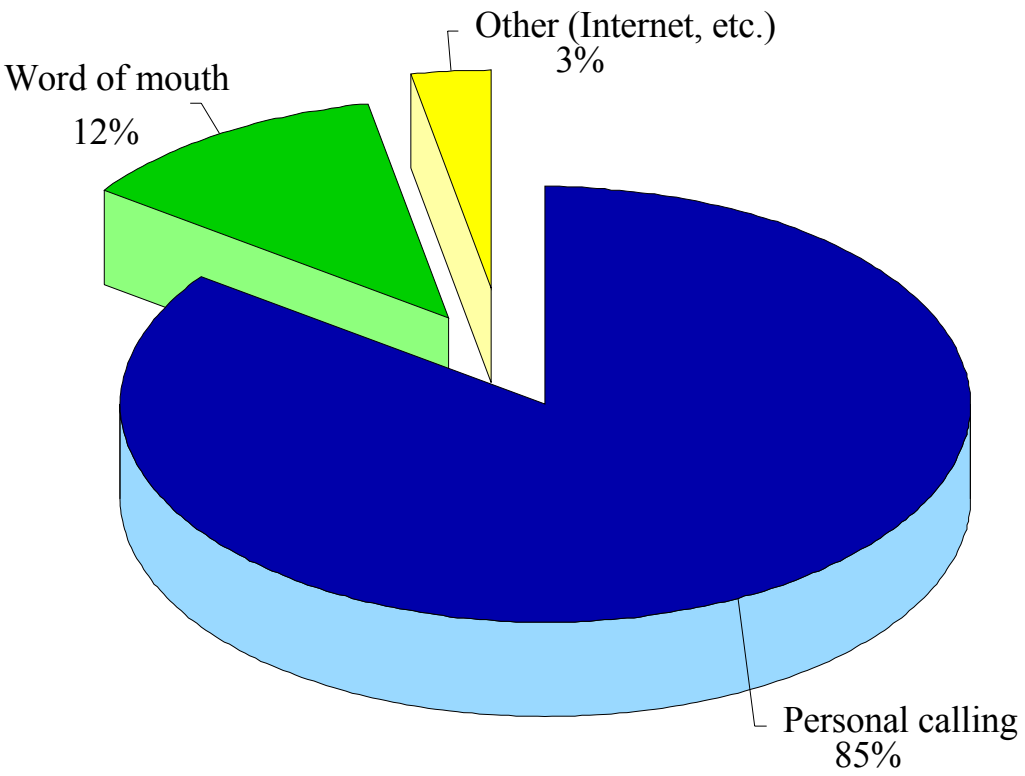


Figure 5.11. Distribution of Respondents by Type of Communication in Use (n = 40)

Planning Activities

In general, responding companies indicated increased post-intervention planning activity in all groups with panel producers lagging (Figure 5.12). It is worth noting that in all manufacturing groups increased teamwork, evaluation of plans, and the use of audited financial accounts in the evaluation were primary planning activities.

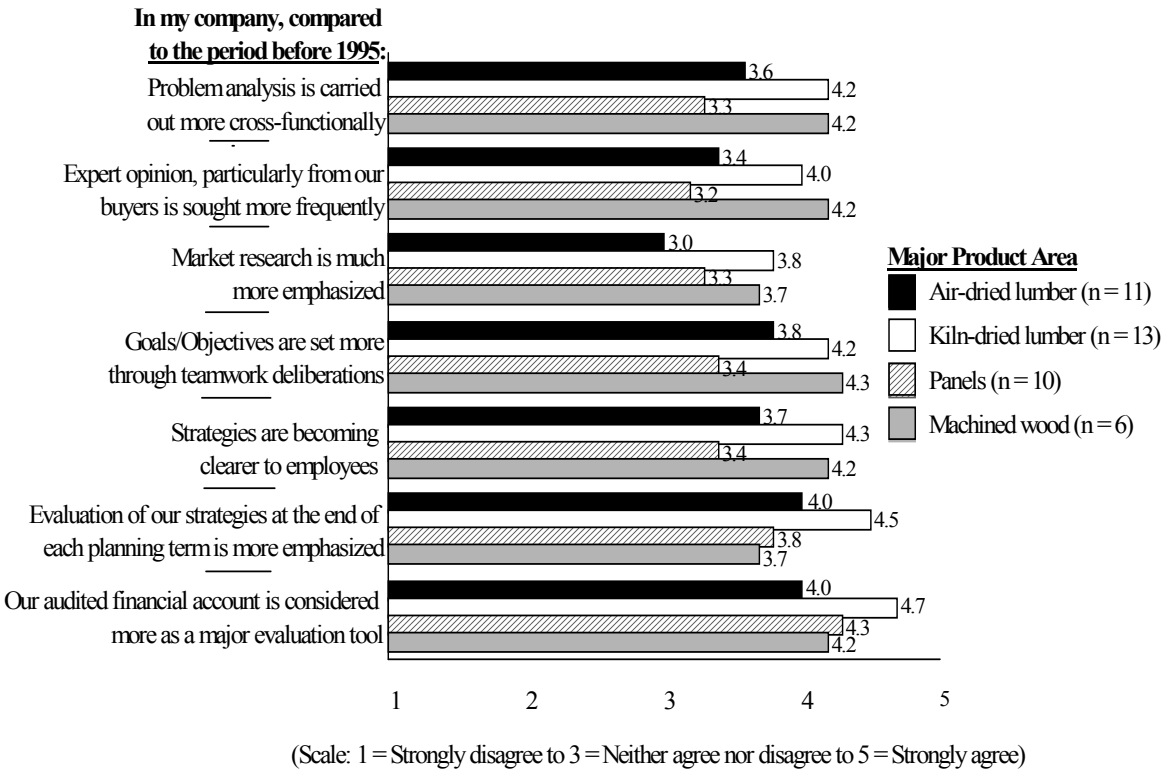


Figure 5.12. Comparison of Planning Activities by Product Area (n = 39)

Opportunities and Threats

Respondents were asked to indicate how they are taking advantage of marketing and to also indicate how possible threats in the industry are affecting them. Generally, the greatest opportunity for companies lies in having and maintaining a good image in their communities. The greatest threat was that bankers are tightening capital acquisition procedures (Figure 5.13).

Whereas kiln-dried lumber and panel producers agreed that eBusiness is a useful transactional tool, air-dried lumber and machined products producers were, on average, averse to that view. All groups agreed that certification is considered a useful marketing tool. Respondents generally disagreed that they are benefiting from the Government Incentive Scheme under the Woodworking Sector Development Project. However, an

increasing trend in agreement level was observed from basic to specialized products. Respondents did not appear to be concerned about claims believed to be associated with value-added products.

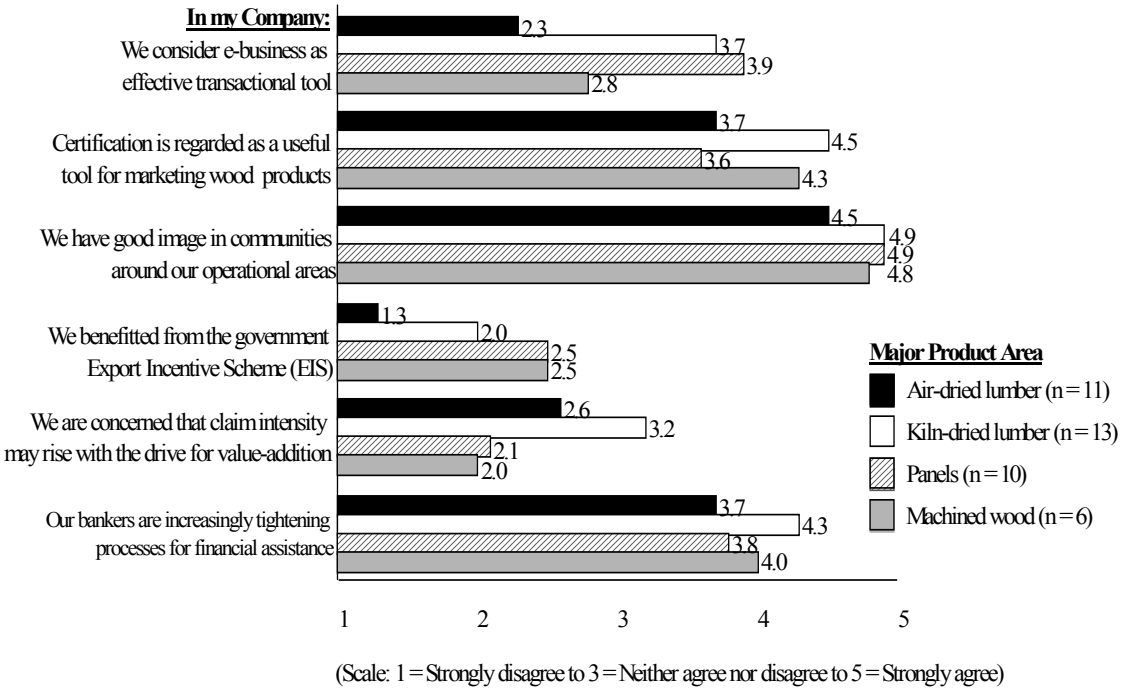


Figure 5.13. Comparison of Perceptions on Opportunities and Threats by Product Area (n = 40)

DISCUSSION

The air-dry levy was a control measure directed at specifically discouraging export of air-dried lumber. Most manufacturers who are major kiln-dried lumber producers today were mostly air-dried lumber producers who were compelled by the intervention to change. Although kiln-dried lumber sells at a higher price than air-dried lumber, if investment and operational costs are factored in, the profit margin might be lower than selling air-dried lumber during the pre-intervention era. Thus kiln-dried

producers share the same negative view of the air-dry levy intervention as air-dried lumber producers. Kiln-dried producers need to be encouraged to continue further downstream to realize the full benefit of their investment instead of just selling the lumber.

Annual allowable cut affected all manufacturing groups by making raw material acquisition difficult, hence the collective negative perception. The industry's realization of positive results for lesser-used species and value-added promotion is a good sign that indicates support for the policies.

Overall, perceptions about companies' reactions to government interventions indicate the policies are working towards their desired objectives. However, the industry can be described as still going through transformational change, and significant benefits are yet to be realized. There seems to have been a move towards value addition with increases in the production of higher-processed value-added products. On the other hand, in exports of further value-added products that are considered to have high potential for company benefit, increases post-intervention are quite marginal. Respondent perceptions regarding the use of machinery clearly corroborate this observation. The industry suffers from lack of higher-end value-added product manufacturing equipment which limits the country's transformational progress. Judging from current export levels, the industry may not be able to afford these machines that require high capital investments.

The relationship the industry has with buyers does not appear conducive for gaining competitive advantage. Increasing pre-shipment inspection in all product categories could indicate a lack of trust; buyers may be harboring fears that they might not get the right product, hence the need for pre-shipment inspection. To compete

effectively on the global market, customers need to feel comfortable about buying over long distances without having to spend extra time to ensure that the product satisfies contractual specifications. Also, the lack of partnership interests (especially from long-time buyers), low pre-financing opportunities for large and recurring orders and the lack of other forms of usual buyer cooperation may be signs of fear or insecurity.

Relationships can be cultivated and good relationships are a key issue in successful business exchanges. Good relationships are based on absolute trust in each other for effective business transactions to take place.

There is a general lack of flexibility in delivery and payment terms but as the industry transforms into value addition there appears to be increasing flexibility. Lack of flexibility in delivery and payment has great potential to turn off highly profitable buyers. Using traditional modes of payment such as a letter of credit attracts costs that can be very high with large orders. Although letters of credit may safeguard against fraud in short-term transactions, they may not be necessary if a healthy relationship exists. Other forms of payment should be tolerated to make overall cost of goods cheaper. Inflexible terms of delivery also pose a problem, especially to end-use buyers. These buyers use the product themselves and are usually high paying (with the elimination of agents), small to medium-sized companies. They do not usually want to get involved in exigencies of clearing goods or deal with insurance and freight agencies and would therefore prefer contracts such as 'Factory-Delivered' or possibly, 'Cost, Insurance and Freight (CIF).'

Availability and degrading of raw material are probably current global problems with which the forest product industry in general has to grapple. However, as industry goes further downstream, careful selection of material going into various production units

can help offset raw material quality problems. Also, since value-added products usually require smaller portions of clear wood than lumber, the possibility of working out raw material quality problems is high.

In the pre-intervention era, the industry depended much on government guiding prices when pricing their products. These prices are minimum prices from market intelligence meant to guide industry in pricing, but most producers used them as final prices. Although there is a general dependence on guiding prices, it is noted on the average that, as industry goes further downstream, dependence on government guiding prices declines and the use of 'image' and 'cost-plus' pricing increases. This may signify the need for pragmatic pricing approaches in order to profit with value-added products, which are associated with high cost.

Containerization is the present form of packaging in the markets that allows efficiency in cargo handling and reduced costs. Value-addition comes along with containerized packaging, which could initially make extra demands on cargo handling.

It is noted that the machined products group dealt solely with partial delivery contracts. In the value-added sector, part delivery is a necessary clause in contracts to cater for frequent downtimes associated with specialized machinery and to receive intermittent payments for such costly and time-consuming jobs.

The forms of promotion in the industry are basically personal calling and word-of-mouth. Whereas these forms facilitate customization which may be in line with trends in marketing, new opportunities are available with Internet capabilities. The use of the Internet enables fast processing of orders and, possibly, necessary financial transactions. Also 'narrowcasting' possibilities enable mass customization among a myriad of

customers when using the Internet. It would therefore be necessary for the industry to expand Internet access and computer capabilities to take advantage of information technologies. This would further facilitate the observed increased planning activity in the industry. For instance, teamwork could be made more effective when information can be processed and shared in real time for planning. Likewise, evaluation of plans and forecasting could be made more interactive and necessary adjustments could be made in time. All this needs to be in place to be able to match competitors in the value-added market, most of whom are already well equipped in terms of these needs.

The greatest threat in the industry is the withdrawal of bankers' support in the wake of the interventions. Raw material shortage and payment of levies might have created uncertainty about the industry's ability to pay back loans. However, to be able to push ahead the transformation process, the industry would need higher financing to acquire advanced machinery (e.g., CNC router) and other accoutrements which go together to enable quality and efficiency (e.g., precision tool shop).

Just as improved buyer relationship aids marketing, so does good 'company-community' linkage. Community connectedness is believed to be one of the underlying factors for a company's success. When a community feels connected, it leads to loyal employees and protection of a company's property. Loyal employees and protection of property should mean a lot to a value-adding company as a result of high costs in skill training and equipment and tools. Of course, demands such as supporting the provision of basic needs to such communities as a way of building loyalty could reach overwhelming proportions. Despite these difficulties, the long-run benefit could mean an equally awesome opportunity.

Based on perceptions of companies' overall reactions to the government interventions, the desired objective of creating a more stable value-added oriented industry sector seems to be happening. However, the highlighted marketing shortcomings need to be addressed to facilitate a more competitive value-added trade.

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RESEARCH METHODOLOGY

The data used in this study were from both primary and secondary sources. The primary data was a survey on the industry's perceptions about marketing implications of the government interventions. Data for two of the three research works carried out in this study were secondary. Monthly data on volumes of forest product exports were collected from the Ghana Forestry Commission's "Permit Report" issued monthly by the Forest Products Inspection Bureau (FPIB), now Timber Industry Development Division (TIDD).

PRIMARY DATA

The questions used in the marketing survey were developed through a focus group discussion in Ghana. Industry consultants, millers, forwarders and buyers' representatives were involved in evolving the appropriate questions to capture what the marketing implications might be as a result of the government interventions.

Development and implementation of the survey followed the Total Design Method (TDM) developed by Dillman (1978). TDM recommendations on survey structure, pre-survey notification, initial survey mailing, post-survey reminder, second mailing and follow-up phone calls were carried out in order to maximize response rates.

Participating companies were selected from TIDD's records as companies in the production and export of **air-dried lumber**, **kiln-dried lumber**, **panel products** (i.e., rotary or sliced veneer and plywood), and **machined products** (i.e., dowel, flooring, furniture parts, processed lumber molding and profile boards). In addition to the product area selection criterion, participating companies should have been in existence since the pre-intervention era (i.e., before December 1995 – the earliest intervention). There were one hundred and twenty companies that qualified under the criteria used (FPIB 2001).

Sampling

Sampling of participating companies faced major problems:

1. The goal of this research was to compare perceptions of respondents from the four major product areas to find out differences in marketing activities using ANOVA. However, one could not tell a company's major product area from the list of the potential participants since most companies were involved in more than one product area. Therefore, only the survey responses could be used for grouping the companies.
2. The number of companies in certain product areas in the entire industry was very low; for example, the machined and panel groups did not exceed ten companies each.
3. Companies have become very hostile to research into the industry since researchers are believed to be responsible for furnishing government with information that lead to excessive control of the industry.

In view of these problems, it was decided that all the hundred and twenty companies should be surveyed to be able to capture enough responses per product group. Therefore sampling problems posed difficulties to the intended use of ANOVA as the analytical tool due to the few possible observations for some groups.

Pre-testing of Questionnaire

Prior to mailing out, few selected companies were used to complete the survey to test the questionnaire for detection and correction of confusing questions and any other difficulties in completing the questionnaire.

Data Collection

Development of the questionnaire (see Appendix 5) involved fixed response questions, including fixed alternative and multichotomous questions for responding demographic profiles of companies, as well as open-ended questions that allow respondents to give expanded responses (Vlosky et al. 2002). Seven-point scales defined by 1 = Large decrease to 4 = No change to 7 = Large increase, and five-point scales defined by 1 = Strongly disagree to 3 = Neither agree nor disagree to 5 = Strongly agree, were used to measure respondent levels of response to government interventions and agreement with various questions addressing marketing implications of government interventions.

Data Analysis

In view of the sampling problems enumerated above, only the means of responses were compared in a descriptive sense using bar charts. Although this approach could not establish whether observed differences were significant, it offered a useful insight as to how companies in different product groups might differ in marketing activities. Such information could be useful in envisaging the marketing needs of the companies heeding to the call for further processing as the desired direction.

ANOVA analysis provides strong basis for extracting marketing activities with significant differences among major product areas for consideration. However, since the industry is still under transformation, important changes in marketing activities could be going on but may not show significant differences among the major product areas yet. It is the view of the researcher that in such circumstances, a descriptive comparison has the potential to reveal subtle ‘differences’ and trends which could form basis for a more focused future research work.

SECONDARY DATA

The secondary data in this study were used to study the direct impacts of the government interventions (Chapter 2) on the forest product export trade in Ghana. Two studies were involved:

- Impact of raw material regulation and air-dry levy as strategies for increasing export of further processed forest products (Chapter 3), and
- Appraisal of government interventions for diversification of species utilization in forest product exports (Chapter 4).

Data Collection

Three monthly data types were collected on volumes of:

1. ten major forest products exported from Ghana from 1992 – 2001 (Chapter 3),
2. species shipped from Ghana from 1992 – 2001 (Chapter 4), and
3. raw material harvested from Ghana's forests from 1992 – 2001 (Chapters 3)

Data from monthly Permit Reports from 1992 – 2001 (FPIB 1992 – 2001) were re-entered into SPSS statistical analysis program. Initial plots of the data were carefully studied to find and correct mistakes in data entries. There were a hundred and twenty months of time series data spanning the ten products, fifty-three species and total monthly raw material harvests in volumes per cubic meter.

Data Analysis

The time series data for the two studies were analyzed using Autoregressive Integrated Moving Average (ARIMA) models (Chapter 2). ARIMA transfer function and intervention forecasting models are recommended for policy and business impact analysis (Box and Tiao 1975, Box and Jenkins 1976, Bowerman and O'Connel 1993, SPSS 1999).

The in-sample maximum likelihood parameter estimates of the intervention variables from this analysis are measures of the impact of the government interventions.

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APPENDIX 1. SUMMARY OF GHANA'S FORESTRY MASTER PLAN AND CURRENT DEVELOPMENTS

DEVELOPMENT THEME

The aim of Ghana's Forestry Development Master Plan is to provide a basis for **achieving sustainable use and development of forest and wildlife**, **modernization of the timber industry and conservation of the environment**. This would ensure realization of the objectives of the Forest and Wildlife Policy. The National Development Planning Commission (NDPC), in its new five-year plan cycle guidelines (as extension of Ghana-Vision 2020), proposes six major development programs. These are: **Agriculture and Forestry**, **Industry**, **Social Development**, **Economic and Social Services**, **Funding of Development**, and **Public Sector**. The NDPC guidelines also identify the need for district assemblies and communities involvement. This would make joint preparation of manuals by MLF and the Ministry of Food and Agriculture (MOFA) for forest management, agro-forestry, rehabilitation and conservation of renewable natural resources possible.

GOALS AND OBJECTIVES

The broad long-term needs of Ghana-Vision 2020 encompass the scope of sectoral development objectives and strategies as spelled out in the Forest and Wildlife Policy:

i) Management and improvement of Ghana's permanent estate of forest and wildlife;

ii) Promotion of efficient forest-based industries, in secondary and tertiary processing;

iii) Promotion of public awareness and involvement of rural people in forestry and wildlife conservation;

iv) Promotion of research-based and technology-led forestry and wildlife management, use and development; and

v) Development of effective ability at national, regional and district levels for sustainable forest and wildlife management.

Attainment of these objectives is possible only by developing the needed technical skills and managerial competence of personnel and institutions in both the public and private realm. This requires sufficient funding, effective policies and legislative support. The schedule of objectives fall into three time horizons, namely, Phase I - 1996 to 2000, Phase II - 2001 to 2010, Phase III - 2011 to 2020. The Phase I project involved:

- Consolidation of forest management to ensure certification of timber as "obtained from sustainable managed forests" by the year 2000
- Implementation of a Protected-areas Plan
- Development and launching of flexible schemes for investments in commercial forest plantations, tree farming and propagation of non-timber products and wildlife
- Creation of favorable climate for rationalization of the timber industry and consolidation of fiscal measures for efficient use and increased value-added processing.

In Phase II the hope is that maintenance of sustainable forest and protected areas will continue with maintenance of commercial forest-based production. Also expected is development of product harvesting, handling and marketing, as well as continuous promotion of total value-added processing and competitive marketing.

Finally, Phase III would see continued maintenance of sustainable forest and wildlife management, commercial production, improved product harvesting, marketing, and competitive value-added processing industries.

PHASE I: PROGRAMS AND ACTIVITIES

PROGRAM 1: SUSTAINABLE FOREST AND SAVANNAH MANAGEMENT

Development Objectives

1) Improved management of high forests and sustainable levels of timber harvesting.

2) Increased public awareness and involvement of individuals and communities in protection and management of forest.

3) Control of destructive forest land-use practices, including uncontrolled bush-fires and unplanned exploitation.

4) Development and application of sustainable management programs in savanna woodlands.

Development Activities

Sustainable forest management - The main activity has been to transform the Forestry Department (FD) into an effective, responsive, decentralized and semi-autonomous Forest Service (FS). This transformation is yielding effective forest management through improved supervision of working plans, timber utilization contracts and felling controls for forest reserves and off-reserves. The ability to preserve workable systems that prove to the international community that all timber exports are from sustainable managed forests is of prime importance. Particular attention is on the collection of relevant fees. This conforms with the criteria for sustainable development stated in ITTO Year 2000 objective. At the same time, the new FS is intensifying local community initiatives to protect forest for traditional, domestic and economic purposes (FD 1995b). The Service has been collaborating with rural communities in sustainable utilization and management of timber and non-timber products. This is done through extension of pilot

collaborative forest management programs to some forest districts in the high forest and savanna zones (FD 1995b).

In support, MLF is completing an inter-sectoral land-use plan through national agreement on land uses for securing permanent forest and wildlife estate. Also, fiscal measures are in place for controlling the rate of timber harvesting and ensuring proper economic returns to landowning communities as well as for improved forest management. Support for the project came from the Forestry sector Development Plan and the Forest and Wildlife Resources Management Project (FWRMP).

Increased public awareness and involvement - Coordinated activities are ongoing for public education and forestry extension programs in order to publicize values and benefits of forest conservation, especially regarding threatened species. The program concentrates on raising environmental awareness and seeks greater participation of the local communities in forest conservation and management. FORIG has been forthcoming in disseminating its research information. The public has been updated on current knowledge about technical problems in propagation, management and the use of timber and wildlife products. Good examples are the recent workshops on FORIG's research findings on lesser-used species and the *Odum* Regeneration Project, which encompassed all sectoral bodies including the public.

PROGRAM 2: EXPANSION AND DIVERSIFICATION OF FOREST-BASED PRODUCTS

Development Objectives

1) Expansion of the nation's forest and tree cover for increased domestic and industrial products and environmental improvement.

2) Development and management of sustainable fuelwood and non-timber products.

3) Development of effective institutional ability to promote and maintain long-term production schemes.

Development Activities

Increased forest and tree cover - The major activities are on enrichment and restocking of degraded forest areas and concessions, establishment of plantations on suitable conversion areas and support to community forestry and agroforestry needs. Areas for enrichment and restocking have been identified and surveyed. A national plantation company has been started to oversee planning and organization of private initiatives in plantation establishment. The national government funds company activities including loans to the private sector which are supported with earnings from a levy imposed on exporting air-dried lumber of selected primary wood species.

Technical information and incentives are needed to support successful enrichment planting. This includes reforestation to restock concessions and denuded lands, establish timber on savannas, farms, mining areas, private lands, and rehabilitating failed plantation forest lands with fast-growing species of both indigenous and exotics trees. The MLF supports the objective through its continuing revision of land and tree tenure for entrenching tree ownership rights in the tree planter and/or landowner.

Development of fuelwood and non-timber products – The Community Forestry Project, which existed mainly in the savanna regions even long before the beginning of this plan, still exists through extension services of the FS. Communities get support with free tree and fruit seedlings to establish fuelwood and other non-timber forests.

In the forest zones, the FS supports communities in reviving denuded forests that

are naturally rich in non-timber forest products through the Collaborated Forest Management Initiative.

Institutional capacity to develop and maintain long-term production schemes – The forestry sector has improved its personnel development, logistics and infrastructure. This has translated into more efficiency in management and day-to-day administration of the sector. Among such improvements are a fleet of vehicles for monitoring forestry operations, renovation of office buildings in all districts, installation of modern communications equipment, increased professional staff and a hi-tech seed improvement facility located at the premises of FORIG.

PROGRAM 3: FOREST INDUSTRY RATIONALIZATION

Development Objectives

1) Reform to promote an effective balance between the timber resource base and industrial capacity.

2) Improve and modernize milling efficiency and increased value-added marketing.

3) Increase processing capacity for plantation and non-timber products.

Development Activities

Reforms to balance timber resource base with industrial capacity – Re-merging of the Timber Export Development Board (TEDB) and Forest Products Inspection Bureau (FPIB) is in place. The amalgamated body is now the Timber Industry Development Division (TIDD) of the Forestry Commission. The division is now focusing on industry modernization and efficient resource utilization. In particular, increased use of lesser-used species is the target for easing rare supplies of traditional Scarlet and Redwood species.

Increased mill recovery and value-added processing - The restructured TIDD is intensifying efforts on improving recovery and value-added production by encouraging efficient secondary and tertiary processing. Among its tasks are conducting feasibility studies on desirable initiatives to identify marketing opportunities and to promote targeted investment. The TIDD promotes upgrading of technical skills and productivity by supporting creation of shared facilities for wood processing and adding value. Increasingly, the adoption of flexible and global-friendly grading systems, terms of trade and payment allow for new marketing opportunities. Figure A indicates patterns of transformation of the industry up to 2001.

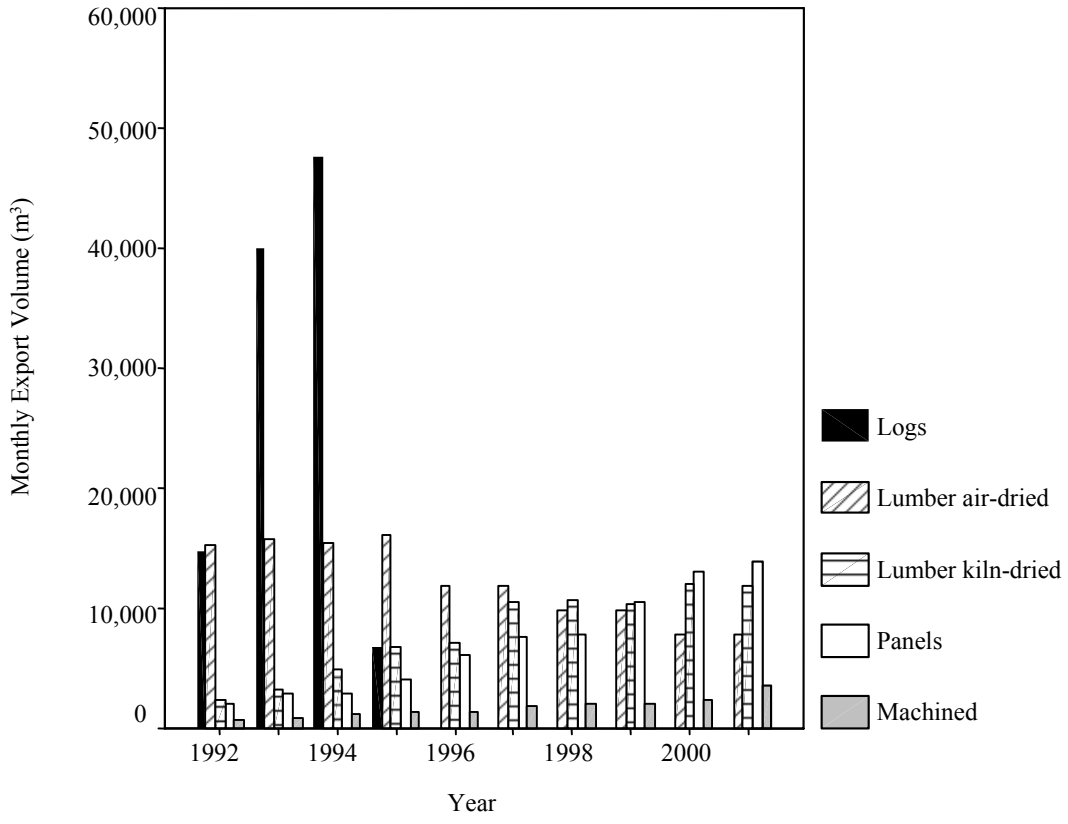


Figure A. Monthly Export Volumes of Major Forest Products (m^3)
(Data source: FPIB 2001)

Develop processing capacity for plantation and non-timber products - TIDD has been promoting plantation timber (Teak, Gmelina and Cedrella) processing and non-timber products (Bamboo and Rattan) by supporting individuals to attend trade shows and missions abroad. Also, in cooperation with the National Board for Small-Scale Industries, the Small-Scale Carpenters Association and Handicraft Manufacturers are under a technical support scheme. In doing this, the division places emphasis on value-added processing for a diverse range of products. The division also provides training opportunities at its Wood Industry Training Center.

PROGRAM 4: WILDLIFE AND PROTECTED AREA CONSERVATION

Development Objectives

1) Development of specific tourism attraction areas and promotion of eco-tourism.

2) Increased marketing opportunities for increased income generation from wildlife products.

3) Increased public awareness of benefits of conservation and biodiversity.

Development Activities

The Wildlife Service (WS) is actively rehabilitating degraded mangrove resources and devising management plans to ensure long-term sustainable development of the mangrove systems. This is obvious in the recent development of Ramsar Sites for migrating birds along the coastal belt. WS is showing and upholding interagency collaboration with institutions within the renewable natural resource sector for effective management of the protected areas. The service has set up several wildlife societies in schools and colleges and even with the public, further supporting its campaigns.

Income generation and marketing of wildlife products – The WS has just developed one of the most unique tourist destinations in Africa – The Kakum National Park. The park has a canopy walkway staked about 30 meters high, just above the crowns and greenery of tropical high forest. The well-maintained park, with such other facilities as a gift shop (with wildlife souvenirs) and restaurant, is a destination for busy tourists.

Current public enthusiasm created from WS campaigns is encouraging private investments in breeding of wildlife species for domestic consumption and export. These include Giant African Snails breeding and Grass-Cutter husbandry. Previously, these species were only found in the wild.

Public education and participation - The WS takes advantage of Wildlife Society meetings by using the forum to plan and carry out community-based projects. Here, the WS prepares and disseminates educational material about conservation.

APPENDIX 2. MODEL ASSESSMENT DETAILS

AIR-DRIED LUMBER ESTIMATES

Interventions

Air-dry Levy

Data Range

Estimation period: 1/92 through 12/01

Goodness-of-fit Statistics

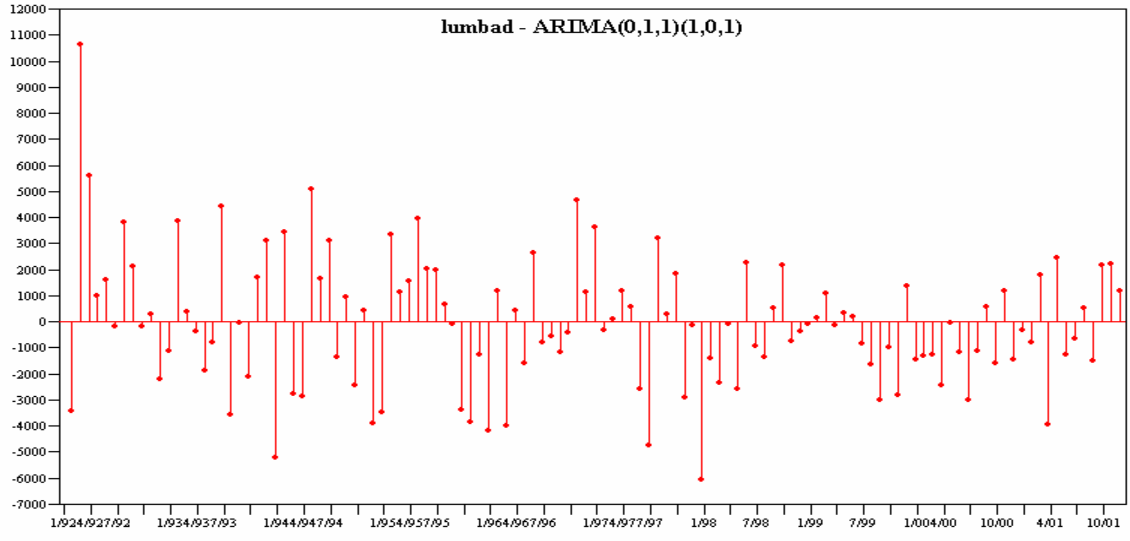
Mean squared error	6.49e+006
Root mean squared error	2548
Mean absolute percentage error	17.81
Mean absolute error	1912
Maximum absolute percentage error	160.2
Maximum absolute error	1.066e+004
R-Squared	0.5885
Normalized Bayesian Information Criterion	15.85

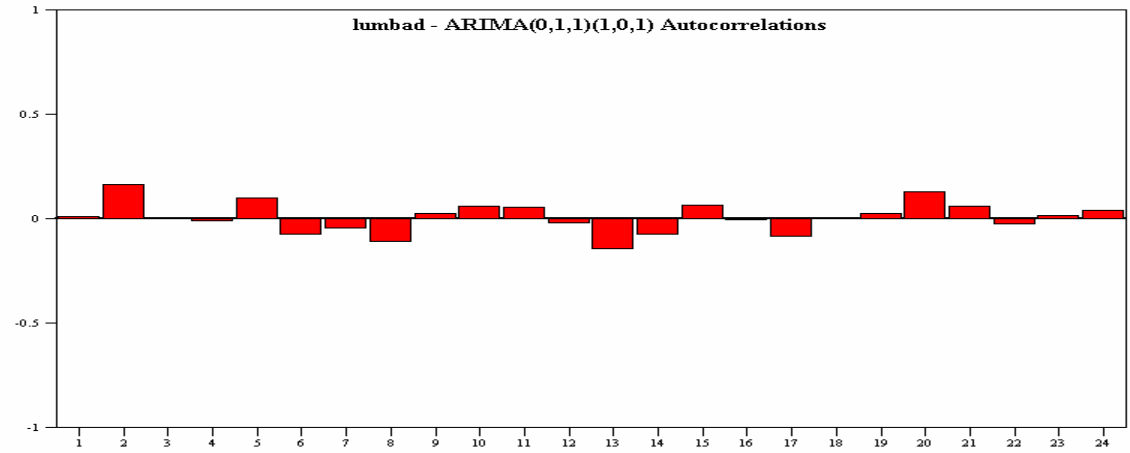
Model Parameters	Estimate	Standard error	t-value
Lumber Air-dried, difference order:1			
Auto-regressive seasonal lag 1	0.8893	0.1322	6.725
Moving average lag 1	0.9043	0.04374	20.67
Moving average seasonal lag 1	0.7305	0.2087	3.5
Air-dry Levy1, difference order: 1			
Numerator lag 0	-3968	1085	-3.658

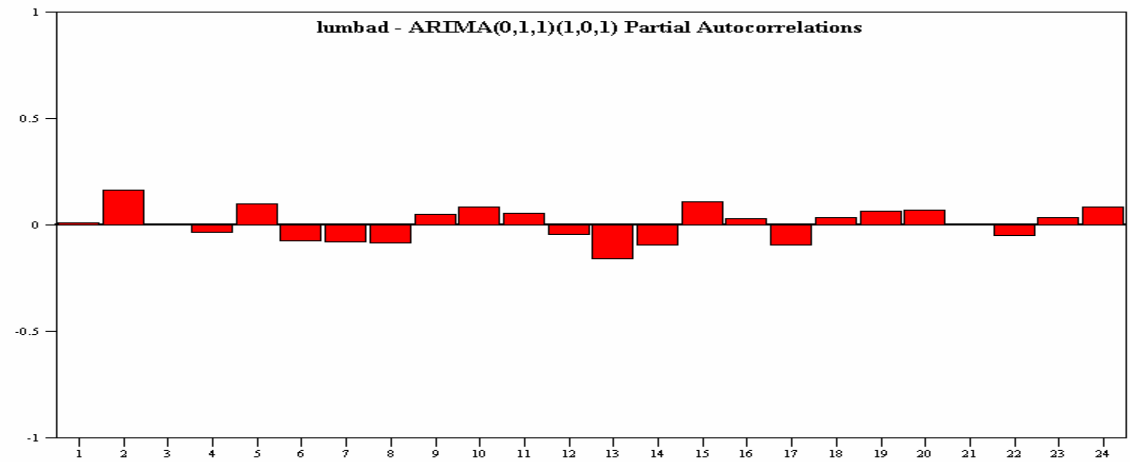
Model Statistics

Error variance	5.897e+006
Log-likelihood	-1097
Number of non-missing residuals	119
Ljung-Box Statistic(18)	13.24
P-value of the Ljung-Box Statistic	0.5839

Air-Dried Lumber Residuals







KILN-DRIED LUMBER ESTIMATES

Predictors

Raw Material

Interventions

Air-dry Levy

Data Range

Estimation period: 1/92 through 12/01

Goodness-of-fit Statistics

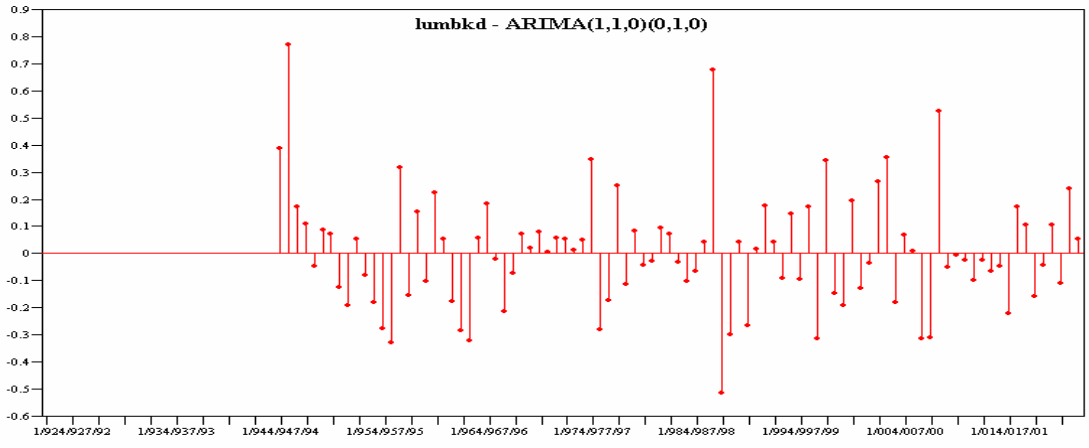
Mean squared error	4.841e+006
Root mean squared error	2200
Mean absolute percentage error	16.21
Mean absolute error	1535
Maximum absolute percentage error	71.11
Maximum absolute error	8111
R-Squared	0.4111
Normalized Bayesian Information Criterion	15.59

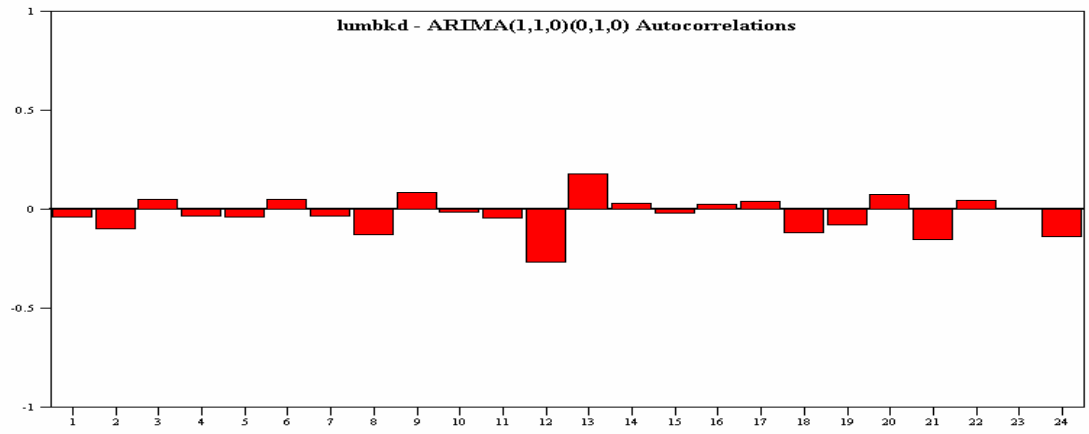
Model Parameters	Estimate	Standard error	t-value
Logarithm of Lumber Kiln-dried, difference order: 1, seasonal difference order: 1			
Auto-regressive lag 1	-0.3908	0.09796	-3.989
Logarithm of Raw Material, difference order: 1, seasonal difference order: 1, delay 10			
Numerator lag 0	-0.379	0.08405	-4.509
Numerator lag 4	0.2514	0.08719	2.883
Air-dry Levy, difference order: 1, seasonal difference order: 1			
Numerator lag 0	0.3218	0.143	2.251

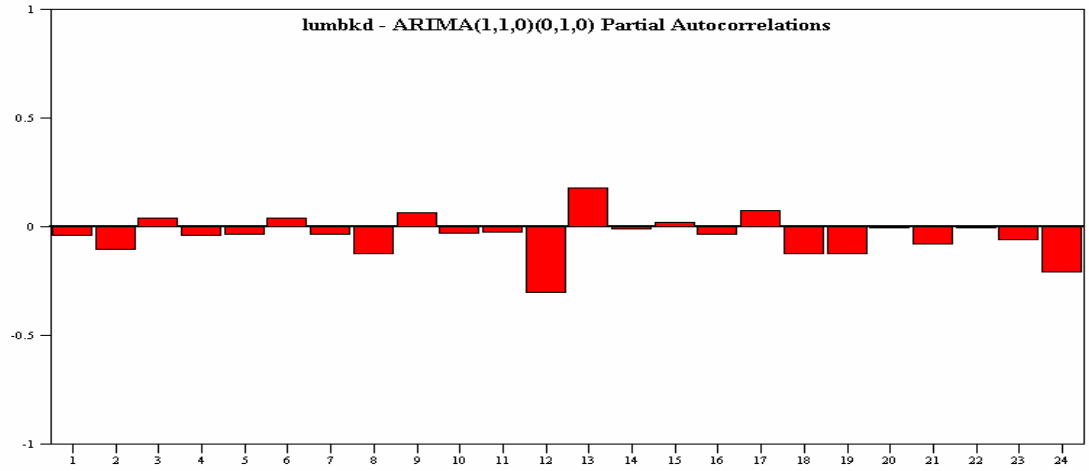
Model Statistics

Error variance	0.04705
Log-likelihood	12.13
Number of non-missing residuals	93
Ljung-Box Statistic(18)	18.01
P-value of the Ljung-Box Statistic	0.3881

Kiln-Dried Lumber Residuals







PROCESSED LUMBER MOLDING ESTIMATES

Predictors

Raw Material

Data Range

Estimation period: 1/92 through 12/01

Goodness-of-fit Statistics

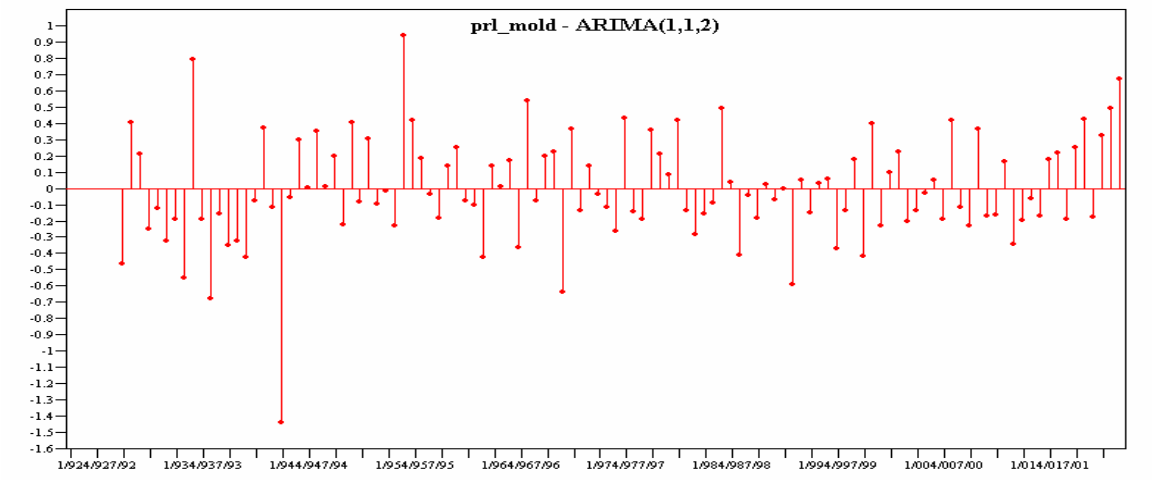
Mean squared error	2.282e+005
Root mean squared error	477.7
Mean absolute percentage error	29.3
Mean absolute error	286.7
Maximum absolute percentage error	345.7
Maximum absolute error	3052
R-Squared	0.7495
Normalized Bayesian Information Criterion	12.59

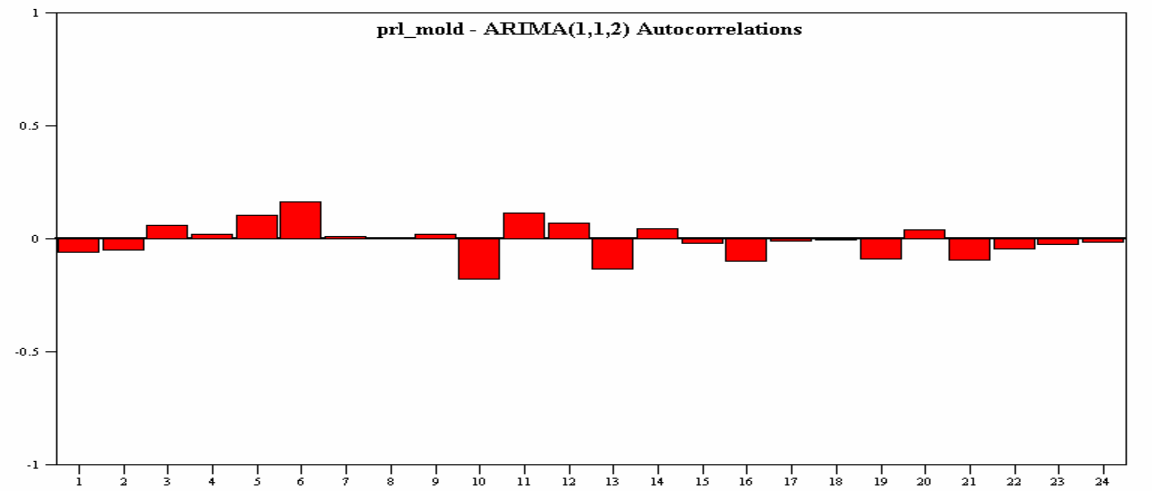
Model Parameters	**Estimate**	**Standard error**	**t-value**
Logarithm of Processed Lumber Molding, difference order: 1			
Constant	0.02151	0.004772	4.508
Auto-regressive lag 1	-0.7057	0.08443	-8.358
Moving average lag 2	0.7575	0.08569	8.839
Logarithm of Raw Material, difference order: 1, delay 3			
Numerator lag 0	-0.3636	0.09679	-3.756
Denominator lag 1	-1.064	0.06409	-16.6
Denominator lag 2	-0.8347	0.07365	-11.33

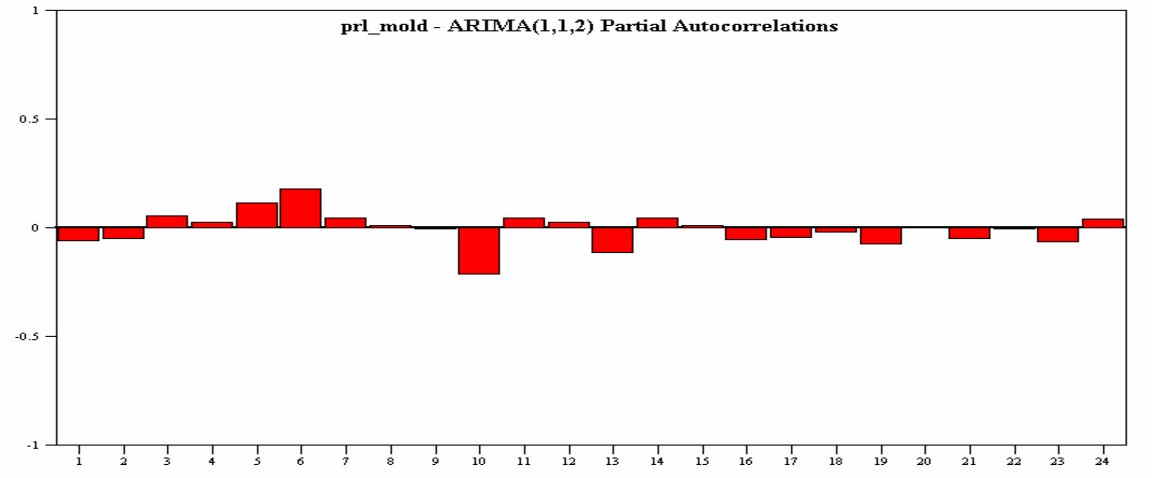
Model Statistics

Error variance	0.1105
Log-likelihood	-33.83
Number of non-missing residuals	114
Ljung-Box Statistic(18)	16
P-value of the Ljung-Box Statistic	0.4527

Processed Lumber Molding Residuals







FURNITURE PARTS ESTIMATES

Interventions
Air-dry Levy

Data Range
Estimation period: 1/92 through 12/01

Goodness-of-fit Statistics

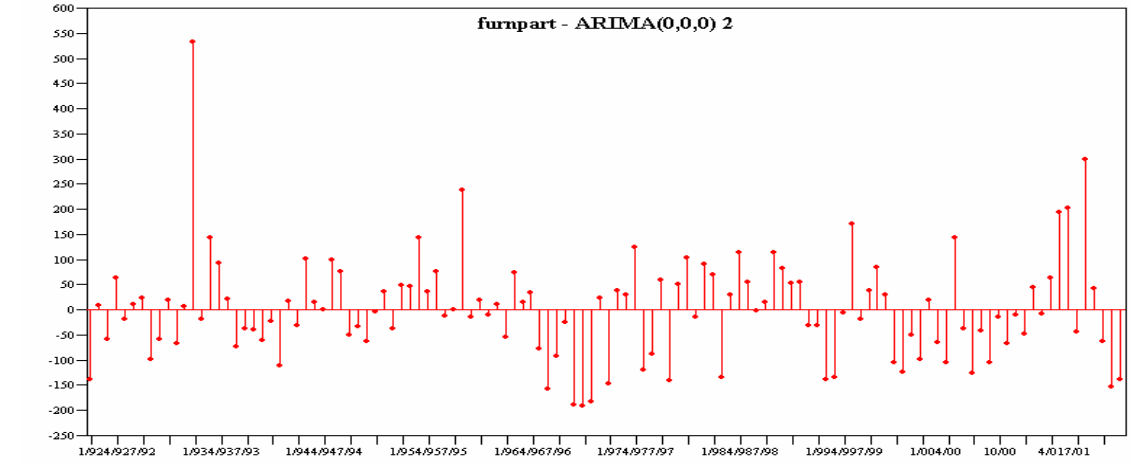
Mean squared error	1.064e+004
Root mean squared error	103.2
Mean absolute percentage error	138.8
Mean absolute error	74.11
Maximum absolute percentage error	9458
Maximum absolute error	531.8
R-Squared	0.07771
Normalized Bayesian Information Criterion	9.352

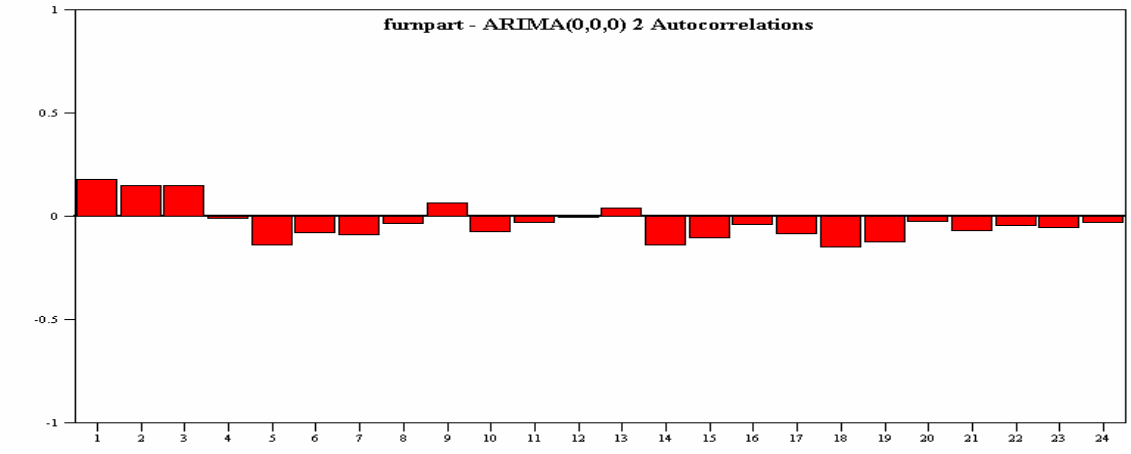
Model Parameters	**Estimate**	**Standard error**	**t-value**
Furniture Parts			
Constant	191.2	13.32	14.35
Air-dry Levy			
Numerator lag 0	59.38	18.83	3.153

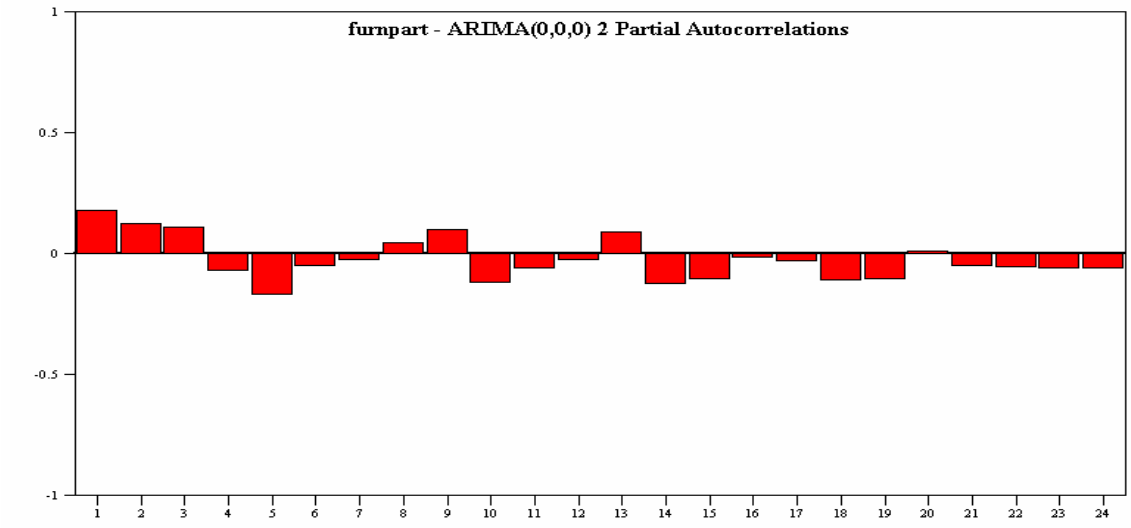
Model Statistics

Error variance	1.064e+004
Log-likelihood	-725.6
Number of non-missing residuals	120
Ljung-Box Statistic(18)	23.94
P-value of the Ljung-Box Statistic	0.1572

Furniture Parts Residuals







SLICED VENEER ESTIMATES

Interventions

Air-dry Levy

Data Range

Estimation period: 1/92 through 12/01

Goodness-of-fit Statistics

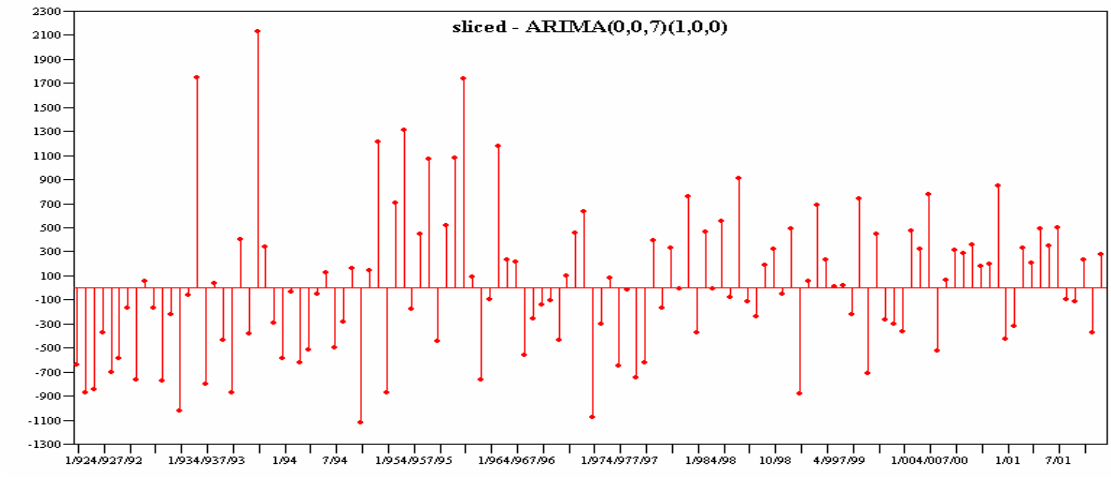
Mean squared error	3.736e+005
Root mean squared error	611.3
Mean absolute percentage error	24.9
Mean absolute error	463.5
Maximum absolute percentage error	185.3
Maximum absolute error	2127
R-Squared	0.4775
Normalized Bayesian Information Criterion	12.99

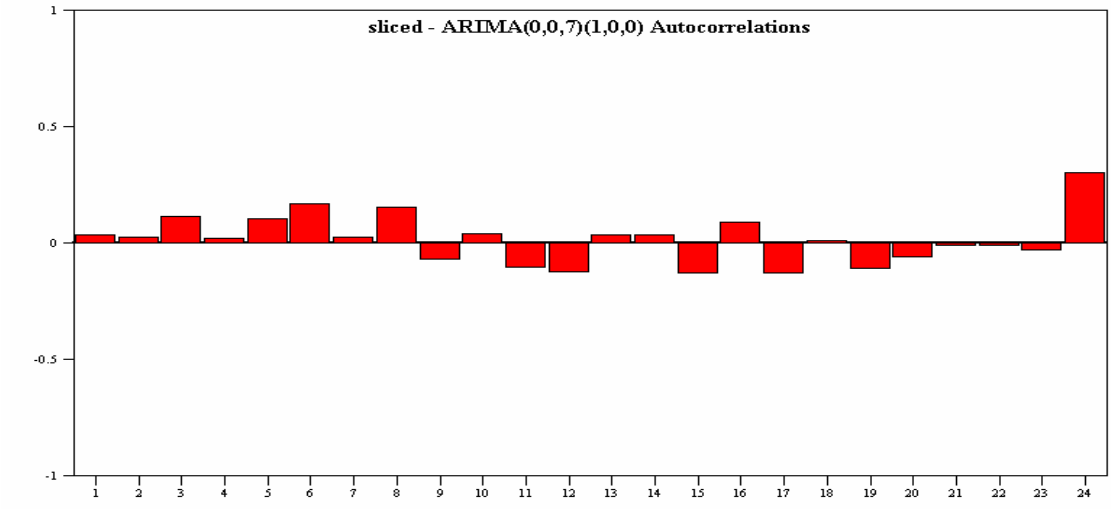
Model Parameters	**Estimate**	**Standard error**	**t-value**
Sliced Veneer			
Constant	1961	145.9	13.43
Auto-regressive seasonal lag 1	0.3487	0.09057	3.849
Moving average lag 7	-0.4143	0.08716	-4.754
Air-dry levy			
Numerator lag 0	713.1	184.4	3.867

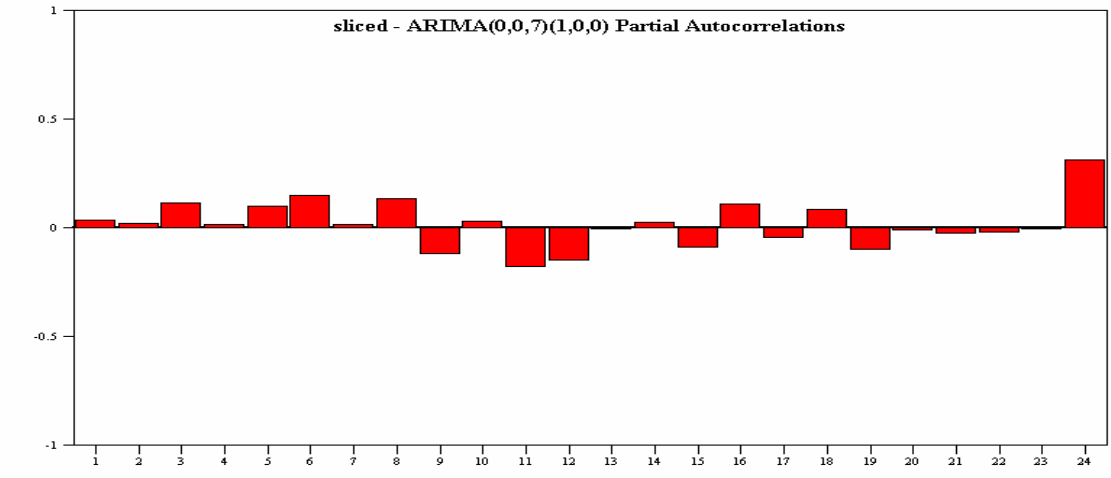
Model Statistics

Error variance	3.647e+005
Log-likelihood	-938.1
Number of non-missing residuals	120
Ljung-Box Statistic(18)	20.74
P-value of the Ljung-Box Statistic	0.1888

Sliced Veneer Residuals







DOWELS ESTIMATES

Data Range

Estimation period: 1/92 through 12/01

Goodness-of-fit Statistics

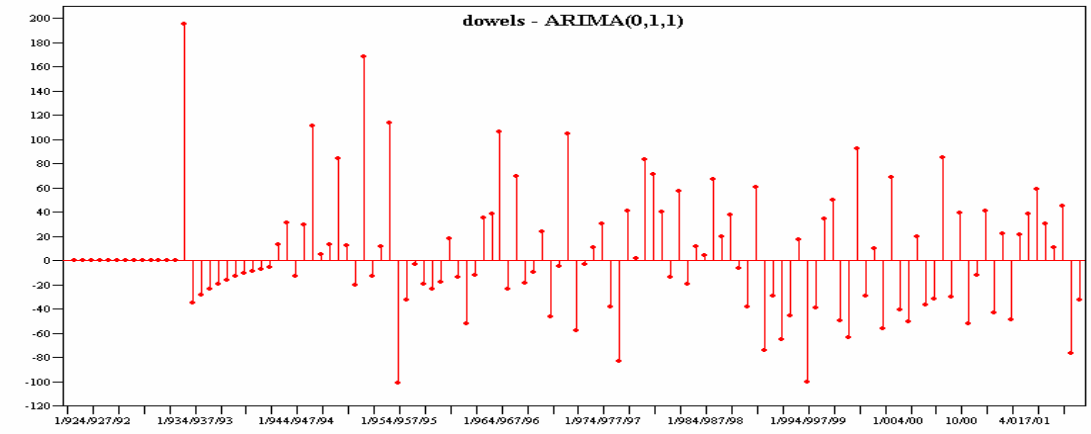
Mean squared error	2478
Root mean squared error	49.78
Mean absolute percentage error	62.8
Mean absolute error	35.87
Maximum absolute percentage error	758.5
Maximum absolute error	195
R-Squared	0.3285
Normalized Bayesian Information Criterion	7.855

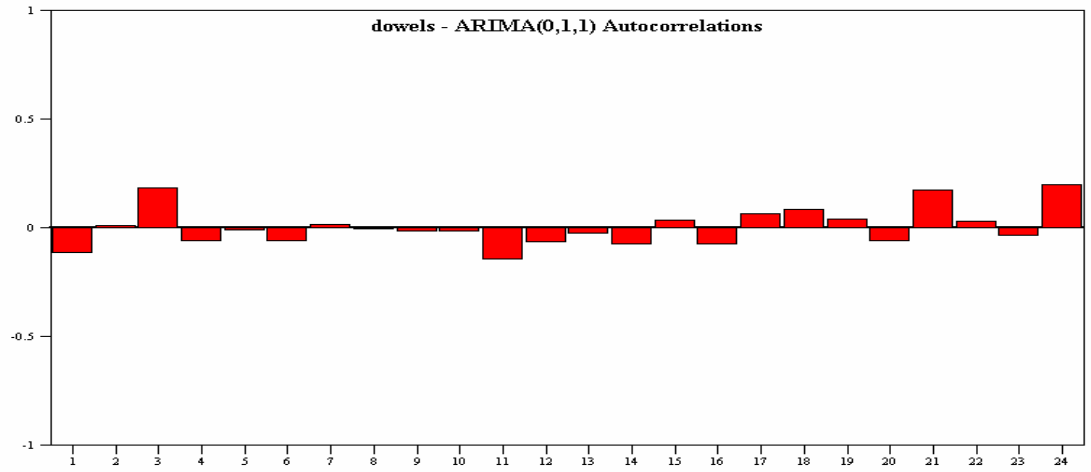
Model Parameters	**Estimate**	**Standard error**	**t-value**
Dowels, difference order: 1			
Moving average lag 1	0.8231	0.05336	15.43

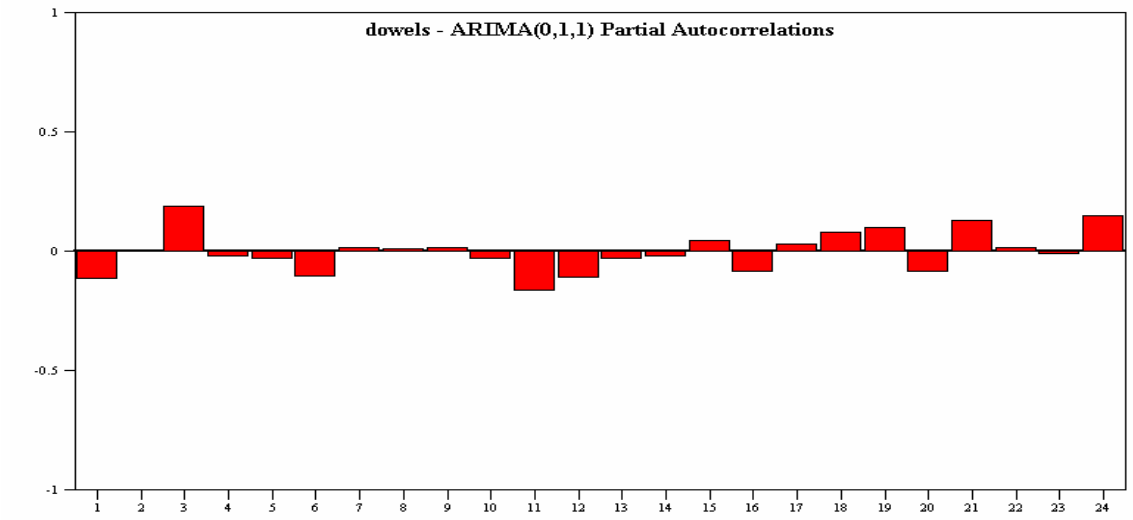
Model Statistics

Error variance	2477
Log-likelihood	-633.9
Number of non-missing residuals	119
Ljung-Box Statistic(18)	13.5
P-value of the Ljung-Box Statistic	0.7024

Dowels Residuals







PROFILE BOARD ESTIMATES

Data Range

Estimation period: 1/92 through 12/01

Goodness-of-fit Statistics

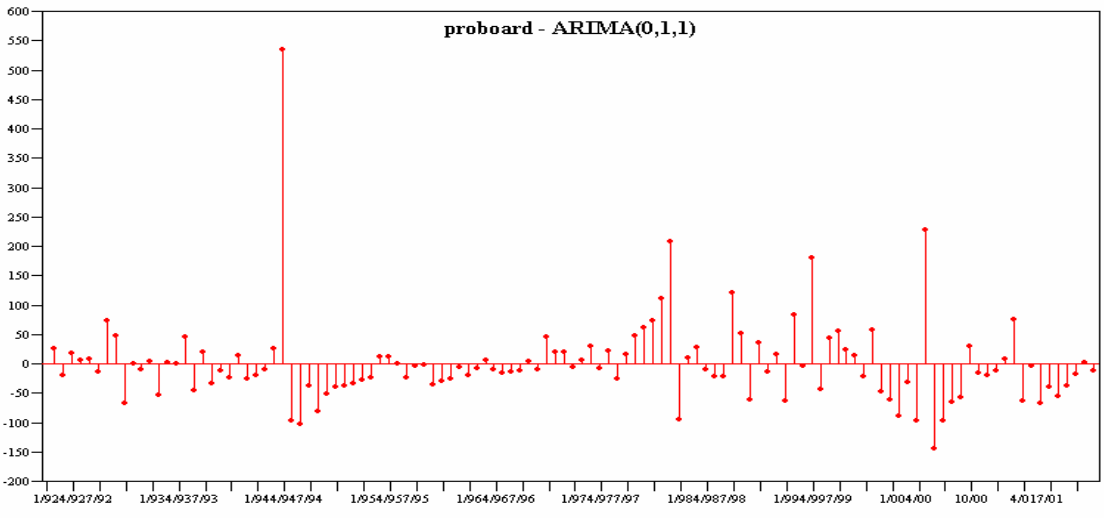
Mean squared error	5520
Root mean squared error	74.3
Mean absolute percentage error	130.6
Mean absolute error	42.87
Maximum absolute percentage error	2888
Maximum absolute error	535.5
R-Squared	0.1185
Normalized Bayesian Information Criterion	8.656

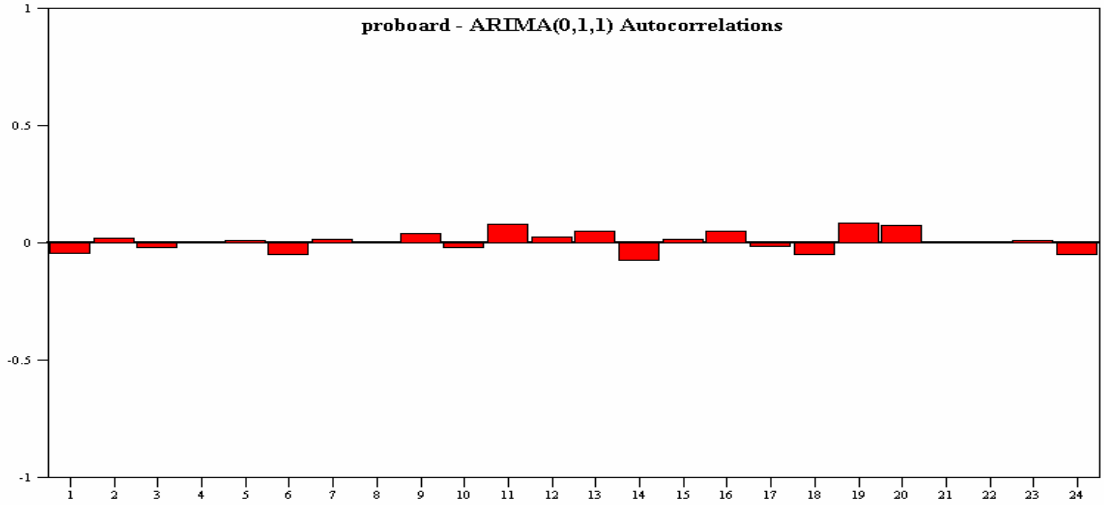
Model Parameters	**Estimate**	**Standard error**	**t-value**
Profile Board, difference order: 1			
Moving average lag 1	0.8463	0.05099	16.6

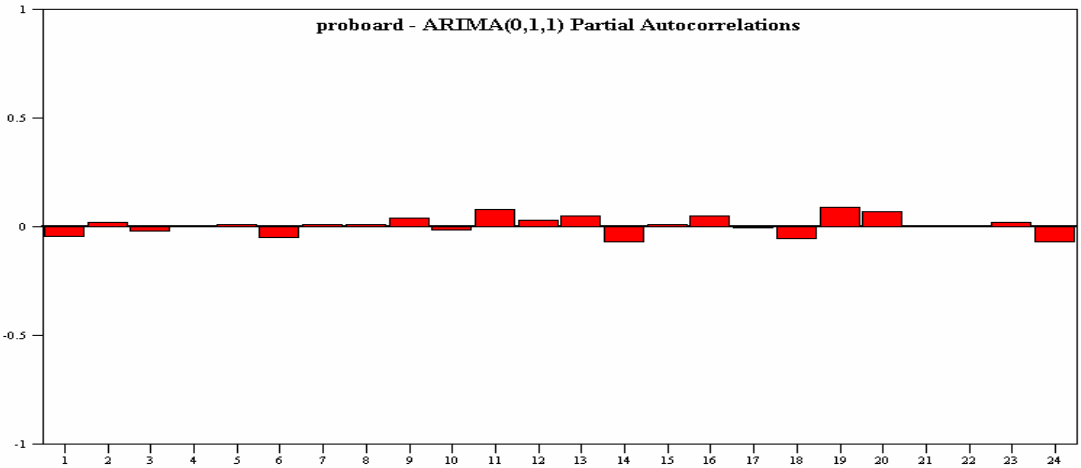
Model Statistics

Error variance	5514
Log-likelihood	-681.6
Number of non-missing residuals	119
Ljung-Box Statistic(18)	3.658
P-value of the Ljung-Box Statistic	0.9997

Profile Board Residuals







FLOORING ESTIMATES

Data Range

Estimation period: 1/92 through 12/01

Goodness-of-fit Statistics

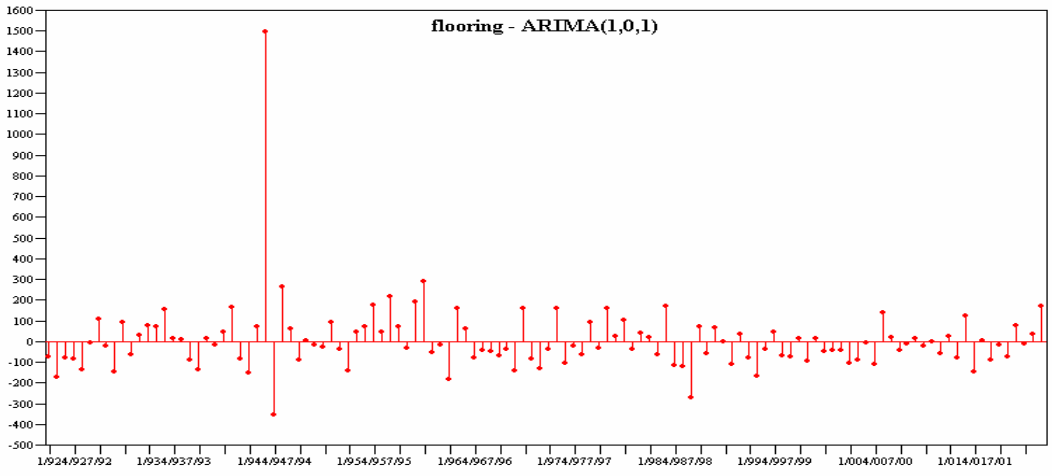
Mean squared error	3.043e+004
Root mean squared error	174.4
Mean absolute percentage error	55.84
Mean absolute error	94.25
Maximum absolute percentage error	1776
Maximum absolute error	1498
R-Squared	0.08108
Normalized Bayesian Information Criterion	10.44

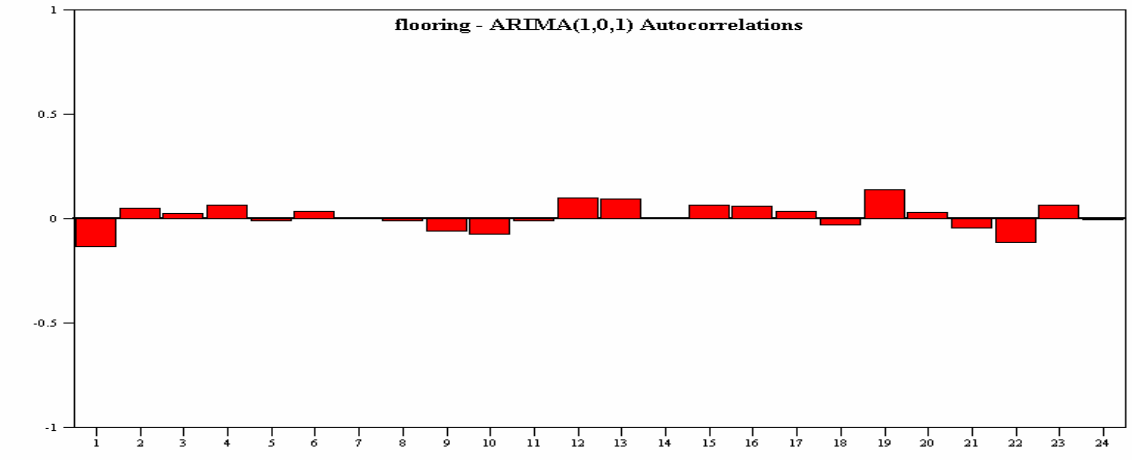
Model Parameters	**Estimate**	**Standard error**	**t-value**
Flooring			
Constant	253.3	41.18	6.151
Auto-regressive lag 1	0.9499	0.05732	16.57
Moving average lag 1	0.8578	0.0982	8.735

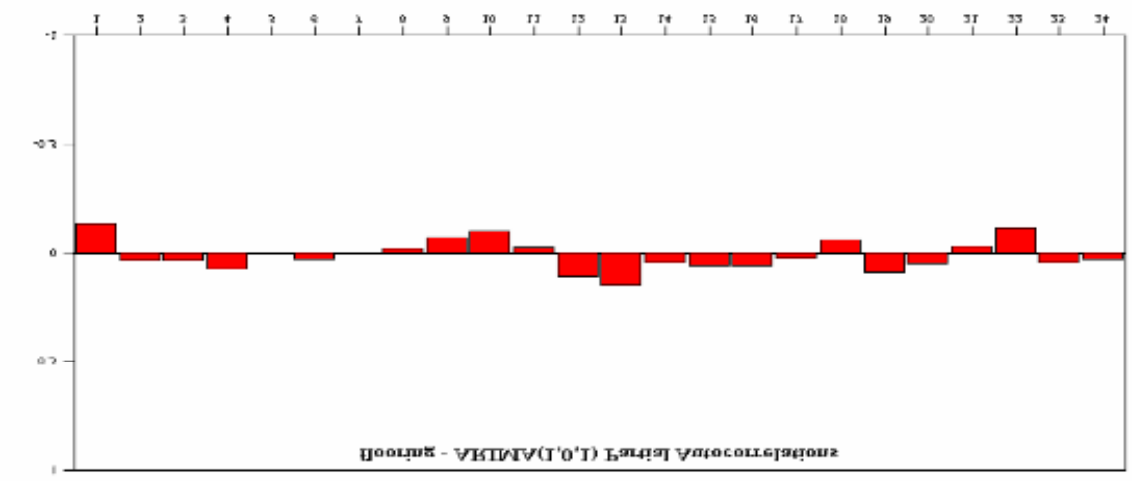
Model Statistics

Error variance	3.04e+004
Log-likelihood	-788.2
Number of non-missing residuals	120
Ljung-Box Statistic (18)	8.328
P-value of the Ljung-Box Statistic	0.9385

Flooring Residuals







PLYWOOD ESTIMATES

Data Range

Estimation period: 1/92 through 12/01

Goodness-of-fit Statistics

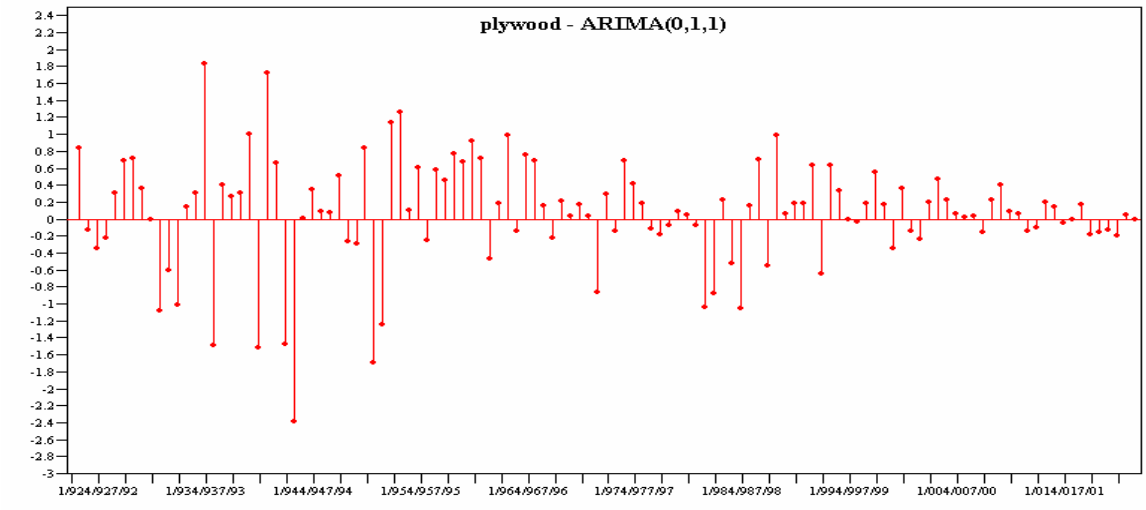
Mean squared error	4.521e+005
Root mean squared error	672.4
Mean absolute percentage error	70.36
Mean absolute error	447.1
Maximum absolute percentage error	1244
Maximum absolute error	2043
R-Squared	0.8201
Normalized Bayesian Information Criterion	13.06

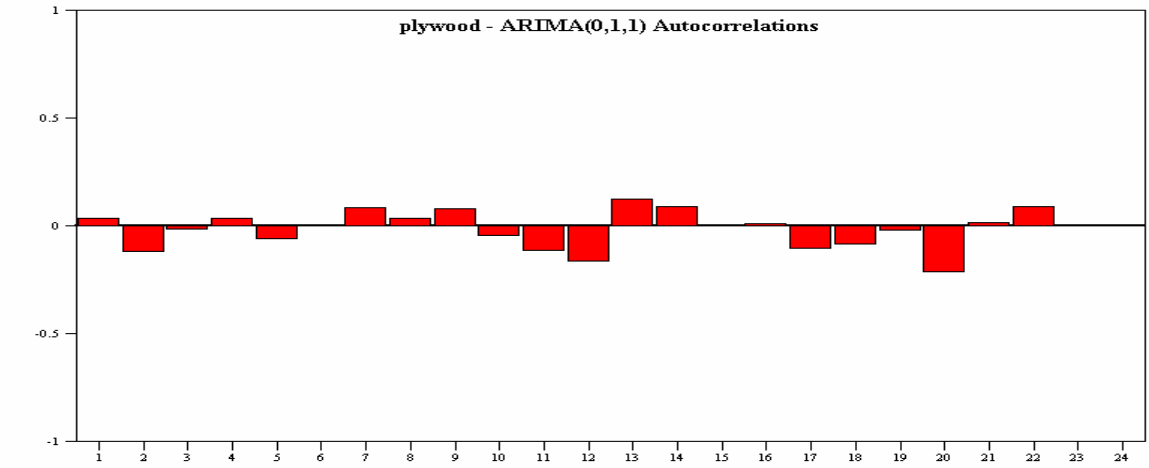
Model Parameters	**Estimate**	**Standard error**	**t-value**
Logarithm of Plywood, difference order: 1			
Moving average lag 1	0.5274	0.07857	6.713

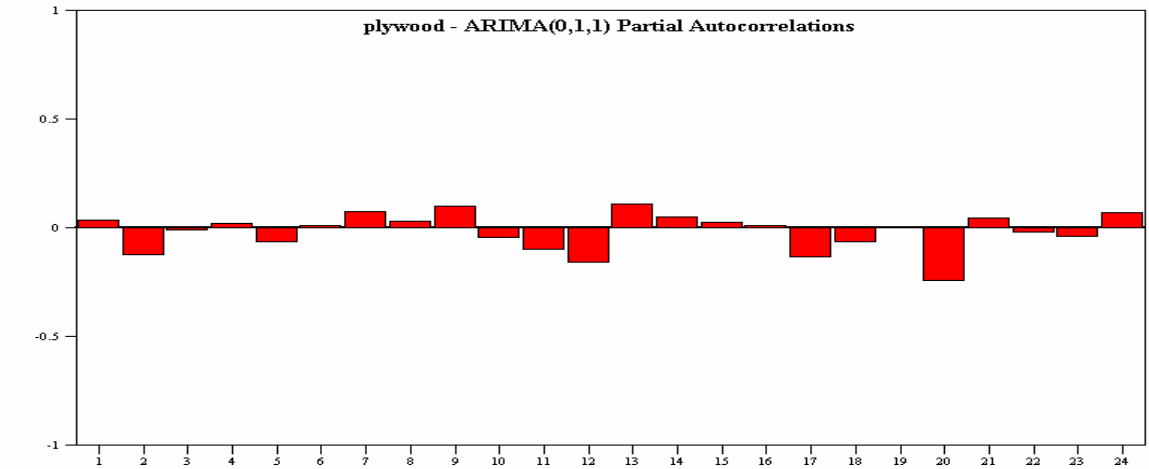
Model Statistics

Error variance	0.416
Log-likelihood	-116.3
Number of non-missing residuals	119
Ljung-Box Statistic(18)	15.63
P-value of the Ljung-Box Statistic	0.5503

Plywood Residuals







ROTARY VENEER ESTIMATES

Data Range

Estimation period: 1/92 through 12/01

Goodness-of-fit Statistics

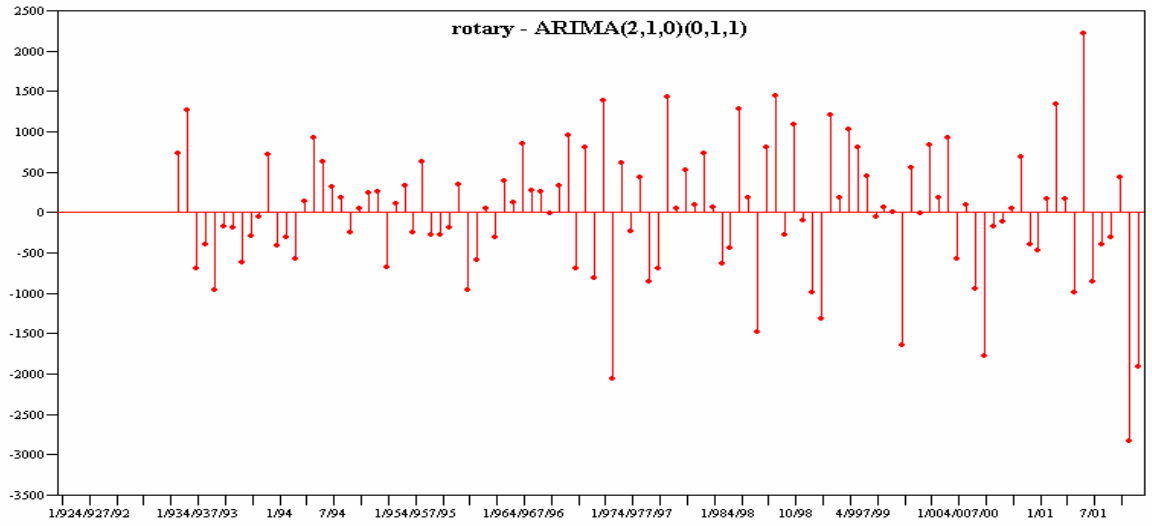
Mean squared error	6.672e+005
Root mean squared error	816.8
Mean absolute percentage error	29.18
Mean absolute error	606.5
Maximum absolute percentage error	189.2
Maximum absolute error	2835
R-Squared	0.8721
Normalized Bayesian Information Criterion	13.54

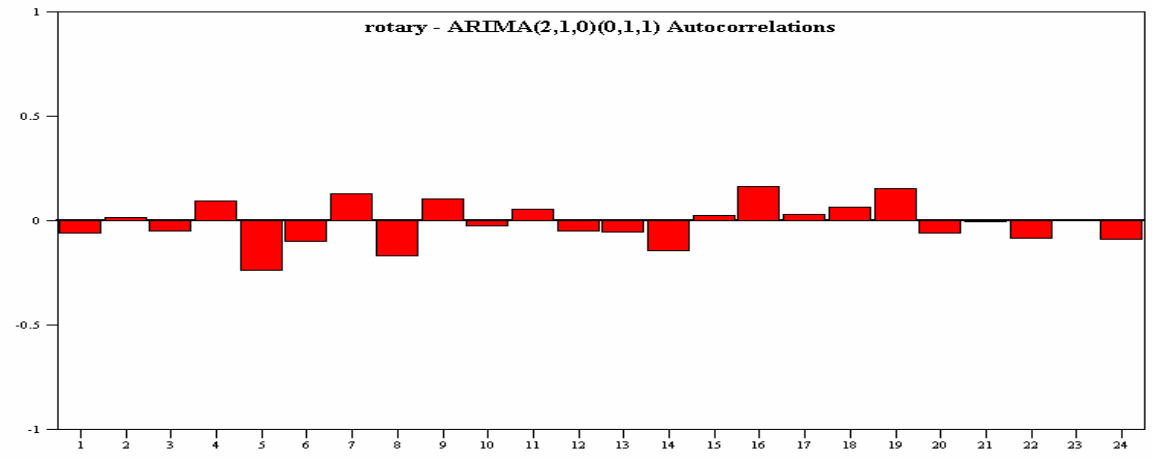
Model Parameters	**Estimate**	**Standard error**	**t-value**
Rotary Veneer, difference order: 1, seasonal difference order: 1			
Auto-regressive lag 1	-0.6685	0.09145	-7.31
Auto-regressive lag 2	-0.3867	0.09724	-3.977
Moving average seasonal lag 1	0.8581	0.1742	4.926

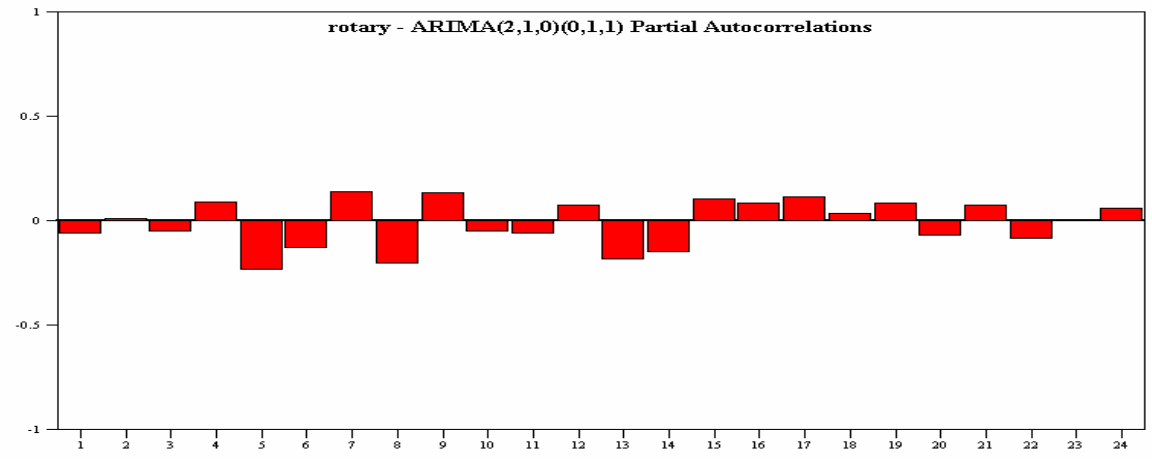
Model Statistics

Error variance	6.123e+005
Log-likelihood	-871.2
Number of non-missing residuals	107
Ljung-Box Statistic(18)	23.79
P-value of the Ljung-Box Statistic	0.06881

Rotary Veneer Residuals







PERCENT LUS ESTIMATES

Interventions

Air-dry Levy

Data Range

Estimation period: 1/92 through 12/01

Goodness-of-fit Statistics

Mean squared error	8.955
Root mean squared error	2.992
Mean absolute percentage error	22.69
Mean absolute error	2.303
Maximum absolute percentage error	131.4
Maximum absolute error	8.137
R-Squared	0.9239
Normalized Bayesian Information Criterion	2.273

Model Parameters	**Estimate**	**Standard error**	**t-value**
Square root of Percent LUS, difference order: 1			
Moving average lag 1	0.6441	0.07456	8.638
air-dry levy, difference order: 1			
Numerator lag 0	0.9803	0.3244	3.022

Model Statistics

Error variance	0.178
Log-likelihood	-65.41
Number of non-missing residuals	119
Ljung-Box Statistic(18)	20.45
P-value of the Ljung-Box Statistic	0.2519

APPENDIX 3. SURVEY QUESTIONAIRE

MARKETING IMPLICATIONS OF RECENT GOVERNMENT INTERVENTIONS IN THE GHANA TIMBER INDUSTRY

This survey is designed to collect information about how the marketing activities of the Ghana Timber industry have been affected by recent interventions by government. By completing this survey, you will receive competitive information about the impact of the interventions on forest products companies. A **complementary copy of the survey results** will be sent to you as a token of our appreciation for completing the survey (SEE WRITTEN COMMENTS).

The survey is **confidential** and only summary information will be reported in the study results. The number at the top of this survey is an **identifier only** that allows for tracking of completed surveys, ensuring that you do not receive subsequent surveys or phone calls. When you have completed the survey, please place it in the postage paid envelope and return it.

Thank you.

Ben N. Donkor, Doctoral Candidate
Forest Products Marketing
Louisiana State University

Section I – Business Profile

1. In which year was your company established? Please state original year of establishment even if management/ ownership has changed. _____

2. Please rank in decreasing order (using 1, 2, 3, etc.) to indicate your scale of operation by revenue in each of the following
product areas. Indicate N/A where not applicable:

   ___ Air-dried lumber (including boules)
   ___ Kiln-dried lumber (including boules)
   ___ Veneer (including sliced and rotary)
   ___ Chipboard
   ___ Plywood
   ___ Moldings, S4S, Semi-finished/finished products

3. In which region of Ghana is your factory premise located? _____

4. Is your company part of a group of companies under same management? 1. Yes 2. No

   If yes, provide the following:

No. of firms in group	Total Employees	Employees in your firm

Section II. Your Company and Recent Government Interventions

1. Since 1995, the government of Ghana has made certain interventions (such as listed below) into the timber industry. From your own perspective, please rate on the scale below the general impact of the interventions:

	Highly Negative	Somewhat Negative	Slightly Negative	No impact	Slightly Positive	Somewhat Positive	Highly Positive
a) Air-dry levy	-3	-2	-1	0	+1	+2	+3
b) Reduction of annual allowable cut	-3	-2	-1	0	+1	+2	+3
c) Promotion of lesser-used species	-3	-2	-1	0	+1	+2	+3
d) Promotion of value-addition	-3	-2	-1	0	+1	+2	+3

2. In comparison to the period before the interventions (prior to 1995), please describe how your firm's volume has changed ***in response to these interventions***. Please mark 'X' in the appropriate box provided in the table below:

My Company has changed in response to government actions through:	Decreased Volume			No Change 0 ±5%	Increased Volume		
	Large Over -20%	Moderate -11 to -20%	Slight -6 to -10%		Slight 6-10%	Moderate 11-20%	Large Over 20%
a) raw material usage							
b)export of kiln-dried lumber							
c)processing and export of lesser-used species							
d)export of value-added products							

If you indicated that your firm had a Large or Moderate Decrease (i.e., decreases of over 10%) in any of the activities listed above, please provide a brief explanation in the appropriate space(s) provided below:

a) Raw material _____
b) Export Kiln-dried_____
c) Lesser-used species_____
d) Export value-added products_____

3. Please mark 'X' in the appropriate box to indicate which period your company exported more by volume (or not applicable) in the following value-added products:

Value-added product	Before 1995	After 1995	Not applicable
Kiln-dried lumber			
Processed lumber moldings/Finger-jointed			
Profile/Window boards			
Furniture parts/Furniture			
Doors			
Flooring/Decking			

4. Please mark 'X' in the appropriate box to indicate which period your company made more use (or not applicable) of the following value-adding equipment (whether self-owned or hired)

Value-adding equipment	Before 1995	After 1995	Not applicable
Kiln-drier			
Molder/Finger-jointer			
Planer/Jointer			
Morticer/Tenoner			
Sander			
Router/CNC Router			

Section III. Your Company's Current Marketing Issues

In comparison to the period before 1995, please describe your current marketing issues based on the propositions/questions below:

1. **Relationship with your Buyers**

Compared to before 1995,	**Strongly disagree**		**Neither agree nor disagree**		**Strongly agree**
a) Acquisition of contracts is much easier	1	2	3	4	5
b) Buyers are much more interested in pre-financing	1	2	3	4	5
c) We have many more partnership/joint ventures with our buyers	1	2	3	4	5
d) Claim settlements with our buyers have much less protracted arbitration	1	2	3	4	5
e) Buyers help us much more with wholesale clearance of stock	1	2	3	4	5
f) We network with our buyers for product specialization	1	2	3	4	5
g) Buyers/agents carry out pre-shipment inspection before export to avoid incidence of claims	1	2	3	4	5
h) Our buyers assist us with technical expertise in skill development and machinery repairs/routine maintenance	1	2	3	4	5

2. **Flexibility in Terms of Trade/Payment**

In my Company:

	Strongly disagree		**Neither agree nor disagree**		**Strongly agree**
a) We are considering other terms of trade apart from **FOB**	1	2	3	4	5
b) We are considering other terms of payment apart from **L/C**	1	2	3	4	5

2b. Please list in order of frequency of use, other terms of trade apart from FOB that you have been using:

_____

2c. Please list in order of frequency of use, other terms of payment apart from L/C that you have been using:

_____

3. **Production Issues**

3a. **In my Company:**

	Strongly disagree		**Neither agree nor disagree**		**Strongly agree**
a) Raw material quality is degrading	1	2	3	4	5
b) We are going through acute shortage of raw material	1	2	3	4	5
c) Our suppliers are becoming unreliable	1	2	3	4	5
d) There is upgrading/acquisition of value adding equipment	1	2	3	4	5
e) Major skill improvement in value adding has recently been carried out	1	2	3	4	5
f) Our total yield based on log input is improving	1	2	3	4	5

3b. Please indicate your percentage yield in the following (indicate N/A where not applicable):

1. Sawing (based on log volume input): _____
2. Peeling (based on log volume input): _____
3. Slicing (based on log volume input): _____
4. Kilning (based on air-dried lumber volume input): _____
5. Machining (based on kiln-dried lumber volume input): _____

4. **Pricing of Products**

My Company:

	Strongly disagree		**Neither agree nor disagree**		**Strongly agree**
a) Does not solely depend on TIDD guiding selling prices	1	2	3	4	5
b) Enjoys high prices because of good quality image in the market	1	2	3	4	5
c) Is adopting the 'cost-plus-profit' approach in pricing due to increasing cost of production	1	2	3	4	5

5. **Distribution**

In each of the areas of operations below, select the choice which is currently more frequently used by your company and then provide a brief description of why that choice is used:

i) Packaging: (Check one) ___ Break bulk
___ Containerized
Why? _____

ii) Delivery: (Check one) ___ Part delivery
___ Full delivery

Why? _____

iii) Distribution Channels: (Check one) ___ Direct
____ Agents
___ Subsidiaries

6. **Promotion/Communication**

Indicate in three most frequently used types of promotional means your company uses (1 = most used, 2 = second most used, 3 = third most frequently used):

___ Personal calling
___ Word-of-mouth
___ e-mail
___ Radio
___ Television
___ Newspaper
___ Brochure
___ Billboard
___ Trade shows/missions
___ Internet

7. **Planning**

In my company, effective planning has become necessary due to current conditions created by the interventions in the Ghana Timber Industry. As a result important planning procedures such as:

	Strongly disagree		**Neither agree nor disagree**		**Strongly agree**
a) Problem analysis is carried out cross-functionally	1	2	3	4	5
b) Expert opinion particularly from our buyers is regularly sought	1	2	3	4	5
c) Market research is very much emphasized	1	2	3	4	5
d) Goals/objectives are set through teamwork deliberations	1	2	3	4	5
e) We develop and disseminate clear strategies and effectively implement necessary actions	1	2	3	4	5
f) Our strategies are evaluated at the end of each planning term	1	2	3	4	5
g) Our audited financial account is considered a major evaluation tool	1	2	3	4	5

8. **Opportunities and Threats**

In my Company:

	Strongly disagree		**Neither agree nor disagree**		**Strongly agree**
a) We consider e-business (business over the internet) as effective transactional tool and have necessary structures and tools in place to use it once it becomes feasible in the country	1	2	3	4	5
b) Certification is regarded as a useful tool for marketing and will consider to do it once the National standards are ready	1	2	3	4	5
c) We have good image in the communities in which we operate and will always maintain it	1	2	3	4	5
d) We benefit from the government's Export Incentive Scheme	1	2	3	4	5
e) One of our worries is intensity of claims/rejects associated with value-added products	1	2	3	4	5
f) Our bankers are increasingly tightening processes for capital /financial assistance acquisition	1	2	3	4	5

Thank you for your time!!

If you have any further question about this survey, please contact:

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