Enhancement of Coffee Quality

Socioeconomic Study

LMC International

with ProForest

ProForest

LMC INTERNATIONAL

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Enhancement of Coffee Quality

Socioeconomic Study

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Background

This study was commissioned by the Food and Agriculture Organization of the United Nations (www.fao.org), the Project Executing Agency for project CFC/ICO/06, 'Enhancement of Coffee Quality through the Prevention of Mould Formation'.

This 5-year project was funded by the Common Fund for Commodities (www.common-fund.org), The Netherlands Ministry of Foreign Affairs (www.minbuza.nl), and the European coffee industry (www.ecf-coffee.org), and the project Supervisory Body was the International Coffee Organization (www.ico.org).

More information on the project can be found at www.coffee-ota.org.

Table of Contents

Executive Summary **E1**

Defining Coffee Quality E1
Ochratoxin A in Coffee E2
Potential Impact of Changes in Food Safety Legislation on the Coffee Industry E3
Traceability E5

Part 1: Introduction **1**

Chapter 1: Defining Coffee Quality **2**

The Coffee Supply Chain 2

- Producer 2
- Internal Trader 3
- Exporter 4
- International Trader 4
- Roaster/Soluble Manufacturer 4
- Retailer/Wholesaler 4
- Consumer 5

Coffee Quality along the Supply Chain 7

- Coffee Quality in Producing Countries 7
- Coffee Quality in Consuming Countries 9

Export Grading and Classification of Green Coffee 10

- Export Grading in Producing Countries 10
- Futures Markets Grading Standards 10

Buyers Definitions of Coffee Quality 13

- Roasters 13
- International Coffee Traders 14

Chapter 2: Ochratoxin A in Coffee **16**

Coffee Quality and Hygiene 16

- General Principals of Food Hygiene 16
- Coffee Quality and Safety 17

Food Safety Legislation 18

- Current Legislation 18
- Forthcoming Legislation 18

Project Recommendations 19

Chapter 3: Costs and Benefits of Improving Coffee Hygiene in Producing Countries 20

The Current Position 20
The Marketing Environment 20

Initiatives to Improve Quality 22
Costs and Benefits of Improved Quality Using Existing Initiatives 23

Scenario A: Limited Enforcement of Improved Hygiene Standards 27

Option 1: Destroying Poor Quality Coffee 27
Uganda 30

Option 2: Changing Farmer Behaviour 33

Scenario B: Strict Enforcement 40
Option 1: Destroying Poor Quality Coffee 40
Option 2: Changing Farmer Behaviour 44

Summary 44

Chapter 4: Potential Impact of Changes in Food Safety Legislation on the Coffee Industry 46

Quantifiable Aspects 47

Share of Export Price Received by Growers 47

Non-quantifiable Aspects 51

Coffee Producing Countries 51
International Coffee Trade 52

Conclusions 53

PART 2

Part 2: Introduction 55

Chapter 1: Description of Different Traceability Systems for Commodity Crops 56

Relating Selected Supply Chain Approaches to the Three Options 56

Option 1: Full Chain of Custody Based on Segregation 56

IFOAM 58

Sustainable Agriculture Network 58

EUREPGAP 59

Option 2: A ‘Grade’ Commodity Separate from the Conventional Product 61

Option 3: The 'Book and Claim' Approach 63

Chapter 2: Applications in the Coffee Sector 64

Typical Value Chains in Coffee 64
Mainstream and Niche Markets 65
Supply Chain Initiatives in the Coffee Sector 66

Fairtrade Labelling Organization (FLO) 67
Starbucks Coffee and Farmer Equity (CAFE) Practices 68
Common Code for the Coffee Community 69
Utz Kapeh 70

Approaches to Traceability in the Coffee Sector 71

Mainstream (Bulk) Markets 71
An Intermediate Step – Traceability to Container 72
Full Traceability to Producer Level 72

Strengths and Weaknesses of Different Approaches in the Coffee Sector 73

Chapter 3: Conclusions and Comparative Analysis 75

A Comparative Analysis of the Three Supply Chain Options 75
Some Additional Cost Issues 78
Costs of Traceability Relative to Complexity of Supply Chain 78

Distribution of Costs in the Supply Chain 78

Appendix 1: Coffee Quality Descriptors 80

Physical Quality 80

Agronomic/Climatic 80
Pest Damage 83
Processing 83

Sensory Quality 84

Aromas/Flavours 84
Liquor 87

Appendix 2: Survey Country Background 88

Indonesia 88

Production System 88
Marketing System 89
Export Grading System 89

Uganda 91

Production System 91
Marketing System 92

Export Grading System 93

Kenya..... 95

Production System 95
Marketing System..... 96
Export Grading System 98

India 100

Production System 100
Marketing System..... 100
Export Grading System 101

Côte d'Ivoire..... 102

Production System 102
Marketing System..... 103
Export Grading System 103

List of Tables

Table EXEC.1: Classification of Green Coffee for Export in Coffee Producing Countries.....E1
Table EXEC.2: Current Regulatory Limits for Ochratoxin A in Coffee in Europe E2
Table EXEC 1: Costs and Benefits of Improving Quality – Case Studies E4

PART 1

Table 1.1: Main Consumption Types in Importing Countries by Region/Country..... 7
Table 1.2: Unwashed (Natural) Coffee – Influences on Quality in Producing Countries 8
Table 1.3: Washed Coffee – Influences on Quality in Producing Countries 9
Table 1.4: Classification of Green Coffee for Export in Coffee Producing Countries..... 10

Table 2.1: Current Regulatory Limits for Ochratoxin A in Coffee in Europe 18

Table 3.1: Survey Countries - Background Data 21
Table 3.2: Indonesia - Moisture Content and Defect Levels..... 22
Table 3.3: Lampung Province, Indonesia – Natural Robusta Value Chain..... 23
Table 3.3: Masaka District, Uganda – Natural Robusta Value Chain 24
Table 3.4: Indonesia – Impact of Removal of Low Quality Coffee on Weighted Average Export Value..... 28
Table 3.5: Lampung Province, Indonesia – Natural Robusta Value Chain (Limited Enforcement, Option 1)..... 28
Table 3.6: Uganda – Impact of Removal of Low Quality Coffee on Weighted Average Export Value..... 30
Table 3.7: Uganda – Natural Robusta Value Chain (Limited Enforcement, Option 1) 30
Table 3.8: Kenya – Impact of Removal of Low Quality Coffee on Weighted Average Export Value..... 32
Table 3.9: Indonesia - Impact of Upgrading of Low Quality Coffee on Weighted Average Export Value..... 34
Table 3.10: Uganda - Impact of Upgrading of Low Quality Coffee on Weighted Average Export Value..... 36
Table 3.11: Kenya - Impact of Upgrading of Low Quality Coffee on Weighted Average Export Value..... 38
Table 3.12: Costs and Benefits of Improving Quality – Case Studies 44

PART 2

Table 3.1: Analysis of Supply Chain Options..... 76

APPENDICES

Table A2.1: Size of Smallholdings and Number of Producers 88
Table A2.2: Average Production by Region 88
Table A2.3: Indonesia – Export Standards for Main Coffee Grades 90
Table A2.4: Uganda – Area Under Coffee in 1999/2000..... 92
Table A2.4: Uganda — Export Standards for Main Coffee Grades..... 94

Table A2.5: Kenya - Production by Region 96
Table A2.6: The Kenyan Grading System..... 98
Table A2.7: The Kenyan Classification System 98
Table A2.8: Production Share by State and District in 2002/03 100
Table A2.9: Export Classification of Indian Coffees 102
Table A2.6: Côte d'Ivoire - Export Standards for Main Coffee Grades - Defects..... 103
Table A2.7: Côte d'Ivoire - Export Standards for Main Coffee Grades – Bean Size..... 104

List of Diagrams

PART 1

Diagram 1.1: Processing of Coffee Cherries and Green Coffee Beans 3
Diagram 1.1: Global Coffee Consumption, 2003 5
Diagram 1.2: EU Coffee Imports by Type 6

Diagram 3.1: Lampung Province, Indonesia – Natural Robusta Value Chain 23
Diagram 3.2: Lampung Province, Indonesia – Costs and Margins 24
Diagram 3.3: Masaka District, Uganda – Natural Robusta Value Chain 25
Diagram 3.4: Masaka District, Uganda – Costs and Margins 26
Diagram 3.5: Lampung Province, Indonesia – Natural Robusta Value Chain (Limited Enforcement, Option 1) 29
Diagram 3.6: Lampung Province, Indonesia – Costs and Margins (Limited Enforcement, Option 1) 29
Diagram 3.7: Uganda – Natural Robusta Value Chain (Limited Enforcement, Option 1) 31
Diagram 3.8: Uganda – Costs and Margins (Limited Enforcement, Option 1) 31
Diagram 3.9: Kenya – Costs and Margins (Limited Enforcement, Option 1) 33
Diagram 3.10: Lampung Province, Indonesia – Natural Robusta Value Chain (Limited Enforcement, Option 2) 35
Diagram 3.11: Lampung Province, Indonesia – Costs and Margins (Limited Enforcement, Option 2) 36
Diagram 3.12: Uganda – Natural Robusta Value Chain (Limited Enforcement, Option 2) 37
Diagram 3.13: Uganda – Costs and Margins (Limited Enforcement, Option 2) 38
Diagram 3.14: Kenya – Washed Arabica Value Chain (Limited Enforcement, Option 2) 39
Diagram 3.15: Kenya – Costs and Margins (Limited Enforcement, Option 2) 40
Diagram 3.16: Lampung Province, Indonesia – Natural Robusta Value Chain (Strict Enforcement, Option 1) 41
Diagram 3.17: Lampung Province, Indonesia – Costs and Margins (Strict Enforcement, Option 1) 42
Diagram 3.18: Uganda – Natural Robusta Value Chain (Strict Enforcement, Option 1) 43
Diagram 3.19: Uganda – Costs and Margins (Strict Enforcement, Option 1) 43

Diagram 4.1: Scenario A – Grower's % of Export Price 48
Diagram 4.2: Scenario A, Option 2 – Changes in Exporter's Costs – Uganda and Indonesia 48
Diagram 4.3: Scenario B – Grower's % of Export Price 49
Diagram 4.4: Scenario A – Changes in Natural Robusta Grower's Margins 50
Diagram 4.5: Scenario B – Changes in Natural Robusta Grower's Margins 50

APPENDICES

Diagram A2.1: Indonesia Input-Output Relations 89
Diagram A2.2: Indonesian Robusta Exports by Grade 91
Diagram A2.3: Uganda Coffee Marketing Chain 93
Diagram A2.4: Ugandan Robusta Exports by Grade 95
Diagram A2.5: Ugandan Arabica Exports by Grade 95

Diagram A2.6: Kenya Input-Output Relations 97
Diagram A2.7: Kenyan Auction Sales by Grade 99
Diagram A2.8: Kenyan Auction Sales by Class 99
Diagram A2.9: Marketing Chain, Direct Marketing 101
Diagram A2.10: Indian Green Coffee Exports by Type 102

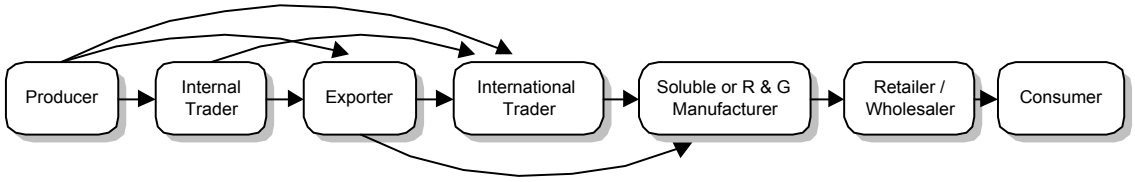
Executive Summary

The ICO/CFC project: "The Enhancement of Coffee Quality through the Prevention of Mould Formation" is due to recommend good hygiene practices (GHPs) that will help to minimise Ochratoxin A (OTA) contamination levels in coffee. The project also hopes to impact positively on producer's earnings and improve the amount of good quality coffee available to the market. This report provides an economic assessment of the costs and benefits of improving quality which would also have the effect of improving hygiene.

Part 1 of this report seeks to determine the costs and benefits of improving coffee hygiene, and compare them to determine whether the adoption of the project recommendations is likely to make economic sense. Part 2 compares approaches to traceability in different agricultural and natural resource-based commodities, with particular emphasis on applications in the coffee sector.

DEFINING COFFEE QUALITY

- Coffee typically passes through a number of stages as it moves from the producer to the consumer. During these stages the product can be shipped from one country to another and transformed from one form into another.



- Coffee quality is usually evaluated in terms of physical quality and sensory quality. It is also influenced by moisture level.
- It is in the producing countries that coffee quality is principally determined, although the stage of the supply chain quality is influenced may vary according to the type of coffee as well as the specific producing country concerned.
- In the consuming countries, coffee quality can be influenced during the transport, storage, sorting, steaming, and roasting stages.
- Prior to export, coffees are classified in different grades or classes that aim to describe homogenous commercial lots. Grade indicators are used to classify coffees where bean size, number of defects, altitude of growing, etc. are taken into account, depending on the producing country (Table EXEC.1).

Table EXEC.1: Classification of Green Coffee for Export in Coffee Producing Countries

Countries	Classification	Examples	Basis
Kenya, Tanzania, Peru, PNG	Grade	AA, A, AB etc.	Bean Size
Côte d'Ivoire, Cameroon, Cuba, Vietnam	Grade	I, II, III, IV etc.	No. of Defects
Brazil	Type	1, 2, 3, 4 etc.	No. of Defects
Guatemala, Honduras, El Salvador	Class	SHG, HG	Altitude

Source: FAO, LMC.

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- International traders usually hedge their physical green coffee purchases on the two main futures markets: the NYBOT "C" contract for mild arabica and the LIFFE contract for robusta. This means that the grading standards applied to coffee submitted for tender to these two markets also form the basis of their physical contracts.

- For most roasters, a major concern is to supply coffee to retailers that is consistent in appearance and taste throughout the year. While the preference is for the supply of a consistent quality of raw material over time, modern roasting technology enables roasters to adjust their blends to allow for variations in cup quality from a particular origin without affecting the taste of the final product.

- Quality definitions depend on the particular requirements of the consuming market. For instance, in emerging markets the requirement is mainly for cheaper products in which consumers are prepared to accept the taste of coffee containing higher levels of defects. In many Western European markets, roasters are under increasing pressure from large retailers to lower their prices, driving them to use lower yielding raw material containing higher levels of defects.

- International traders consider that cup quality is the main determinant influencing quality, with most defects less important for mainstream market coffees and particularly soluble. The main quality problem is full fermented/stinker beans, which cannot be separated by colour sorters. Overall, between 5% and 10% of coffee produced is considered as being 'poor quality' by traders.

OCHRATOXIN A IN COFFEE

- Within Europe, the EU recently set maximum levels for OTA in roasted and soluble coffee of 5.0 ppb and 10 ppb, respectively, through EC Regulation 123/2005. Member states that already had maximum levels in place are expected to align with the new EU limits (Table EXEC.2). A decision on whether to establish limits for green bean is expected in June 2006. The need for an International Code of Practice for the reduction/ prevention of OTA in cocoa and coffee is being discussed within the Codex Committee on Food Additives and contaminants.

Table EXEC.2: Current Regulatory Limits for Ochratoxin A (OTA) in Coffee in Europe
(ppb)

	Green	Roasted	Soluble
EU	-	5	10
Finland	5	5	5
Germany	-	3	6
Greece	20	-	-
Italy	8	4	4
Netherland	-	10	10
Portugal	8	4	4
Spain	8	4	4
Czech Rep.	10	10	10
Hungary	15	10	10
Switzerland	5	5	5

Source: FAO.

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- OTA contamination in coffee is linked to mould growth at various stages of coffee production, handling and processing. During post-harvest stages, mould contamination is best avoided by ensuring adequate control of the moisture content of the coffee since moulds cannot grow at sufficiently low moisture levels. Data from the FAO/CFC/ICO project "The Enhancement of Coffee Quality through the Prevention of Mould Formation" also suggest that OTA accumulation can also occur pre-harvest, although this phenomenon is not sufficiently well understood to enable the development of clear recommendations on preventing such contamination. The project: is due to recommend good hygiene practices (GHPs) that will help to minimise contamination levels although the project also hopes to impact positively on producer's earnings and improve the amount of good quality coffee available to the market.

- There are also some indications that there may be a link between certain types of visible defects and the risk of OTA contamination. However, the analysis to date is inconclusive and more work is required.

- This points to a direct link between coffee quality and hygiene. By improving certain aspects of coffee quality, hygiene is automatically improved.

POTENTIAL IMPACT OF CHANGES IN FOOD SAFETY LEGISLATION ON THE COFFEE INDUSTRY

At present schemes designed to improve coffee quality are voluntary, we analyse these schemes and attempt to determine the costs and benefits of improving coffee quality. The general assumption being that a general improving of coffee quality would also benefit in improved coffee hygiene. To improve coffee quality there are three alternatives:

- Any recommendations from the project remain voluntary and the market determines whether premiums should be paid for this higher quality coffee;

- A limited enforcement scenario is one where improved hygiene standards are enforced in a limited number of countries. In the producing countries there are two possible outcomes under this scenario:

    — Option 1: where one producing country removes 'poor quality' coffee from the supply chain prior to export and destroys it, and

    — Option 2: where farmer behaviour changes to reduce the volumes of poor quality coffee produced.

  In the consuming countries, this would be the case that applies at present where occasional consignments are checked in countries that have OTA limits.

- Strict enforcement is where standards are universally adopted in both producing and consuming countries. In the importing country, with a view to improving hygiene this could mean a requirement for assurances from competent authorities that good hygiene practices are observed along the chain as well as checks on OTA levels, defect levels and moisture content on coffee entering a country. In producing countries, such a scenario could mean measures to enforce national codes of practice at all stages of the chain as well as checks on moisture, defects and OTA at various stages of the marketing chain, and most importantly at export level. Checks at importer level would be expected to have a knock on effect throughout the marketing chain.

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Table EXEC 1 highlights the findings.

Table EXEC 1: Costs and Benefits of Improving Quality – Case Studies

		Scenario A		Scenario B	
	Voluntary	Option 1	Option 2	Option 1	Option 2
Export Price Premium	0%	-10% to -2%	0% to 4%	8 c/kg	2.5 c/kg
Change in Grower Costs	6 to 8 c/kg	0%	14% to 36%	0%	15% to 20%
Change in Margin	1 to 7 c/kg	-10% to -28%	-26% to -1%	40% to 60%	15% to 20%

In today's mainstream market, no premiums are payable at the export level for improving quality at the grower level. Premiums do exist in some schemes where a roaster is purchasing coffee for their own operations; this is the case with Nestlé's direct purchases in Indonesia and Cote d'Ivoire. However, volumes are small.

In existing schemes where growers are receiving higher prices, this is because most schemes involve direct buying and hence the marketing chain is shorter and exporter's costs in drying and sorting are reduced.

Improving quality in producing countries has little if any effect on costs in consuming countries. The majority of sorting and grading occurs in producing countries. There is very little reconditioning in consuming countries. Where this does occur, it is the exception rather than the rule. This is because conditioning at origin is cheaper and all multinational exporters have invested in sorting and cleaning equipment at origin. Warehousing companies still offer these services in the major consuming countries, but costs of reprocessing and rebagging are high in the order of 20 c/kg. In addition, coffee that is reconditioned in Europe is not tenderable at the futures exchange.

Once regulation is introduced there is a marked difference between the limited and strictly enforced scenarios. Under a limited enforcement scenario (Scenario A) grower returns are lower. This is because in Option 1, where substandard coffee is destroyed, the lower export volume means a lower average price. The impact on margins is greater in completely free markets where a larger volume of coffee has to be destroyed. In Option 2, where coffee is upgraded, margins are lower because the cost of upgrading by the farmer is higher than the resulting increase in price.

Under a strictly enforced scenario (Scenario B) the returns are greater largely because the volume of coffee being marketed is reduced. This reduces supply and increases price. It is not the improvement in quality that is increasing price but the reduction in volumes (the greater the volume reduction the higher the price); therefore, grower returns are higher under Option 1 rather than Option 2. The strictly enforced scenario would have significant monitoring costs and these have not been incorporated into the analysis.

The analysis suggests that in a limited enforcement scenario, the benefit to farmers of upgrading coffee depends upon how much costs can be reduced along the supply chain, how much of this cost reduction is passed on to growers, and whether this increase in income makes it financially beneficial to upgrade coffee. Export premiums are unlikely. The exceptions to this are the niche markets such as Utz Kapeh, Fairtrade, etc.

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In order to realise premiums from reducing costs along the supply chain, smallholder growers may need to organise themselves into groups that can agree on higher standards and link with traders or exporters to market their produce in bulk, although this requires coordination. One advantage of this is that the supply chain can often be shortened, which also increases the scope for higher farmgate prices.

Growers would also need to sell their coffee in a form where quality could be assessed to receive price premiums. In the case of natural robusta, this means selling green bean as opposed to dry cherry, which would require additional investment by growers, while local traders may suffer a reduction in their margins.

While Scenario 2 leads to higher prices, most industry participants remain sceptical about the political desirability of such programmes (among both producers and consumers) and the ability of the authorities in producing countries to enforce such legislation.

TRACEABILITY

- There are three main approaches to traceability systems for commodity crops:
  - Conventional chain of custody based on segregation throughout the production process.
  - Development of a commodity 'grade' thus allowing it to be traded as a commodity while still keeping it separate from conventional product.
  - Development of a 'book and claim' approach in which a user specifies a given characteristic to a supplier who then ensures that an equivalent quantity of product is purchased from a plantation complying with the specification.
- The mainstream (bulk) coffee markets currently provide little possibility for introducing supply chain initiatives for improving social, environmental and economic aspects of production. However, with increasing demand for knowledge about the origin and production methods used for commodities, and constantly improving technology, there is a strong possibility that such information could be incorporated in future.
- The Common Code for the Coffee Community initiative is aimed at improving sustainability of production and trade within the mainstream coffee market. It is explicitly focused on the smallest unit to which production could be traced in a cost effective manner, which is one container. However, it may take several years before a particular supply chain can trace coffee back to a 4C unit.
- Full traceability of coffee production has tended to be associated with niche markets, where knowledge of origin and the production and process methods (PPMs) are important characteristics of the coffee. These coffees tend to be more directly traded, with greater knowledge at each stage of the preceding provenance.
- The costs of implementing increased traceability for commodity products are related to the length and complexity of the supply chain. In addition, the costs are incurred at different parts of a supply chain. Studies on the implementation of traceability for non-GM identity preserved soy meal estimate a higher FOB cost of

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US$9.00 – US$10.00; this would include the costs of traceability as well as any market premium.

- The costs of traceability fall mainly to the traders and processors, not the growers themselves. However, in order to preserve margins these costs are pushed either up or down the marketing chain. Where they actually fall will depend on each individual market. For instance, under a voluntary system where consumers buy into the concept of traceability, consumers appear willing to pay and the costs fall on the consumer. This cost is reflected in the premiums that are paid for these products. Under a mandatory system, it is possible that the costs would fall on the grower as there would be no market access without compliance. The development of traceability systems may also improve efficiency and eventually reduce costs; and the technology for traceability systems (like the electronic trading systems, and electronic chips for coffee bags) is getting cheaper all the time.

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Part 1: Introduction

The ICO/CFC project: “The Enhancement of Coffee Quality through the Prevention of Mould Formation” is due to recommend good hygiene practices (GHPs) that will help to minimise Ochratoxin A (OTA) contamination levels in coffee. The project also hopes to impact positively on producer’s earnings and improve the amount of good quality coffee available to the market.

Part 1 of this report seeks to determine the costs and benefits of improving coffee hygiene in order to determine whether the adoption of the project recommendations is likely to make economic sense. The first chapter presents an overview of the coffee supply chain and considers various definitions of coffee quality. Chapter 2 briefly considers aspects of coffee quality and hygiene including relevant food safety legislation. Chapter 3 examines the effect of introducing food safety legislation, under limited and strictly enforced scenarios, into coffee producing countries. This analysis is based on case study data that were collected as part of the project. Chapter 4 pulls the report together and examines the implications of the introduction of food safety legislation on the coffee industry. It also considers the main non-quantifiable aspects of coffee hygiene, before providing a number of conclusions.

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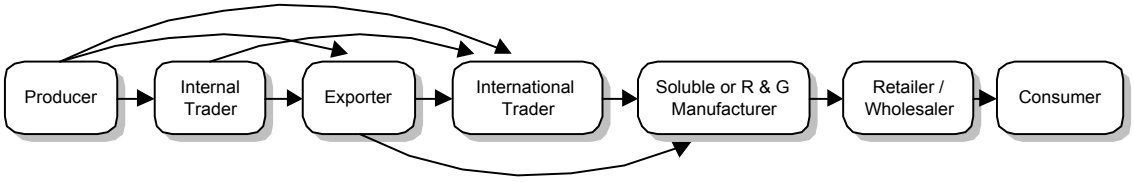
Chapter 1: Defining Coffee Quality

This chapter presents an overview of the coffee supply chain and describes how coffee quality evolves moving along this chain. This is followed by a review of export grading and the classification of green coffee by the producing countries as well as the main coffee futures markets. Finally, buyer's definitions of coffee quality are discussed.

THE COFFEE SUPPLY CHAIN

Coffee typically passes through a number of stages as it moves from the producer to the consumer. During these stages the product can be shipped from one country to another and transformed from one form into another.

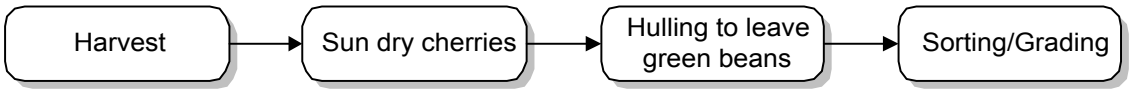


Producer

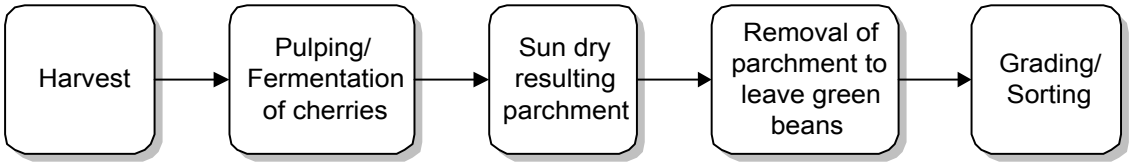
Coffee is predominantly grown by 25 to 30 million smallholder producers in about 80 countries in the tropics. Each smallholder typically farms between 0.1 and 5.0 hectares of coffee, with most depending directly on the crop as their primary source of cash income.

Producers harvest coffee in cherry form from either arabica or robusta plants. After picking, the cherries may undergo a number of primary processing stages before being sold on to internal traders.

For natural arabica and virtually all robusta production, the cherries are sun-dried and then hulled to remove the dried cherry and leave the green bean.



For washed arabica and a small amount of robusta, the cherries are pulped to remove the flesh, washed in water and then dried (either by the sun or artificially). The resulting dried parchment is then hulled to remove a parchment and leave the green bean.



A more detailed picture of the processing stages up to the point of export is produced in Diagram 1.1, which is taken from the ITC: Coffee Exporters Guide.

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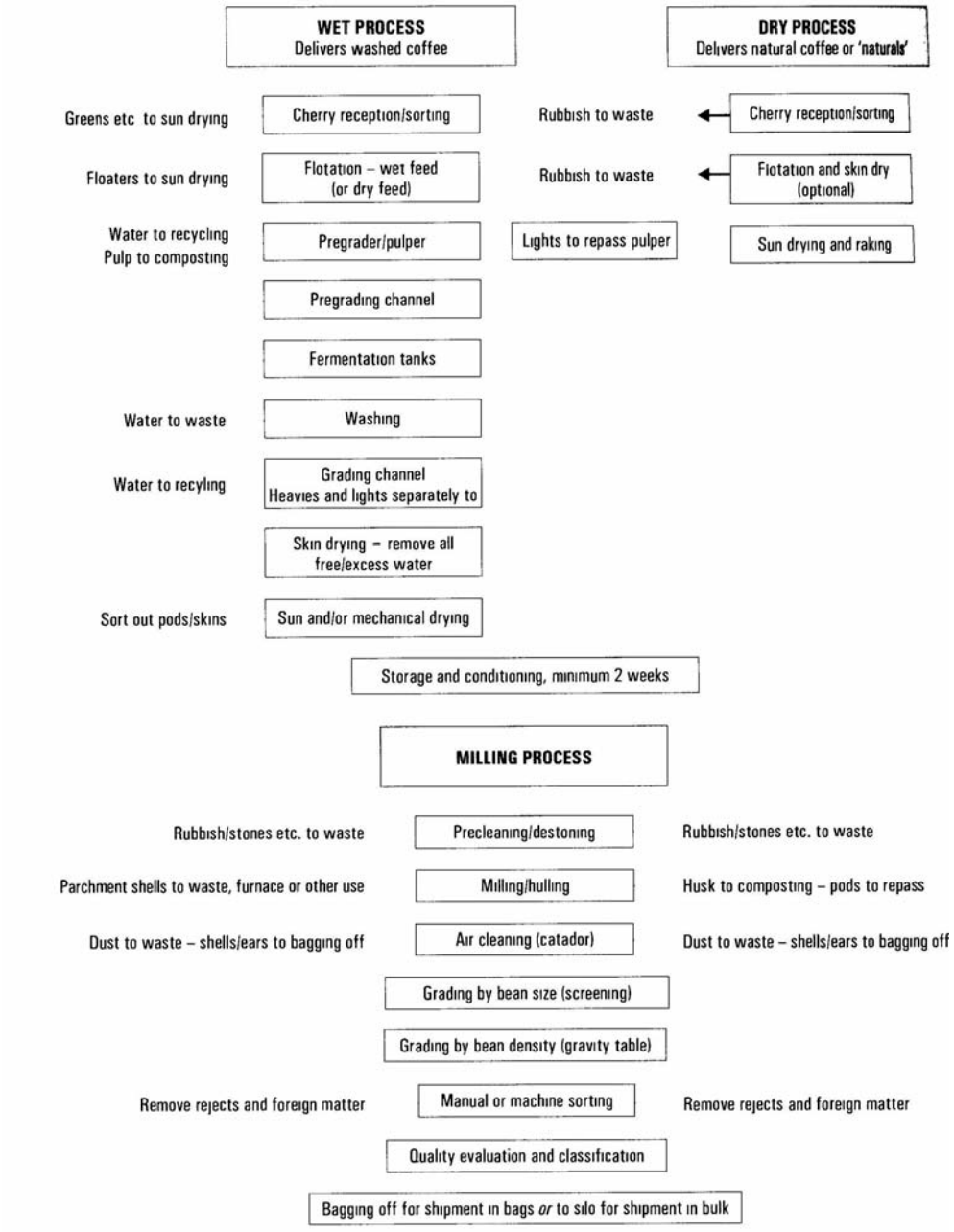
Diagram 1.1: Processing of Coffee Cherries and Green Coffee Beans



Source: ITC Exporters' Guide.

Internal Trader

Internal traders purchase coffee from producers in either cherry, sun-dried or green bean form, usually at the farmgate or a local buying depot. Inadequately dried coffee is often re-dried prior to milling and preparation for export. Internal traders may be required to store significant quantities of coffee and transport it over long distances prior to sale to exporters.

Apart from private traders, co-operatives are a common means of buying and processing coffee from growers.

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Exporter

Exporters are often closely associated with internal traders, providing them with pre-financing to enable the specific coffees required by their overseas clients to be sourced. They may have to carry out some of the secondary processing stages for the coffee they receive (where they have not been performed by the internal traders) including hulling, sorting and grading; in some cases, they may even have to re-dry coffee to meet minimum export requirements. Following this, they are usually required to blend coffee into marketable quantities of homogenous quality, often to specifications previously agreed with their overseas clients.

The remaining exporter functions typically involve organising shipping to overseas markets, storage and handling of coffee prior to export, and maintaining close contact with buyers as the coffee moves along the marketing chain.

International Trader

International traders source green bean coffees from the various producing countries for roasters mainly located in the consuming countries; they are typically responsible for logistics, financing, risk management and ensuring just-in-time deliveries. In order to be assured of securing the specific coffees roasters require at any particular point in time, the international traders are closely associated with exporters in producing countries, often supplying the pre-finance that is channelled up the marketing chain to the internal traders. In some cases, the exporters are subsidiary companies of international traders.

As the roaster segment of the coffee marketing chain has become more concentrated (see below) so has the coffee trade, with three European-based companies dominating the trade.

Roaster/Soluble Manufacturer

Roasters/soluble manufacturers blend and roast the green beans delivered to their plants by the international traders. In recent years, improvements in roasting technologies that make it possible to alter the components of a blend without changing its taste, while technical innovations such as the steam washing of robusta have allowed roasters to minimise their raw material costs by substituting cheaper beans in their blends. Around 10% of robusta exports are treated in this way..

The roaster segment is concentrated, particularly for soluble coffee. This is partly due to the importance of branded product sales and, in the case of soluble, the high capital cost associated with entry into the market.

Retailer/Wholesaler

The majority of retail coffee sales are in supermarkets and hypermarkets across the world and in some markets (particularly mainland Europe) coffee is used as a loss leader. The mainstream market, which accounts for over 90% of the coffee consumed in the importing countries, comprises three market segments:

- **Premium Brands/Blends**. Among the major roasters, a number produce premium blends for the top end of the market; in some markets, these products compete with specialty coffee. These products can be single origin products, or products of a few named origins. With oversupply in the market and roasters able

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to pick and choose between products, single origin products are contracting as roasters choose to market premium blends according to brand rather than origin name.

- **Major Brands/Blends**. This is the largest category of sales and refers to the roasters' standard blends. This are almost exclusively marketed according to brand name rather than the individual components of the blend. The brand is typically linked to consumer perceptions and the degree of roasting and accounts for the bulk of consumption in coffee importing countries.

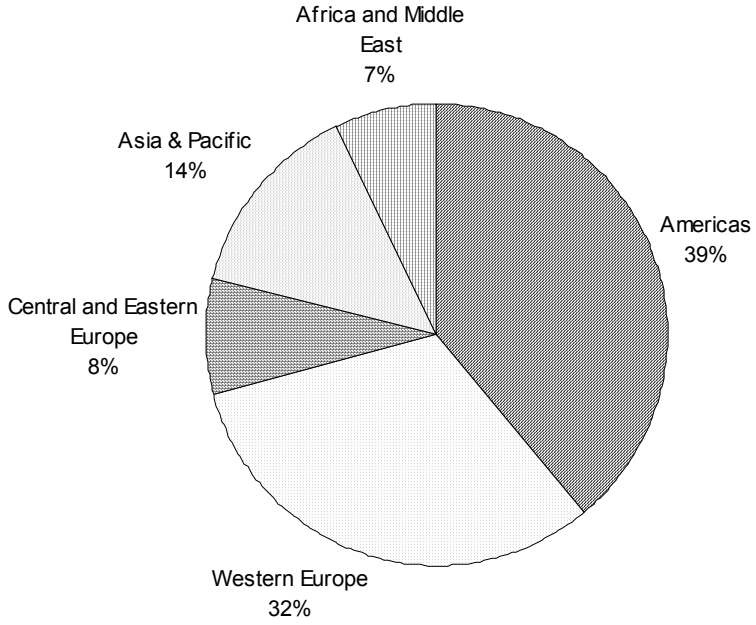
- **Own Label Products**. These are products marketed by individual supermarket chains or outlets. Prices tend to be at the bottom end of the market. These products primarily compete on price with the major blends.

Consolidation in the retail sector is a factor driving the concentration seen taking place in earlier segments of the coffee marketing chain, notably roasting and trading.

Consumer

The developed markets dominate global coffee consumption (Diagram 1.1) although consumption growth has been greater in the emerging markets and in the producing countries in recent years.

Diagram 1.1: Global Coffee Consumption, 2003



The components of brands and blends vary considerably according to market. Within the coffee importing countries, the use of robusta in blends is greatest in the emerging markets, which are also the most price sensitive markets, and in the Southern European markets; in particular, robusta is popular in Italian espresso production.

However, in the traditional markets, developments in roasting technology mean that roasters are increasingly able to change the components of blends, for price considerations, whilst maintaining the same taste. The ability to define standard tastes and the advent of the steaming of robusta has reduced its harsh taste and allowed

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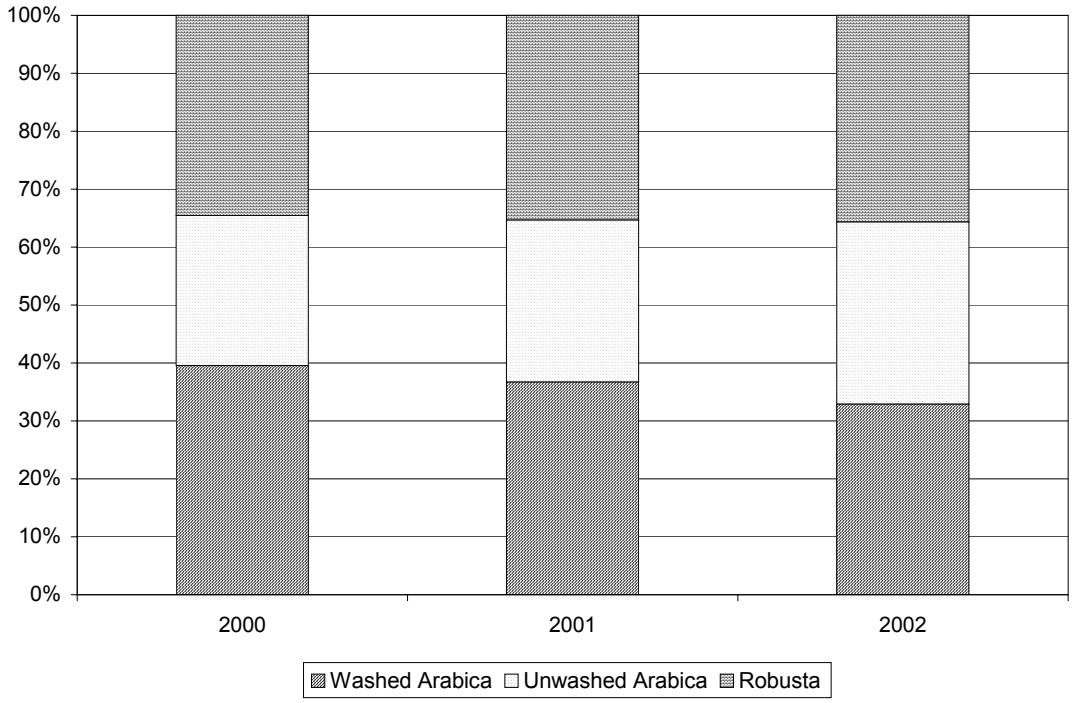
roasters to increase the robusta proportion of a blend whilst maintaining the blend's taste characteristics. In the soluble sector, the use of flavour recovery techniques has enhanced the taste characteristics of blends.

Initially, with the growth of robusta coffee production and the rise in the arabica premium from 1997, roasters increased the robusta proportion of blends. This flexibility has continued to increase. With the harvest of a massive Brazilian 2002/03 crop, the proportion of robusta was maintained, while unwashed coffee consumption rose dramatically. In both cases, the losers have been washed arabica producers, who have seen their share of blends decline. In the EU for instance, the washed arabica proportion of imports net of stock changes declined from 40% in 2000 to 33% in 2002 (Diagram 1.2).

Diagram 1.2: EU Coffee Imports by Type



This increased flexibility means that it is harder to define countries accounting to the type of coffee consumed, however, the broad categories are presented below in Table 1.1. Generally, the degree of roasting (length of time) is greater in countries consuming robusta-based products; darker roasts are also preferred in espresso-based products.

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Table 1.1: Main Consumption Types in Importing Countries by Region/Country

R&G		Soluble
Arabica based	Robusta based	
Germany	Italy	UK
Benelux	France	Greece
Austria	Czech Republic	Russia
Switzerland	Spain	Ireland
Nordic	Portugal	South Africa
Canada	Poland	South Korea
US	Hungary	China
Japan	Romania	Australia
	North Africa	New Zealand

Source: LMC.

COFFEE QUALITY ALONG THE SUPPLY CHAIN

Coffee quality is usually evaluated in two ways:

- Physical quality – this refers mainly to the visual aspects, such as density, as well as damage from pests and processing, which can often be improved by grading and sorting. Physical quality is usually assessed using measurable criteria known as defects.
- Sensory quality – this refers to the cup or liquor quality, which is evaluated through tests done by specialised tasters or liquorers. The tests, by definition subjective, detect off-tastes and provide the classification of coffee according to aromas/flavours and liquor.

Quality is also influenced by moisture level. When harvested, cherries contain 65-70% moisture (wb), whereas clean or green coffee for export should be below 12.5% moisture (wb) (as defined by the International Coffee Council Resolution 420). Under drying may cause mould that may lead to loss of cup quality and OTA contamination.

Coffee Quality in Producing Countries

It is in the producing countries that coffee quality is principally determined, although the stage of the supply chain (Producer, Internal Trader, Exporter) at which there is greatest risk of quality deterioration may vary according to the type of coffee as well as the specific producing country concerned.

Unwashed (Natural) Coffee

In the case of most robustas, as well as unwashed (natural) arabica, a number of quality problems can arise at the harvest stage. These problems are largely attributed to the practice of 'strip-picking' of cherries by producers. In addition to producers, internal traders and/or exporters carry out post-harvest activities such as drying, storage and milling (hulling). Internal traders and/or exporters may carry out sorting and grading; these stages result in the removal of most physical defects prior to export (Table 1.2).

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Table 1.2: Unwashed (Natural) Coffee – Influences on Quality in Producing Countries

	Producer			Internal Trader			Exporter		
Stage	Activity	Impact on Quality	Resulting Defects/ Problems	Activity	Impact on Quality	Resulting Defects/ Problems	Activity	Impact on Quality	Resulting Defects/ Problems
Harvest	Picking	Sensory, Physical	Quaker (Unripe), Foxy (Overripe), Black, Sticks, Stones						
Post-Harvest	Drying	Sensory, Physical, Moisture	Sour, Fermented, Medicinal, Mouldy, Bleached, Grassy, Green, Foxy	Drying	Sensory, Physical, Moisture	Sour, Fermented, Medicinal, Mouldy, Bleached, Grassy, Green, Foxy	Drying	Sensory, Physical, Moisture	Sour, Fermented, Medicinal, Mouldy, Bleached, Grassy, Green, Foxy
	Storage	Sensory, Physical, Moisture	Musty, Mouldy, Faded, Insect Damaged	Storage	Sensory, Physical, Moisture	Musty, Mouldy, Faded, Insect Damaged	Storage	Sensory, Physical, Moisture	Musty, Mouldy, Faded, Insect Damaged
	Hulling	Sensory, Physical	Earthy, Dirty, Husk, Crushed, Broken, Parchment	Hulling	Sensory, Physical	Earthy, Dirty, Husk, Crushed, Broken, Parchment	Hulling	Sensory, Physical	Earthy, Dirty, Husk, Crushed, Broken, Parchment
				Sorting	Physical		Sorting	Physical	
				Grading	Physical		Grading	Physical	

Source: ITC Exporter's Guide

Washed Coffee In the case of higher-value washed coffees, the practice of 'strip-picking' of cherries by producers is less common, although the additional pulping and fermentation stages of post-harvest processing can result in other quality problems. Milling (removal of parchment), sorting and grading are usually carried out by large traders and/or exporters; the two latter activities result in the removal of most physical defects prior to export (Table 1.3).

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Table 1.3: Washed Coffee – Influences on Quality in Producing Countries

	← Producer →			← Internal Trader →			← Exporter →		
Stage	Activity	Impact on Quality	Resulting Defects/ Problems	Activity	Impact on Quality	Resulting Defects/ Problems	Activity	Impact on Quality	Resulting Defects/ Problems
Harvest	Picking	Sensory, Physical	Quaker (Unripe), Foxy (Overripe), Black, Sticks, Stones						
Post-Harvest	Pulping	Sensory, Physical	Floater, Broken/Nipped/Cut						
	Fermentation	Sensory	Over Fermented, Foul, Sour, Onion, Stink, Foxy						
	Drying	Sensory, Physical, Moisture	Mouldy, Fungus Damaged, Earthy, Bleached, Blotchy, Green, Dull, Mottled, Grassy, Foxy	Drying	Sensory, Physical, Moisture	Mouldy, Fungus Damaged, Earthy, Bleached, Blotchy, Green, Dull, Mottled, Grassy, Foxy			
	Storage	Sensory, Physical, Moisture	Musty, Mouldy, Insect Damaged, Unclean	Storage	Sensory, Physical, Moisture	Musty, Mouldy, Insect Damaged, Unclean			
				Transport	Sensory, Moisture	Mouldy	Transport	Sensory, Moisture	Mouldy
							Storage	Sensory, Moisture	Musty, Mouldy, Insect Damaged, Unclean
							Hulling	Sensory	Earthy, Dirty, Hull/Husk, Crushed, Broken, Parchment
							Grading	Physical	
							Sorting	Physical	

Source: ITC Exporter's Guide

Coffee Quality in Consuming Countries

Coffee quality can be influenced in the consuming countries during the following stages:

- Transport and storage – this can result in the same quality problems as seen in the producing countries e.g. musty, mouldy, insect-damaged etc.
- Sorting – the warehouse keeper (usually on behalf of the international trader) may carry out additional sorting to remove defects from the imported green coffee

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prior to despatch to the roaster's plant. This often occurs at the same time as the blending of coffees from different origins.

- Steaming – in the case of robusta, steaming can be used to remove harsh tastes prior to roasting.
- Roasting – the roasting process strongly influences the taste of the final product, and roasting can mask both physical and sensory quality problems, depending on the roasting technology being employed.

EXPORT GRADING AND CLASSIFICATION OF GREEN COFFEE

Export Grading in Producing Countries

After milling and prior to export, coffees are classified in different grades or classes that aim to describe homogenous commercial lots.

Strictly speaking, grade indicators are used to describe bean size, and are commonly expressed in 1/64th of an inch. The rule is to use even numbers for the arabicas (20, 18, 16, etc) and odd numbers for the robustas (17, 15, 13, etc). For example: beans of grade 18 means that beans pass through screen 18 (holes with a diameter of 18/64") and are retained by screen 16.

However, commercially, grade indicators are used to classify coffees where bean size, number of defects, altitude of growing, etc. are taken into account, depending on the producing country (Table 1.4).

Table 1.4: Classification of Green Coffee for Export in Coffee Producing Countries

Countries	Classification	Examples	Basis
Kenya, Tanzania, Peru, PNG	Grade	AA, A, AB etc.	Bean Size
Côte d'Ivoire, Cameroon, Cuba, Vietnam	Grade	I, II, III, IV etc.	No. of Defects
Brazil	Type	1, 2, 3, 4 etc.	No. of Defects
Guatemala, Honduras, El Salvador	Class	SHG, HG	Altitude

Source: FAO, LMC.

The specific standards applying in the five project countries studied in Chapter 3 (Indonesia, Uganda, Kenya, India and Côte d'Ivoire) are presented in Appendix II.

Futures Markets Grading Standards

International traders usually hedge their physical green coffee purchases on the two main futures markets: the NYBOT "C" contract for mild arabica and the LIFFE contract for robusta. This means that the grading standards applied to coffee submitted for tender to these two markets also form the basis of their physical contracts.

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NYBOT

Minimum Standards

The minimum standards for delivery under the Coffee "C" futures contract are as follows:

- The coffee is sound in the cup;
- The coffee is of good roasting quality;
- The coffee is of such bean size that (i) fifty percent (50%) of the coffee sampled screens fifteen (15) or larger, and (ii) no more than five percent (5%) of the coffee sampled screens below fourteen (14);
- The coffee is greenish and free of foreign odours; and
- The coffee contains no more than fifteen (15) full imperfections below the basis, except that in the case of Colombian coffee the maximum number of full imperfections below the basis shall be ten (10).

Schedule of Imperfections

(1) The following constitute one (1) full imperfection:
- — one (1) full black;
- — one (1) full sour;
- — one (1) pod or cherry;
- — five (5) shells;
- — five (5) broken or cut beans;
- — two (2) to five (5) partly black or partly sour beans, depending upon the extent
- — to which each bean is discolored or spoiled;
- — five (5) floaters;
- — three (3) sticks smaller than one-half (½) inch;
- — one (1) stick ranging in size from one-half (½) inch to one (1) inch;
- — three (3) stones passing through a screen size below twelve (12);
- — one (1) stone passing through a screen size no smaller than twelve (12);
- — two (2) to three (3) hulls or husks, depending upon size; and
- — two (2) to three (3) parchments, depending upon size.

(2) The following constitute two (2) full imperfections:
- — one (1) stick ranging in size from one (1) inch to two (2) inches; and
- — one (1) stone passing through a screen size no smaller than sixteen (16).

(3) The following constitute three (3) full imperfections:
- — one (1) stick larger than two (2) inches; and
- — one (1) stone passing through a screen size over twenty (20).

(4) Any additional non-coffee item shall be one (1) full imperfection.

Schedule of Bases.

For purposes of these procedures, the bases of various growths of coffee are as follows:

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(1) Coffee of Guatemala, Salvador, Mexico, Costa Rica, Nicaragua, Honduras, Kenya, Tanzania, Uganda, Papua New Guinea, Peru, Venezuela, Dominican Republic, Burundi, Ecuador, India, Rwanda and Panama—eight (8) full imperfections; and,

(2) Coffee of Colombia—thirteen (13) full imperfections.

LIFFE

Grades Tenderable

Coffee of CTML standard grade shall be tenderable at basis or at the discount shown below:

- Type 1: up to 150 defects per 500 g at basis;
- Type 2: from 151 to 250 defects per 500 g at a discount of US$15 per tonne;
- Type 3: from 251 to 350 defects per 500 g at a discount of US$30 per tonne;
- Type 4: from 351 to 450 defects per 500 g at a discount of US$45 per tonne.

Defects (from 1 February 2000)

Defect	Number of Defects
1 black bean, or pod, or cherry	1
2 half blacks, sour beans, parchment or large husks	1
1 large stone (1 cm diameter)	5
1 medium stone (about 5 mm diameter)	2
2 small stones or pieces of earth	1
1 large stick (3 cm length)	5
1 medium stick (2 cm length)	2
2 small sticks (1 cm length)	1
5 broken beans, shells withered, green or unripe beans, bleached beans, small pieces husk	1
1 partially mouldy bean (i.e. less than 50% mould)	½
1 fully mouldy bean (i.e. 50% mould or more)	1
Insect damaged beans:	
2 beans half eaten away	1
5 beans slightly eaten away	1
Extraneous matter, per item 1 or more at graders' discretion	

Coffees containing more than 25% passing through screen 14 round and less than 10 per cent passing through screen 12 round shall be tenderable at a discount of US$60 per tonne.

Untenderable Coffee

Coffee is not tenderable if it:

- Has more than 450 defects per 500 g;
- Is unsound, i.e. for any reason other than those already listed, as determined by the graders;
- Contains more than 10 per cent passing through screen 12 round; or

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— Has more than 5 fully mouldy or 10 partially mouldy beans or any combination thereof such that the total exceeds the equivalent of 5 fully mouldy beans per 500 g.

BUYERS DEFINITIONS OF COFFEE QUALITY

Interviews with the major coffee roasters and international coffee traders in Switzerland and Germany revealed a number of additional factors influencing coffee quality:

Roasters

- For most roasters, a major concern is to supply coffee to retailers that is consistent in appearance and taste throughout the year. In order to achieve this they blend together several different origins of coffee; coffees making up the blend need to be relatively easily substitutable often from a number of countries. Deliveries from traders to roasters can be from a basket of acceptable coffees, often from different countries. The baskets represent coffees that are acceptable for the same purpose in blends.

- Quality requirements are nonetheless specific. A roaster may specify the quality, number of defects and type of defect. This may require the trader to blend the green coffee to achieve this profile. For instance, in the case of Vietnamese robusta, a typical description for an export lot would be: Vietnam Grade II - 5%: (max. 5% blacks and brokens, max. 1% admixture and pods, max. 1% excelsa beans, max. 13% moisture, 95% above 5mm).

- The critical quality problems usually resulting in the rejection of a shipment of coffee at the roasting plant are those which affect cup quality, in particular:

  — Full ferment/stinker beans (for washed arabica);

  — Unclean (mouldy/earthy) beans (for dry robusta);

  — Rio/rain-damaged beans (for natural arabica).

  There is no way to treat full ferment/stinker beans, although washing and steaming at specialist European port facilities can be used to treat the latter two defects; however, this is expensive (5-15 US cents/lb). The steam cleaning process is also used to remove the harsh taste of robusta and allow more to be used in a blend. This process removes the methyl isoborneol component of the robusta bean. Around 10% of robusta exports are steam treated.

- Roasters have sophisticated sampling facilities at their plants enabling them to compare the coffee received against the detailed specifications agreed in the export contract. They also have cleaning facilities to remove foreign matter such as sticks, stones etc.

- While the preference is for the supply of a consistent quality of raw material over time, modern roasting technology enables roasters to adjust their blends to allow for variations in cup quality from a particular origin without affecting the taste of the final product. Technology also allows for variations in physical quality during roasting, for instance broken beans (except where the final product is whole roasted beans).

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- Quality definitions depend on the particular requirements of the consuming market. For instance, in emerging markets such as those in Central and Eastern Europe, the requirement is mainly for cheaper soluble and roast and ground (R&G) products in which consumers are prepared to accept the taste of coffee containing higher levels of defects. As such many roasters consider that there is no such thing as 'poor quality' coffee!

- In many Western European markets, roasters are under increasing pressure from large retailers to lower their prices. In the case of Germany, where discount supermarket chains are rapidly increasing their market share and coffee is often used as a 'loss leader' product, there has been a marked shift in demand towards products manufactured from cheaper coffees[1]. This inevitably leads to roasters having to use lower yielding raw material containing higher levels of defects.

International Coffee Traders

- Traders have to adapt to the same underlying market trends as those affecting roasters, notably the increasing demand for cheaper coffees. This requires them to work closely with exporters to source raw material according to increasingly detailed price and quality specifications.

- The cost of not meeting roaster's specifications once the coffee has been shipped to the consuming countries is extremely high, particularly given the roasters' just-in-time delivery systems and high labour costs, and the preference is therefore to manage quality carefully just prior to export in the producing countries. This requires significant investments in washing, drying, grading and sorting facilities which are capital intensive and for which there are often significant scale economies.

- As in the case of roasters, traders consider that cup quality is the main determinant influencing quality, with most defects less important for mainstream market coffees and particularly soluble. The main quality problem is full fermented/stinker beans, which cannot be separated by colour sorters. Some attributes that would result in rejection of a shipment in one consuming country are actually sought after in other consuming countries, for example earthy and Rio flavours.

- While traders have often invested heavily in secondary processing facilities in producing countries, they consider that these can only address some of the quality problems found in coffee. For instance, cleaning and mechanical sorting reduces the number of physical defects such as the number of sticks and stones mixed in with the coffee; colour sorting can reduce the numbers of black and insect damaged beans in a particular grade (a separate market is then sought for these off grades); while drying reduces the moisture content. The majority of quality problems can best be addressed by improving production, harvest and primary processing practices. Overall, between 5% and 10% of coffee produced is considered as being 'poor quality' by traders.

- In the liberalised domestic markets found in most producing countries, the competition for farmers' supplies among local buyers is intense, while regulation

[1] Roasters estimate that discounters currently hold an 18% share of the European grocery market compared to less than 10% at the beginning of the 1990s, and that their market share is currently growing by 5-10% per year compared to traditional retailers' growth of 1-3% per year.

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is in practice often non-existent. Farmers exhibit a preference for receiving immediate cash payment for coffee that is usually in a form in which its quality cannot be assessed. This restricts a trader's room for manoeuvre in terms of paying the farmer a higher price for higher quality coffee.

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Chapter 2: Ochratoxin A in Coffee

This chapter starts with a brief overview of how coffee quality is affected by hygiene. This is followed by a review of current and forthcoming food safety legislation and its impact on coffee. Finally, the recommendations made by the project: ICO/CFC project: "The Enhancement of Coffee Quality through the Prevention of Mould Formation" are considered.

COFFEE QUALITY AND HYGIENE

General Principals of Food Hygiene

According to *Codex* Alimentarius*,* food hygiene refers to all conditions and measures necessary to ensure the safety and suitability of food at all stages of the food chain. Effective food hygiene is vital to avoid the adverse human health and economic consequences of food borne illness, food borne injury, and food spoilage. Everyone, including farmers and growers, manufacturers and processors, food handlers and consumers, has a responsibility to assure that food is safe and suitable for consumption.

According to the Codex General Principles of Food Hygiene, in order to reduce the likelihood of introducing a hazard that may adversely affect the safety of food, or its suitability for consumption at later stages of the food chain, primary production should be managed in a way that ensures that food is safe and suitable for its intended use. Where necessary, this will include:

- Avoiding the use of areas where the environment poses a threat to the safety of food;
- Controlling contaminants, pests and diseases of animals and plants in such a way as not to pose a threat to food safety; and
- Adopting practices and measures to ensure food is produced under appropriately hygienic conditions.

To enable hazards to be effectively controlled along the supply chain, operators should ensure that their premises, equipment and facilities are located, designed and constructed to ensure that:

- Contamination is minimized;
- Design and layout permit appropriate maintenance, cleaning and disinfections and minimize air-borne contamination;
- Surfaces and materials, in particular those in contact with food, are non-toxic in intended use and, where necessary, suitably durable, and easy to maintain and clean; and
- Where appropriate, suitable facilities are available for temperature, humidity and other controls; and there is effective protection against pest access and harbourage.

To reduce the risk of unsafe food along the supply chain, operators should control food hazards by:

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- Formulating design requirements with respect to raw materials, composition, processing, distribution, and consumer use to be met in the manufacture and handling of specific food items; and

- Designing, implementing, monitoring and reviewing effective control systems.

The Global coffee project has developed guidelines for reducing mould contamination in coffee based on the Codex General Principles of Food Hygiene.

Coffee Quality and Safety

Agricultural production systems are often complex, involving multiple potential interactions between the biological ecosystem and various processing parameters and methodologies. This is particularly true in the case of coffee, which is predominantly produced by a large number of smallholders in many countries, and which involves a number of processing stages as it moves along the supply chain from the producer to the consumer.

Physical and sensory quality problems can arise at a number of stages of coffee production and processing. Quality deterioration is often related to unacceptably high moisture content in the coffee. While moisture is often reduced prior to export, this will not eliminate undesirable changes that may have taken place during previous periods of high moisture handling or storage. In the opinion of international coffee traders, the majority of the quality problems found in coffee at the export level could be addressed by improving production, harvest and primary processing practices. Secondary processing facilities installed further along the supply chain can only clean up coffee, removed foreign matter and sort it into more uniform grade but the inherent quality of the coffee can not be changed.

OTA contamination in coffee is linked to mould growth at various stages of coffee production, handling and processing. During post-harvest stages, mould contamination is best avoided by ensuring adequate control of the moisture content of the coffee since moulds cannot grow at sufficiently low moisture levels. Effective management of moisture content of coffee at all stages of handling and storage will therefore not only reduce safety problems posed by OTA contamination but will also lead to improved quality by reducing taints caused by mould growth. Data from the FAO/CFC/ICO project “The Enhancement of Coffee Quality through the Prevention of Mould Formation” also suggest that OTA accumulation can also occur pre-harvest, although this phenomenon is not sufficiently well understood to enable the development of clear recommendations on preventing such contamination. The project: is due to recommend good hygiene practices (GHPs) that will help to minimise contamination levels although the project also hopes to impact positively on producer’s earnings and improve the amount of good quality coffee available to the market.

This points to a direct link between coffee quality and hygiene. By adhering to good hygiene practices, quality is automatically improved.

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FOOD SAFETY LEGISLATION

Current Legislation

OTA

Within Europe, the EU recently set maximum levels for OTA in roasted and soluble coffee of 5.0 ppb and 10 ppb, respectively, through EC Regulation 123/2005. Member states that already had maximum levels in place are expected to align with the new EU limits (Table 2.1).

Table 2.1: Current Regulatory Limits for Ochratoxin A (OTA) in Coffee in Europe (ppb)

	Green	Roasted	Soluble
EU	-	5	10
Finland	5	5	5
Germany	-	3	6
Greece	20	-	-
Italy	8	4	4
Netherland	-	10	10
Portugal	8	4	4
Spain	8	4	4
Czech Rep.	10	10	10
Hungary	15	10	10
Switzerland	5	5	5

Source: FAO.

Traceability

EC Regulation 178/2002, which lays down the general principles and requirements of food law in the EU, requires that food business operators set up 'one step back-one step forward' traceability systems and procedures for ingredients, foodstuffs and, where appropriate, animals used for food production.

However, the traceability requirement covers production, processing and distribution in the EU, and in the case of extra-EU imports applies from the importer up to the retail level only. According to the guidance notes accompanying EC Regulation 178/2002 exporters in trading partner countries are not legally required to fulfil the traceability requirement imposed within the EU.

Forthcoming Legislation

OTA

The EU is currently considering whether to set a maximum limit for OTA in green coffee no later than June 30 2006. The decision will be based on an up-to-date risk assessment to be performed by European Food Safety Authority (EFSA), and taking into account prevention measures applied to reduce OTA.

The European Coffee Federation (ECF) suggests that, taking a very conservative reduction of OTA during processing of 2/3rd, a green coffee contamination of 15 ppb

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will result in a finished product (be it roasted or soluble) that does not exceed the EU maximum limits[1].

Traceability

Discussions with government officials suggest that no changes are envisaged in terms of the traceability requirements applying to food exporters in EU trading partner countries, as the requirements are primarily market driven.

PROJECT RECOMMENDATIONS

The ICO/CFC project: "The Enhancement of Coffee Quality through the Prevention of Mould Formation" is due to recommend good hygiene practices (GHPs) that will help to minimise OTA contamination levels although the project also hopes to impact positively on producer's earnings and improve the amount of good quality coffee available to the market.

At the time of writing the recommendations have not been finalised, although it is understood that they are likely to be similar to those previously issued by the ECF[2], but will include additional refinements.

[1] OTA Risk Management: Guidelines for Green Coffee Buying, Rev 1-1, March 2005

[2] Code of Practice: Enhancement of Coffee Quality Through Prevention of Mould Formation, 14 June 2002

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Chapter 3: Costs and Benefits of Improving Coffee Hygiene in Producing Countries

A number of recommendations have emerged both from the project and from the ECF on how to improve hygiene practices n the coffee sector. In this and the following chapter, we analyse the costs and benefits of adopting these recommendations. Our assumption is that an improvement of hygiene practices is associated with a general improvement of coffee quality. There are three possible situations:

- The recommendations on good practice remain largely voluntary and the market determines whether premiums should be paid for this higher quality coffee;
- A limited enforcement scenario is one where improved hygiene practices/ standards are enforced in a limited number of countries. In the producing countries there are two possible outcomes under this scenario:
    - Option 1: where one producing country removes 'poor quality' coffee from the supply chain prior to export and destroys it, and
    - Option 2: where farmer behaviour changes to reduce the volumes of poor quality coffee produced.

  In the consuming countries, this would be the case that applies at present where occasional consignments are checked in countries that have OTA limits.
- Strict enforcement is where standards are universally adopted in both producing and consuming countries. In the importing country, with a view to improving hygiene this could mean a requirement for assurances from competent authorities that good hygiene practices are observed along the chain as well as checks on OTA levels, defect levels and moisture content on coffee entering a country. In producing countries such a scenario could mean measures to enforce national codes of practice at all stages of the chain as well as checks on moisture, defects and OTA at various stages of the marketing chain, and most importantly at export level. Checks at importer level would be expected to have a knock on effect throughout the marketing chain.

Data on costs and benefits are based on the results of various surveys conducted as part of the project. Surveys were conducted in five producing countries: Indonesia, Uganda, India, Côte d'Ivoire and Kenya. Where the project surveys provided insufficient data on costs and prices for the purpose of this study, it has been necessary to supplement the survey data with data supplied by the national coffee agencies and data from previous LMC studies.

The chapter begins with a description of the current situation and the initiatives that are currently in place in the producing countries. Background details on the survey countries production, marketing and export grading systems are presented in Appendix 2.

THE CURRENT POSITION

The Marketing Environment

The surveyed countries give an indication of the differences facing different coffee producing countries. At one extreme, Indonesia is a completely liberalised market ,

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while at the other all Kenyan production is marketed via an auction. In the case of Uganda, India and Côte d'Ivoire a regulatory authority is in place, although the extent of its involvement in marketing is limited. Annual production varies from over 7 million bags to less than 1 million bags per annum (Table 3.1).

Table 3.1: Survey Countries - Background Data

	Marketing System	Production '000 bags	Robusta %
Cote d'Ivoire	Free market - Regulatory Authority	1,950	100%
India	Free market - Regulatory Authority	4,850	62%
Indonesia	Free Market	7,538	86%
Kenya	Compulsory Auction	917	0%
Uganda	Free market - Regulatory Authority	2,750	80%

Source: LMC, ICO

The differences in marketing systems and farmer practises mean that average defect levels vary considerably between producers and across the marketing chain.

In Indonesia and Côte d'Ivoire, defect levels are high at the farmer level, the result of strip picking and artisanal hulling (coffee is marketed once it has been hulled). In the case of Cote d'Ivoire, the survey points to over 85% of beans being strip picked. This leads to high numbers of unripe and over ripe beans being harvested and a high incidence of black beans. In Indonesia, moisture contents remain high until the coffee reaches export level (Table 3.2). Despite the high levels of moisture, OTA levels of samples taken during the survey were relatively low and below the level applied by the EU (5 ppb). It is essential to understand the significance of this finding. The presence of OTA contamination depends on the fulfilment of two basic conditions: the presence of OTA-producing mould and the simultaneous existence of conditions that allow the mould to produce OTA – primarily adequate moisture. OTA producing mould are commonly present in the environment but at very low frequency. It is possible therefore that there may be little or no OTA found in coffee that has been handled unhygienically if the mould is not present in that particular sample. However, this is a matter of 'chance'. This is inconsistent with good hygiene practice which requires all actors to ensure that moisture is maintained at sufficiently low levels so as to prevent the formation of the mycotoxin. Holding coffee for long periods of time and high moisture levels is contrary to basic hygiene principles and constitute a risk to consumer health, but according to the survey findings is relatively common practice in Indonesia.

In both cases, reducing the level of defects and reducing the moisture content for exportable quality occur at the exporter level.

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Table 3.2: Indonesia - Moisture Content and Defect Levels

	Moisture Content Average (%)	CV (%)	Defect Average	CV (%)
Farmer	19.43	13.94	211	91.66
Collector	19.08	10.56	189	47.35
Trader	17.77	8.85	140	26.58
Exporter	12.73	5.89	58	20.09

Source: Case Studies.

In Uganda, coffee is generally either marketed as dried cherry or as hulled coffee, and there is a greater understanding of quality issues across the marketing chain. Moisture levels form part of the price negotiation and, albeit from a small sample, the number of producers solely strip picking was just 10%, although almost half used a combination of selective and strip picking. The situation is similar in India where excess moisture content and a mouldy smell are two of the major reasons given by traders for discounting the price paid for coffee.

Where there is a high level of domestic consumption (such as in Indonesia and India), the number of defects for exportable coffees can be reduced by marketing lower qualities to the local market. The public health implications of this could be significant.

The situation in Kenya is somewhat different as all smallholders are obliged to be members of cooperatives and coffee is group marketed. Smallholders deliver fresh cherries to the cooperatives for processing. This coffee is then washed (or dry processed in the case of lower grades) before being secondary processed and auctioned. All production is arabica.

Initiatives to Improve Quality

In the robusta countries there are some examples of marketing schemes for improved quality coffee. In Indonesia and Côte d'Ivoire, this is due to Nestlé buying directly from farmers and seeking higher quality coffees for their local processing units, while in Uganda and India, schemes have been established to produce higher quality coffee. These schemes are all voluntary.

In Indonesia, in order to sell to Nestlé, farmers are required to practice higher standards of crop husbandry including selective picking of cherries instead of strip picking, and drying to a moisture level of below 12% prior to sale.

There are few examples of schemes to improve quality in Uganda, although one exception is a USAID-funded scheme in Masaka involving 2,000 farms, which is being implemented by Ibero Coffee Exporters. Similar to the Nestlé scheme in Indonesia, the USAID-funded scheme trains farmers to practice higher standards of crop husbandry (including selective picking of cherries instead of strip picking) and to dry their coffee to a moisture level of 12.5% prior to sale (using supplied tarpaulins) in return for which they receive an average 15% price premium if they sell directly to Ibero.

In India, in 2003/04, the Indian Coffee Board introduced a number of premium export grades with specific quality parameters, including Robusta Cherry A and AA grades which contain larger beans and a lower level of defects compared to Robusta Cherry AB.

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Costs and Benefits of Improved Quality Using Existing Initiatives

The Indonesian and Ugandan case studies provide sufficient data to be able to compare the costs and benefits of improving coffee quality in the existing initiatives.

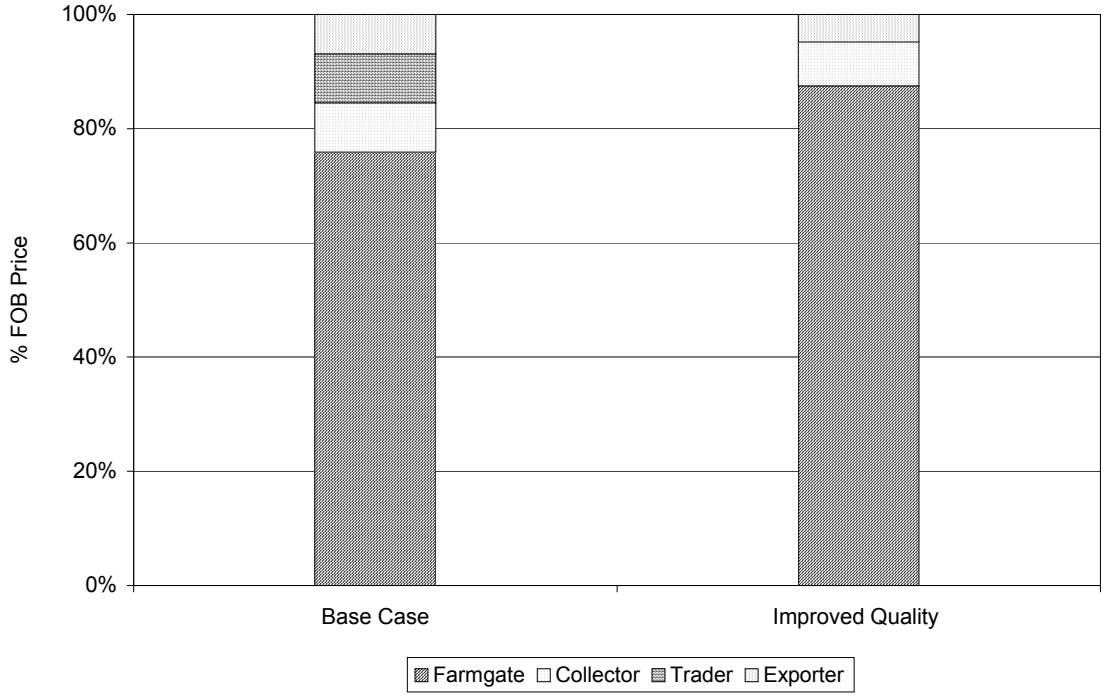
An analysis of the value chain for the traditional system producing ungraded *asalan* coffee (base case) in Indonesia is compared to the Nestlé system, which specifies moisture content and defect levels (improved quality), is shown in Table 3.3 and Diagram 3.1. This assumes that an exporter could pay a similar price as Nestlé for improved quality coffee. According to this analysis, it is estimated that farmers producing improved quality coffee could realise 88% of the export price, compared to 76% in the base case. While the export price of the improved quality coffee is higher, part of the increased farmgate margin is also due to a shorter market chain, with no defined trader function.

Table 3.3: Lampung Province, Indonesia – Natural Robusta Value Chain

	Base Case		Improved Quality	
	US$ per kg	% FOB Price	US$ per kg	% FOB Price
Farmgate Price	0.43	76%	0.58	88%
Collector Price	0.47	85%	0.63	95%
Trader Price	0.52	93%		
Exporter Price	0.56	100%	0.66	100%

Source: FAO Survey Data, LMC.

Diagram 3.1: Lampung Province, Indonesia – Natural Robusta Value Chain



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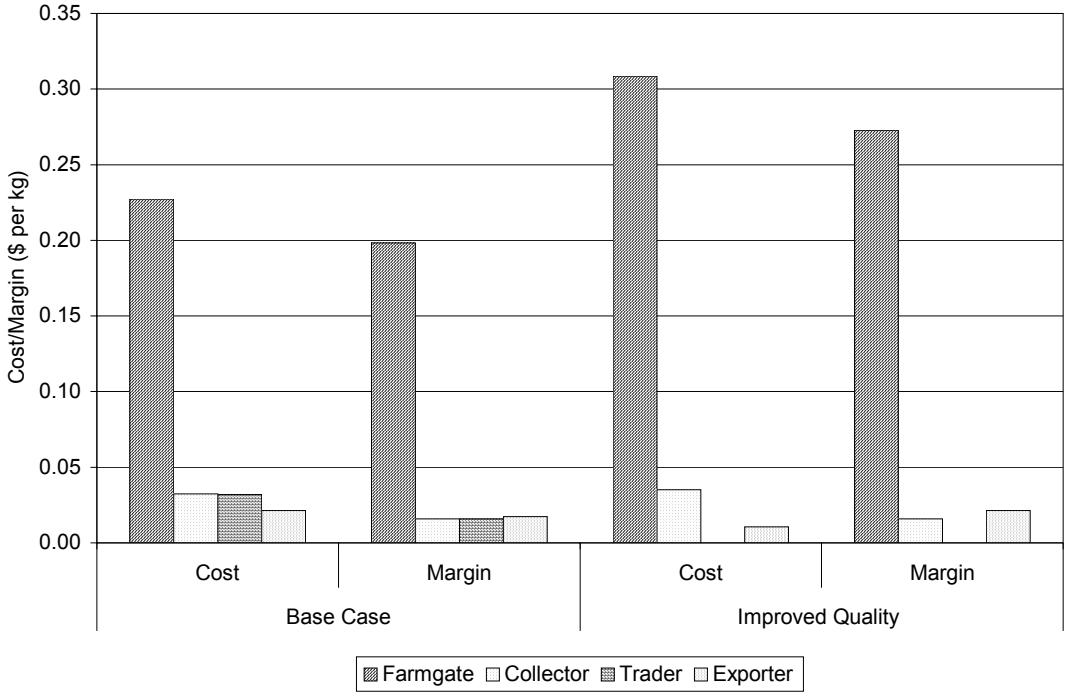
To produce this coffee though incurs higher costs, such as picking and drying costs. According to the survey, the cost to farmers of producing *asalan* was $0.23 per kg while the margin earned was $0.20 per kg. Producing improved quality coffee cost $0.31 per kg; however, due to the higher price earned the farmer's margin increased to $0.27 per kg. Further along the marketing chain, exporter's costs were reduced from $0.02 per kg in the base case to $0.01 per kg for improved quality coffee (Diagram 3.2).

Diagram 3.2: Lampung Province, Indonesia – Costs and Margins



Similarly, an analysis of the value chain for the traditional system (base case) in Uganda is compared to the USAID scheme (improved quality) in Table 3.3 and Diagram 3.3. According to this analysis farmers producing improved quality coffee could realise 76% of the export price compared to 66% in the base case. The premium is in the order of 2 to 8 US cents per kg (50 to 150 Ugandan shillings) on top of the prevailing market price. There is no change in the export price as these coffees have not been able to attract a premium in the market. The higher farm gate price is due to the shorter marketing chain as the farmer is selling directly to the exporter, and the lower costs incurred by the exporter for drying and sorting.

Table 3.3: Masaka District, Uganda – Natural Robusta Value Chain

	Base Case		Improved Quality	
	US$ per kg	% FOB Price	US$ per kg	% FOB Price
Farmgate Price	0.48	66%	0.55	76%
Collector Price	0.49	68%		
Trader Price	0.59	82%	0.62	85%
Exporter Price	0.72	100%	0.72	100%

Source: FAO Survey Data, LMC.

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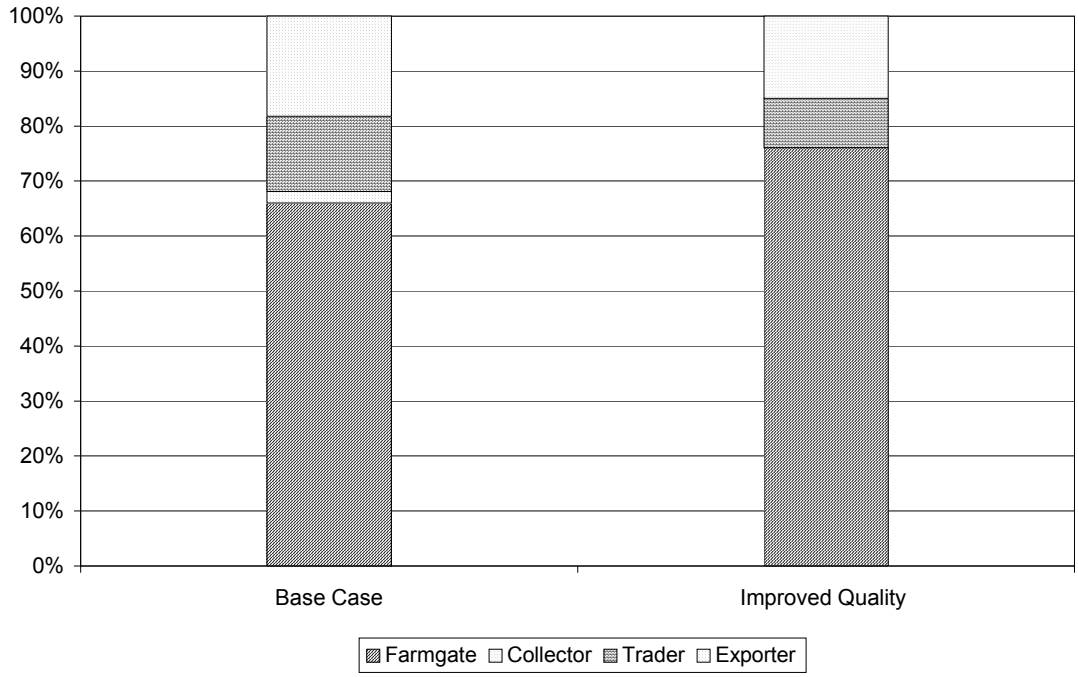
Diagram 3.3: Masaka District, Uganda – Natural Robusta Value Chain



In terms of cost, the cost to farmers of producing *kiboko* was $0.36 per kg while the margin earned was $0.12 per kg. Producing improved quality coffee cost $0.42 per kg; however, due to the higher price earned the farmer's margin increased slightly to $0.13 per kg. Some farmers participating in the USAID scheme commented though that the premium was not adequate to cover the additional costs. Further along the marketing chain, exporter's costs were reduced from $0.12 per kg in the base case to $0.08 per kg for improved quality coffee (Diagram 3.4).

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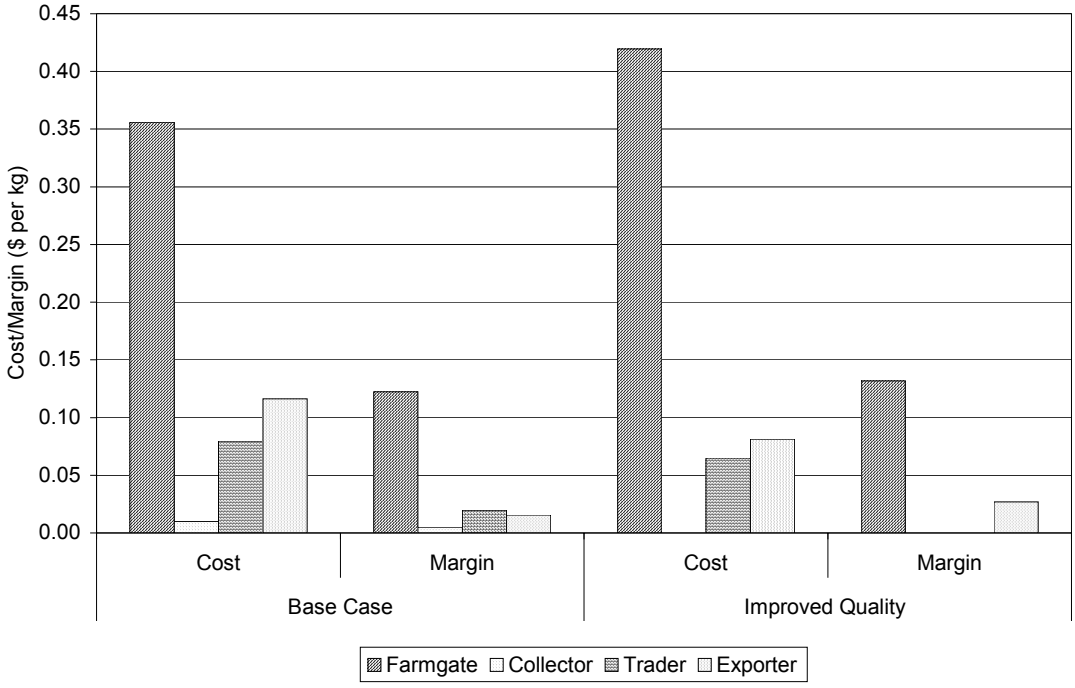
Diagram 3.4: Masaka District, Uganda – Costs and Margins



The two examples suggest that improving quality at farm gate level can lead to an increase in margins.

However, there are a number of significant provisos:

- There is a limited market for higher quality coffee – the Indonesian analysis is based on the Nestlé system, which only operates for the volumes required by the company for its local plant, and there is no guarantee that other markets exist.

- There are only limited premiums available. In the case of the Uganda, the exporter has not been able to realise a price premium for the scheme's coffee on the international market. The higher price paid has been to encourage the scheme and because of lower internal marketing costs, but not as a result of market demand.

- Strong competition for supplies means that at times non-scheme buyers can offer the same price to farmers to secure the coffee, discouraging the production of good quality coffee. Some traders then reportedly attempt to recover their margin by downgrading quality (e.g. by mixing in poor quality coffee or adding in foreign matter) before sale further up the marketing chain.

- An entrenched marketing system can discourage the production of higher quality coffee. In Indonesia for instance, local traders provide additional services to farmers such as pre-harvest credit - this ties farmers to the traditional system producing *asalan*, from which traders earn a margin.

This suggests that a more regulated approach to improving coffee quality may be required, if improving coffee hygiene and quality are perceived as being desirable objectives.

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SCENARIO A: LIMITED ENFORCEMENT OF IMPROVED HYGIENE STANDARDS

Using the data from the case studies as well as the results from the voluntary schemes that are in place to improve quality, it is possible to suggest some of the likely outcomes from both limited and totally enforced schemes.

We focus on the Ugandan, Indonesian and Kenyan studies, as these were the only ones giving sufficient data to allow comparisons to be made. Monitoring and compliance costs were not taken into account in the analysis.

In defining 'poor quality', we have used the definition adopted by the International Coffee Council in Resolution 407:

- For robusta, over 150 defects per 300 g sample;
- For arabica, over 86 defects per 300 g sample.

Scenario A contains two possible outcomes:

- Option 1: where one producing country removes 'poor quality' coffee from the supply chain prior to export and destroys it, and
- Option 2: where farmer behaviour changes to reduce the volumes of poor quality coffee produced.

Option 1: Destroying Poor Quality Coffee

Under Option 1, farmer behaviour does not change and exporters have to destroy a proportion of coffee in order to reduce the proportion of poor quality coffee; alternatively, this coffee could be marketed on the local market.

Indonesia

In Indonesia the export grading system is based on defects (see Appendix 2) and for this to occur Grade 6 beans (containing over 150 defects per 300 g sample) would be prohibited from export and destroyed. Based on the weighted average volume and value of a tonne of Indonesian coffee over the 1998/99-2003/04 period, it is estimated that this would result in a 12% reduction in export volume and a 10% reduction in the export price (Table 3.4).

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Table 3.4: Indonesia – Impact of Removal of Low Quality Coffee on Weighted Average Export Value

Before:	mt	$
Grade 1	0.03	45.04
Grade 2	0.03	24.81
Grade 3	0.24	242.80
Grade 4	0.53	426.27
Grade 5	0.05	35.96
Grade 6	0.12	85.81
Total	**1.00**	**860.68**
After:	mt	$
Grade 1	0.03	45.04
Grade 2	0.03	24.81
Grade 3	0.24	242.80
Grade 4	0.53	426.27
Grade 5	0.05	35.96
Total	**0.88**	**774.88**
Change	-12%	-10%

Source: AEKI, LMC.

Assuming that the 10% export price reduction is transmitted back through the supply chain to producers, the impact would be a 3% reduction in the proportion of the export price received by growers compared to the base case (Table 3.5 and Diagram 3.5).

Table 3.5: Lampung Province, Indonesia – Natural Robusta Value Chain (Limited Enforcement, Option 1)

	Base Case		Limited Enforcement - Option 1	
	US$ per kg	% FOB Price	US$ per kg	% FOB Price
Farmgate Price	0.43	76%	0.37	73%
Collector Price	0.47	85%	0.42	83%
Trader Price	0.52	93%	0.47	92%
Exporter Price	0.56	100%	0.50	100%

Source: FAO Survey Data, LMC.

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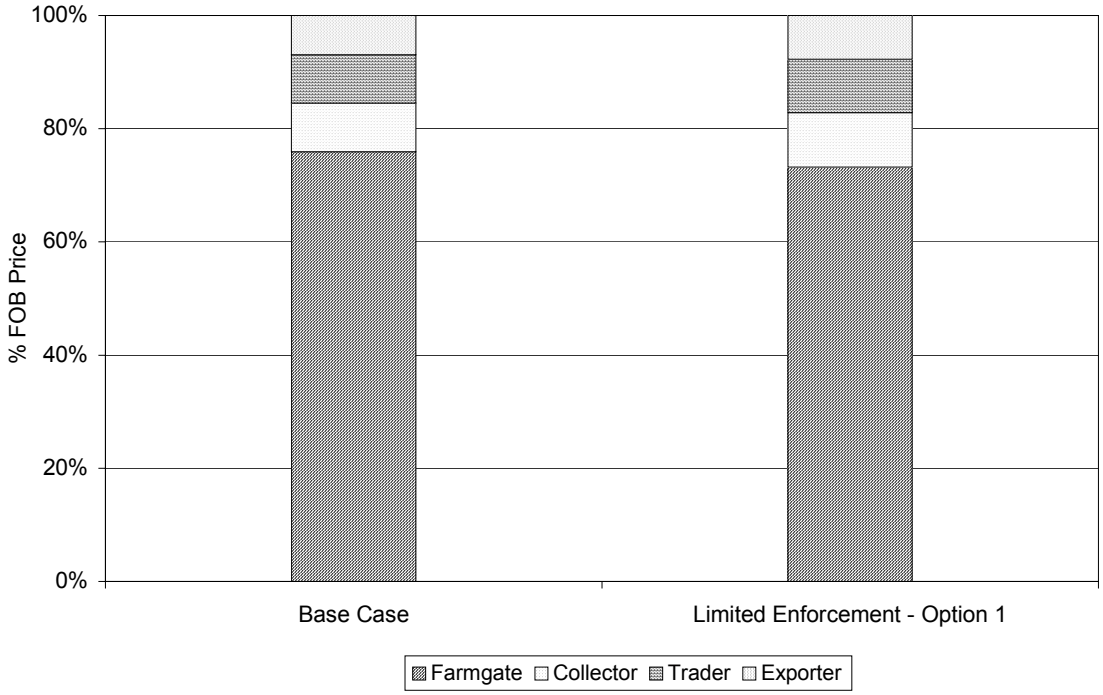
Diagram 3.5: Lampung Province, Indonesia – Natural Robusta Value Chain (Limited Enforcement, Option 1)



Assuming no change in unit production and marketing costs along the supply chain, this would translate into a 28% reduction in the grower's margin compared to the base case (Diagram 3.6).

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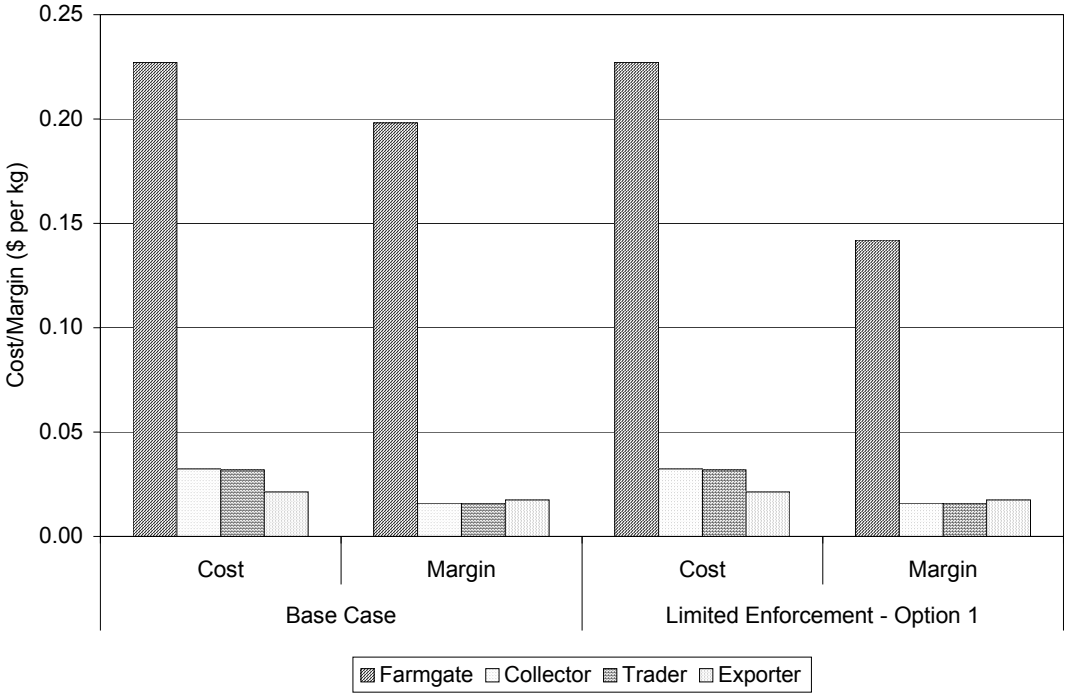
Diagram 3.6: Lampung Province, Indonesia – Costs and Margins (Limited Enforcement, Option 1)



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Uganda

Ugandan exports are classified by grade (see Appendix 2) and to meet the criteria set out in Option 1 it is assumed that the off-grades (BHP and Black Beans) are prohibited from export and destroyed. Based on the weighted average volume and value of a tonne of Ugandan coffee over the 1999/2000-2003/04 period, it is estimated that this would result in a 4% reduction in export volume and a 2% reduction in the export price (Table 3.6).

Table 3.6: Uganda – Impact of Removal of Low Quality Coffee on Weighted Average Export Value

Before:	mt	$
Scr-18	0.09	66.86
Scr-17	0.03	18.11
Scr-15	0.61	382.67
Scr-14	0.02	9.53
Scr-13	0.00	1.64
Scr-12	0.21	118.29
BHP-1199	0.03	7.79
BHP-1013	0.00	0.50
B-Beans	0.01	1.81
Total	**1.00**	**607.19**
After:	mt	$
Scr-18	0.09	66.86
Scr-17	0.03	18.11
Scr-15	0.61	382.67
Scr-14	0.02	9.53
Scr-13	0.00	1.64
Scr-12	0.21	118.29
Total	**0.96**	**597.10**
Change	-4%	-2%

Source: UCDA, LMC.

Assuming that the 2% export price reduction is transmitted back through the supply chain to producers, the impact would be a 1% reduction in the proportion of the export price received by growers compared to the base case (Table 3.7 and Diagram 3.7).

Table 3.7: Uganda – Natural Robusta Value Chain (Limited Enforcement, Option 1)

	Base Case		Limited Enforcement - Option 1	
	US$ per kg	% FOB Price	US$ per kg	% FOB Price
Farmgate Price	0.48	66%	0.47	65%
Collector Price	0.49	68%	0.48	68%
Trader Price	0.59	82%	0.58	81%
Exporter Price	0.72	100%	0.71	100%

Source: FAO Survey Data, LMC.

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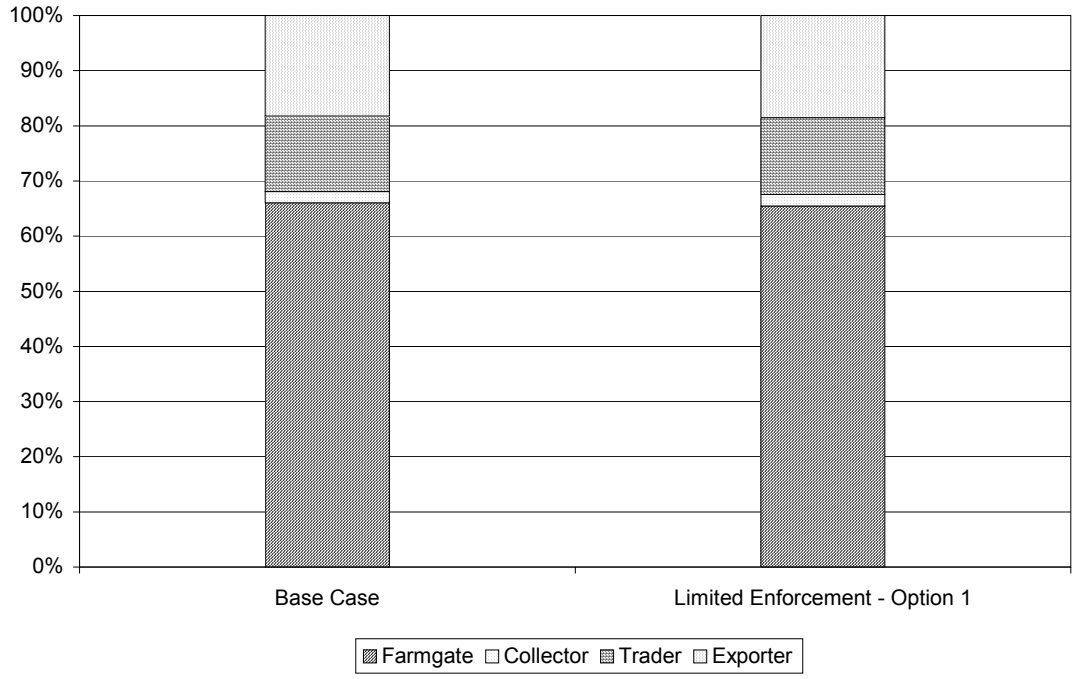
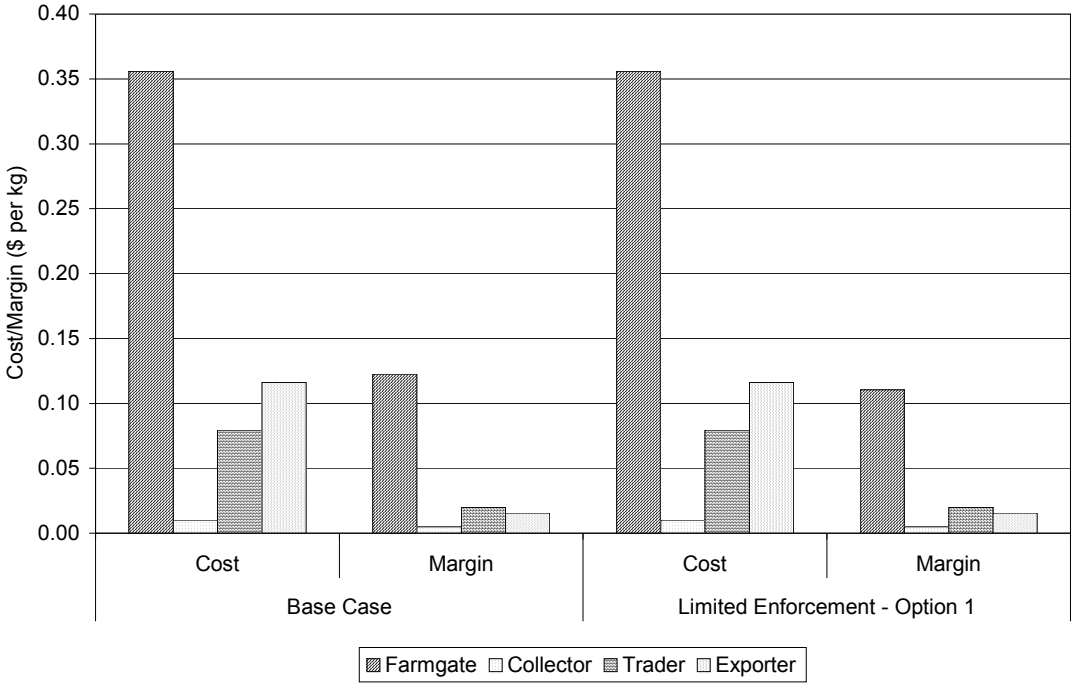
Diagram 3.7: Uganda – Natural Robusta Value Chain (Limited Enforcement, Option 1)



Assuming no change in unit production and marketing costs along the supply chain, this would translate into a 10% reduction in the grower's margin compared to the base case (Diagram 3.8).

Diagram 3.8: Uganda – Costs and Margins (Limited Enforcement, Option 1)



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Kenya

Kenya coffee is graded by size and density, after which it is classified by quality (see Appendix 2). This analysis examines the impact of removing coffee in Classes 7-10 from export and destroying it[1]. Based on the weighted average volume and value of a tonne of Kenyan coffee over the 2000/01-2002/03 period, it is estimated that this would result in a 13% reduction in export volume and a 6% reduction in the export price (Table 3.8).

Table 3.8: Kenya – Impact of Removal of Low Quality Coffee on Weighted Average Export Value

Before:	mt	$
One	0.00	0.51
Two	0.00	11.68
Three	0.07	175.23
Four	0.31	619.47
Five	0.26	405.18
Six	0.13	147.39
7 – 10	0.13	86.67
11-15	0.11	56.36
Total	**1.00**	**1502.49**
After:	mt	$
One	0.00	0.51
Two	0.00	11.68
Three	0.07	175.23
Four	0.31	619.47
Five	0.26	405.18
Six	0.13	147.39
11-15	0.11	56.36
Total	**0.88**	**1415.81**
Change	-13%	-6%

Source: Kenya Coffee Board, LMC.

Assuming that this 6% export price reduction is transmitted back through the supply chain to producers, the estimated impact would be a 2% reduction in the proportion of the export price received by growers compared to the base case, which would translate into a 13% reduction in the grower's margin (Diagram 3.9).

[1] Classes 11-15 are assumed to be Mbuni (dried cherry).

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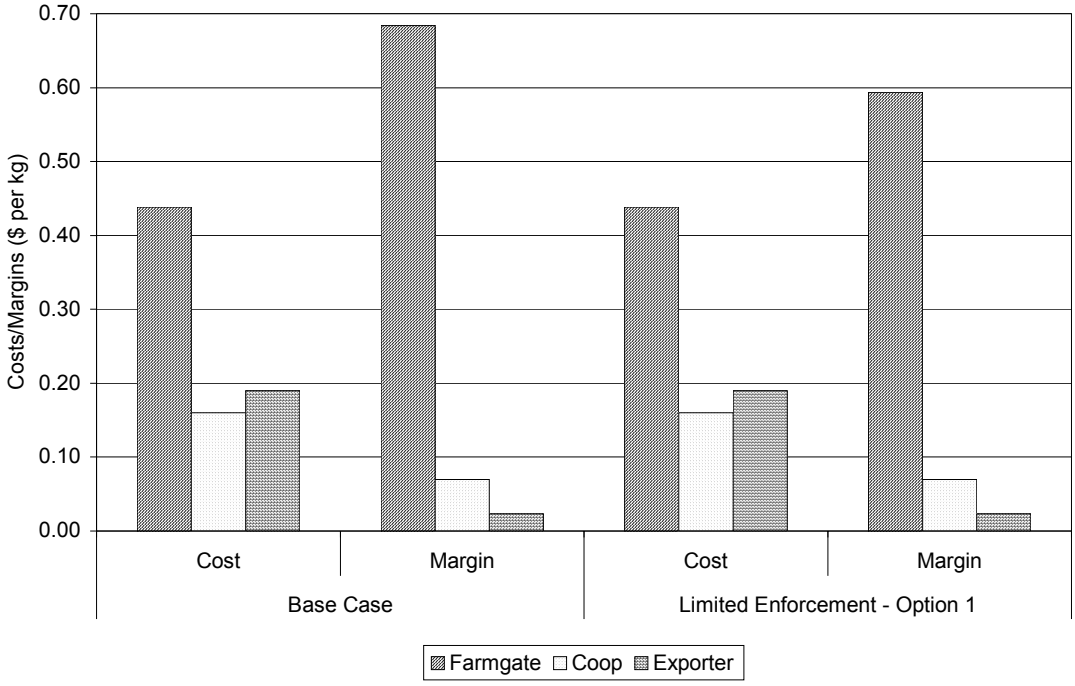
Diagram 3.9: Kenya – Costs and Margins (Limited Enforcement, Option 1)



Costs and Benefits of Scenario A: Option 1

Comparing the two robusta cases, it is clear that reducing the export of poor quality coffee by destroying it leads to lower grower returns, with the impact being greatest in the unregulated market (i.e. Indonesia). Grower returns are reduced by between 10% and 28%.

The analysis of an arabica producer operating in a controlled market (i.e. Kenya) suggests results that are similar to the robusta producer in the regulated market (i.e. Uganda).

Option 2: Changing Farmer Behaviour

Under Option 2, farmer behaviour changes with improved harvest and post harvest techniques. This would reduce the number of defects produced but lead to higher costs for the farmer. In this case, instead of destroying substandard coffee is it upgraded to the next highest grade (i.e. in Indonesia, Grade 6 coffee is upgraded to Grade 5). We assume that this can be achieved with no volume loss although, in reality, there will remain a volume of coffee that cannot be upgraded which would need to be destroyed or redirected to the local market. This arises from the nature of the agricultural production process: variable weather, pests and diseases, as well as the imperfect nature of harvest and post harvest processing; this would result in some volume loss. The scenario therefore overstates the benefits of upgrading coffee.

Indonesia

In Indonesia, our analysis suggests that the impact of upgrading quality on the export price would be marginal (a price increase of around $4 per tonne) (Table 3.9). This is

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attributed to the modest export price premium earned by Grade 5 beans over Grade 6 beans.

Table 3.9: Indonesia - Impact of Upgrading of Low Quality Coffee on Weighted Average Export Value

Before:	mt	$
Grade 1	0.03	45.04
Grade 2	0.03	24.81
Grade 3	0.24	242.80
Grade 4	0.53	426.27
Grade 5	0.05	35.96
Grade 6	0.12	85.81
Total	**1.00**	**860.68**
After:	mt	$
Grade 1	0.03	45.04
Grade 2	0.03	24.81
Grade 3	0.24	242.80
Grade 4	0.53	426.27
Grade 5	0.18	125.21
Total	**1.00**	**864.13**
Change	0%	0%

Source: AEKI, LMC.

The analysis suggests that the increase in the proportion of the export price received by growers compared to the base case is 4%. This is mainly attributed to a reduction in upgrading costs further along the marketing chain (Diagram 3.10).

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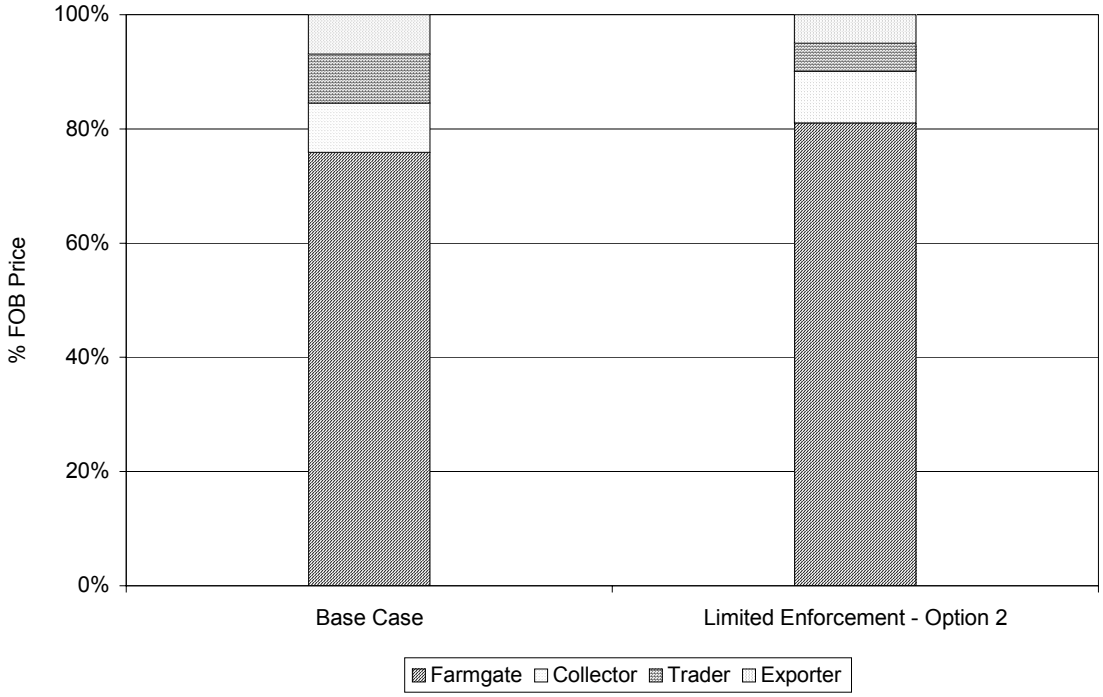
Diagram 3.10: Lampung Province, Indonesia – Natural Robusta Value Chain (Limited Enforcement, Option 2)



However, despite the increase in the proportion of the export price received by growers, changes in picking and drying costs at the producer level would be expected to translate into a 26% reduction in the grower's margin compared to the base case (Diagram 3.11). Further analysis suggests that the average export price would have to increase by over 10% to have a positive impact on the grower's margin.

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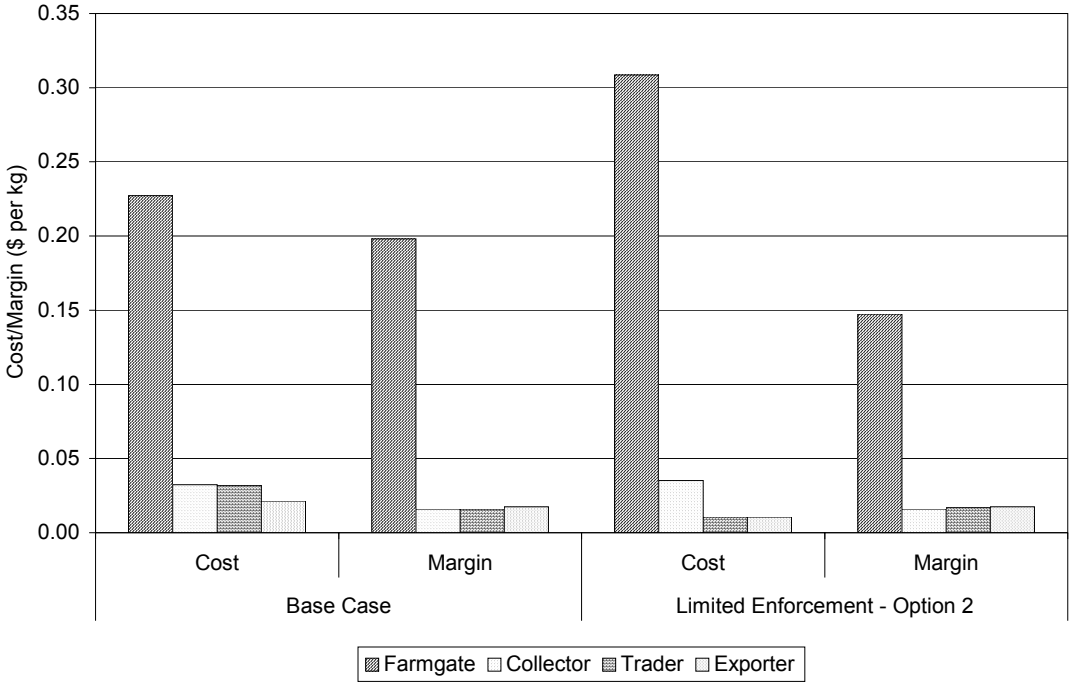
Diagram 3.11: Lampung Province, Indonesia – Costs and Margins (Limited Enforcement, Option 2)



In Uganda, such a scheme would lead to an $11 per tonne (or 2%) increase in the export price (Table 3.10).

Table 3.10: Uganda - Impact of Upgrading of Low Quality Coffee on Weighted Average Export Value

Before:	mt	$
Scr-18	0.09	66.86
Scr-17	0.03	18.11
Scr-15	0.61	382.67
Scr-14	0.02	9.53
Scr-13	0.00	1.64
Scr-12	0.21	118.29
BHP-1199	0.03	7.79
BHP-1013	0.00	0.50
B-Beans	0.01	1.81
Total	**1.00**	**607.19**
After:	mt	$
Scr-18	0.09	66.86
Scr-17	0.03	18.11
Scr-15	0.61	382.67
Scr-14	0.02	9.53
Scr-13	0.00	1.64
Scr-12	0.25	139.63
Total	**1.00**	**618.44**
Change	0%	2%

Source: UCDA, LMC.

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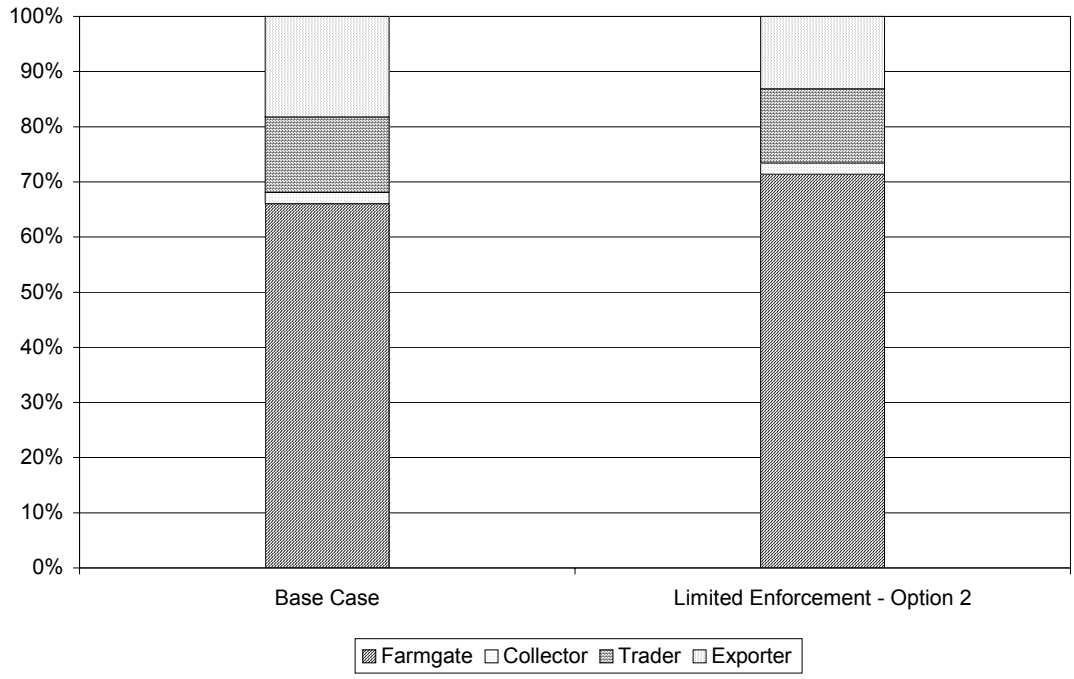
The proportion of the export price received by growers would be expected to increase by around 5% compared to the base case, mainly due to a reduction in upgrading costs further along the marketing chain (Diagram 3.12).

Diagram 3.12: Uganda – Natural Robusta Value Chain (Limited Enforcement, Option 2)



However, despite the increase in the proportion of the export price received by growers, higher upgrading costs would be expected to translate into a 1% reduction in the grower's margin compared to the base case (Diagram 3.13).

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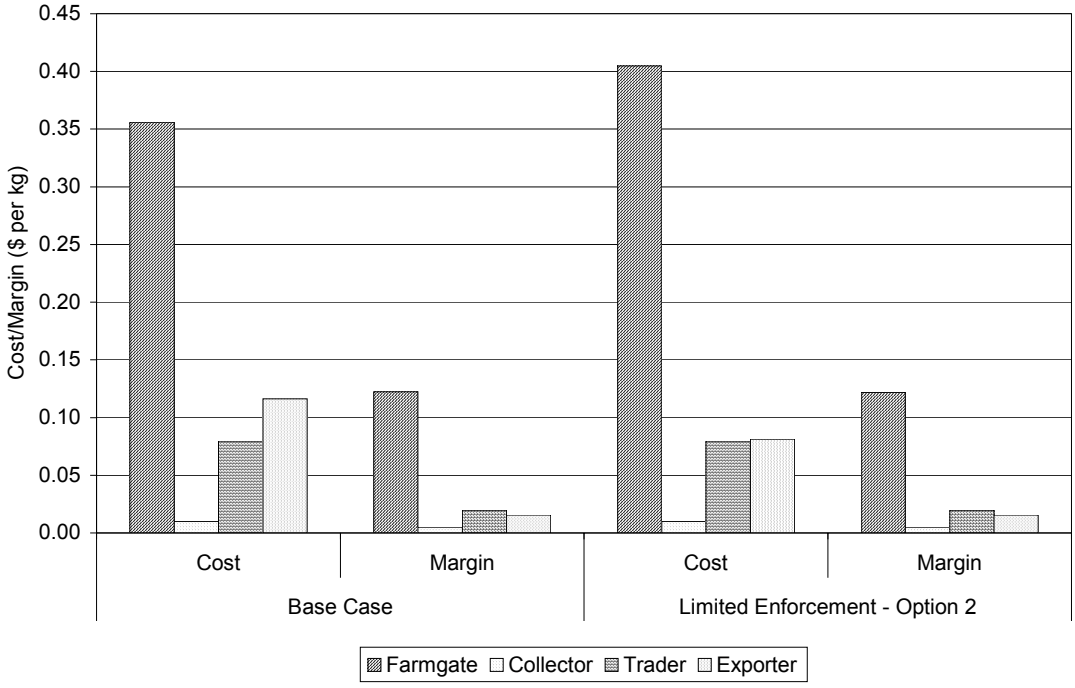
Diagram 3.13: Uganda – Costs and Margins (Limited Enforcement, Option 2)



Kenya

In Kenya, under such a scenario there would be a 4% increase in the export price (Table 3.11).

Table 3.11: Kenya - Impact of Upgrading of Low Quality Coffee on Weighted Average Export Value

Before:	mt	$
One	0.00	0.51
Two	0.00	11.68
Three	0.07	175.23
Four	0.31	619.47
Five	0.26	405.18
Six	0.13	147.39
7 – 10	0.13	86.67
11-15	0.11	56.36
Total	**1.00**	**1502.49**
After:	mt	$
One	0.00	0.51
Two	0.00	11.68
Three	0.07	175.23
Four	0.31	619.47
Five	0.26	405.18
Six	0.25	294.24
11-15	0.11	56.36
Total	**1.00**	**1562.66**
Change	0%	4%

Source: LMC.

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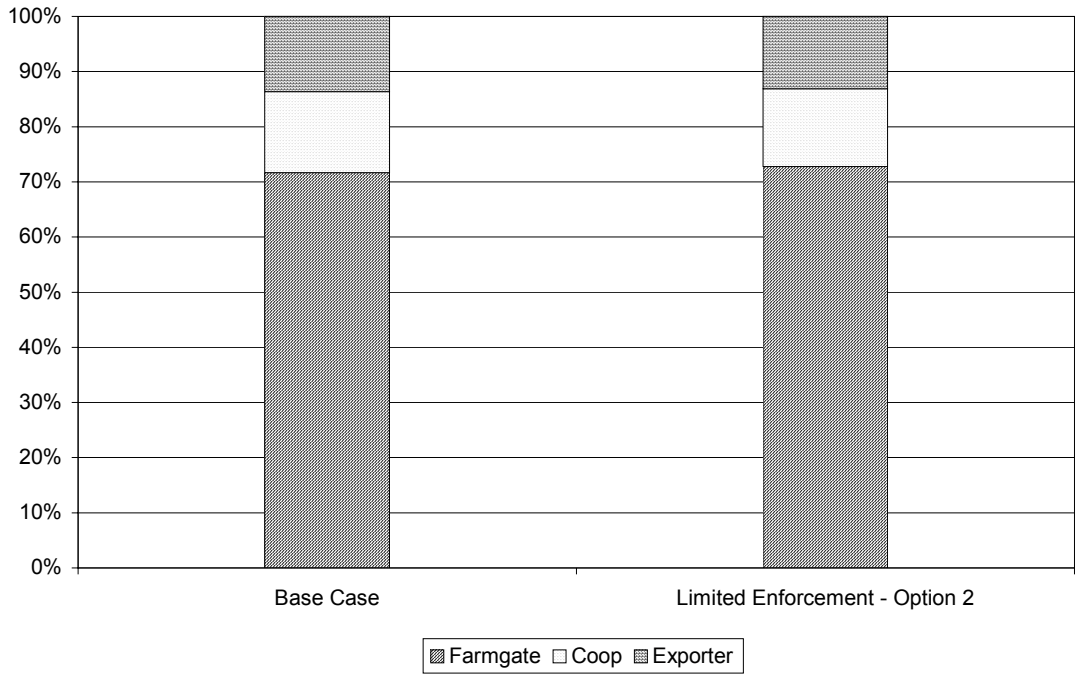
With little change expected in costs further along the marketing chain, the proportion of the export price received by growers would increase marginally (by around 1%) compared to the base case (Diagram 3.14).

Diagram 3.14: Kenya – Washed Arabica Value Chain (Limited Enforcement, Option 2)



Due to the additional costs involved in upgrading Class 7-10 coffee to Class 6, it is estimated that the grower's margin would decline by 4% under this option (Diagram 3.15).

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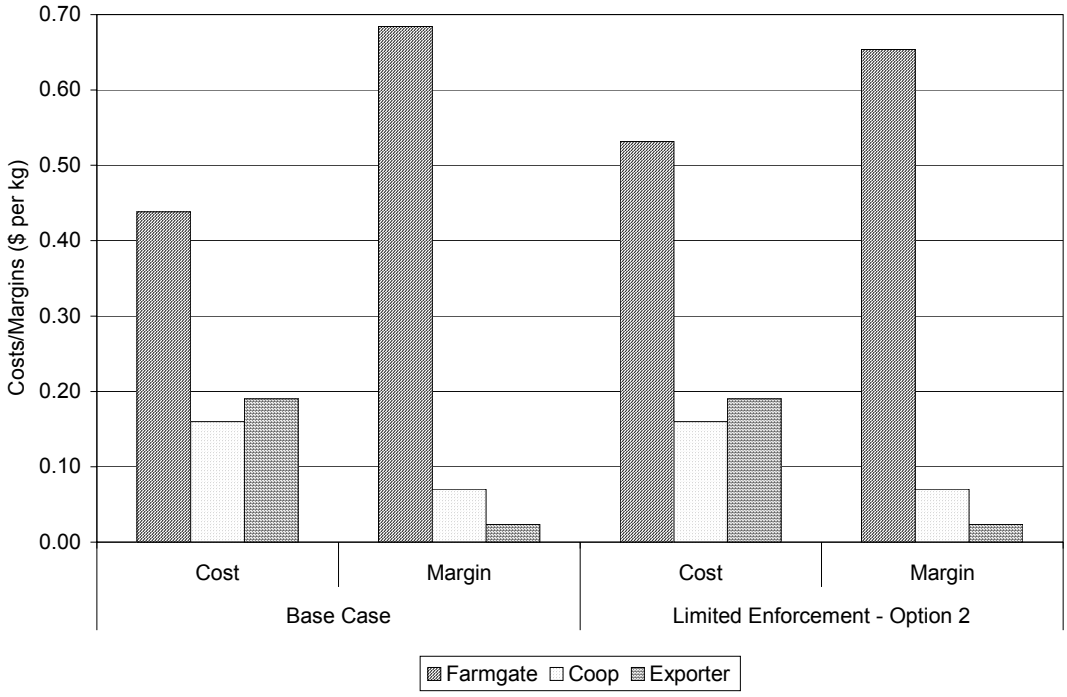
Diagram 3.15: Kenya – Costs and Margins (Limited Enforcement, Option 2)



Costs and Benefits of Scenario A: Option 2

Under Option 2, upgrading coffee results in a higher average export price. However the costs of upgrading are higher than the increase in producer prices and growers margins fall by between 1% and 26%.

This option would only be viable when there is a sufficiently large increase in the average export price once coffees have been upgraded.

SCENARIO B: STRICT ENFORCEMENT

Strict enforcement would be a situation where good practice guidelines and standards are universally applied. For instance, if improved hygiene standards were enforced in importing countries to ensure that these standards were met, standards would be required to be introduced across all producing countries concurrently. 'Poor quality' coffee would then be removed from the supply chain prior to export. As with Scenario A, given the available information we can only attempt to quantify cost/benefits of strict enforcement in two ways of achieving this: (i) by destroying coffee; and (ii) by upgrading coffee. In reality, strict enforcement of good practice guidelines and codes of practices would force a general improvement of coffee quality.

This analysis is restricted to the robusta market, given that the bulk of the case studies concern robusta-producing countries.

Option 1: Destroying Poor Quality Coffee

Under Option 1, farmer behaviour does not change and exporters have to destroy a proportion of coffee in order to reduce the proportion of poor quality coffee.

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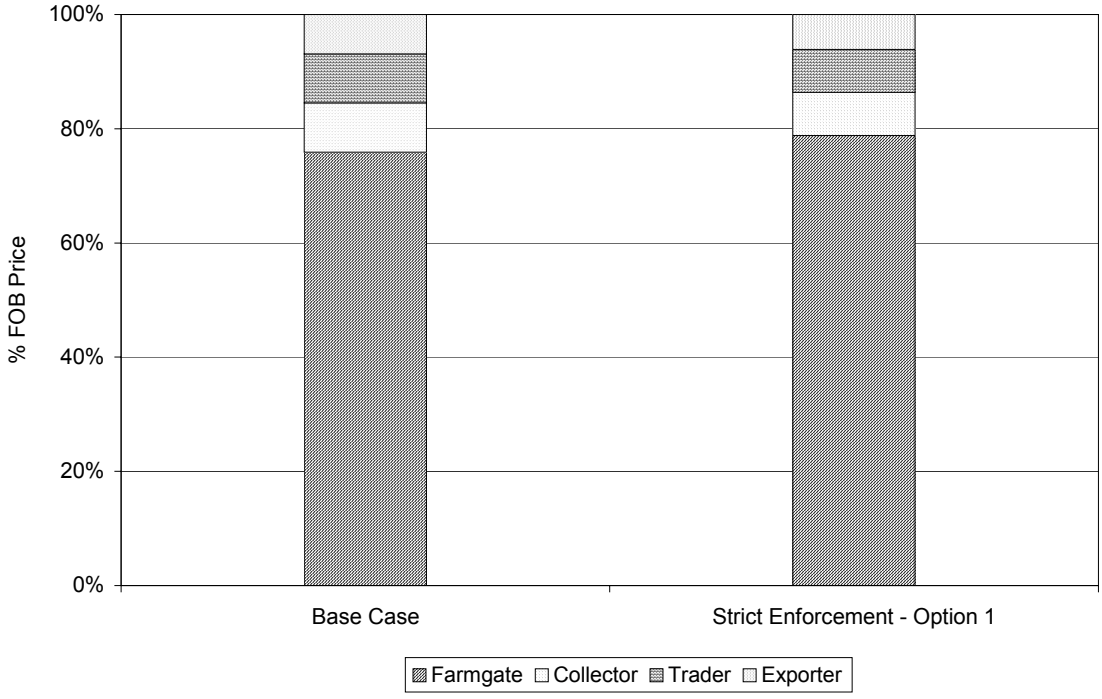
By destroying coffee the global supply-demand balance is altered. Supply is reduced and consequently prices rise. We assume the price increase will be of a similar magnitude to that estimated by the Free University of Amsterdam in a study for the ICO, that prices would rise by 4.5 US cents per kg increase for every 60,000 tonnes of 'poor quality' coffee removed from the market.

Under these assumptions, the removal and destruction of 6% of global robusta exports (the average rate for Indonesia and Uganda in Scenario A) would result in an export price increase of 8 US cents per kg.

Indonesia

Assuming that this price increase is transmitted back through the supply chain to producers, the impact would be a 3% increase in the proportion of the export price received by growers compared to the base case (Diagram 3.16).

Diagram 3.16: Lampung Province, Indonesia – Natural Robusta Value Chain (Strict Enforcement, Option 1)



Assuming no change in unit production and marketing costs along the supply chain, this would translate into a 38% increase in the grower's margin compared to the base case (Diagram 3.17).

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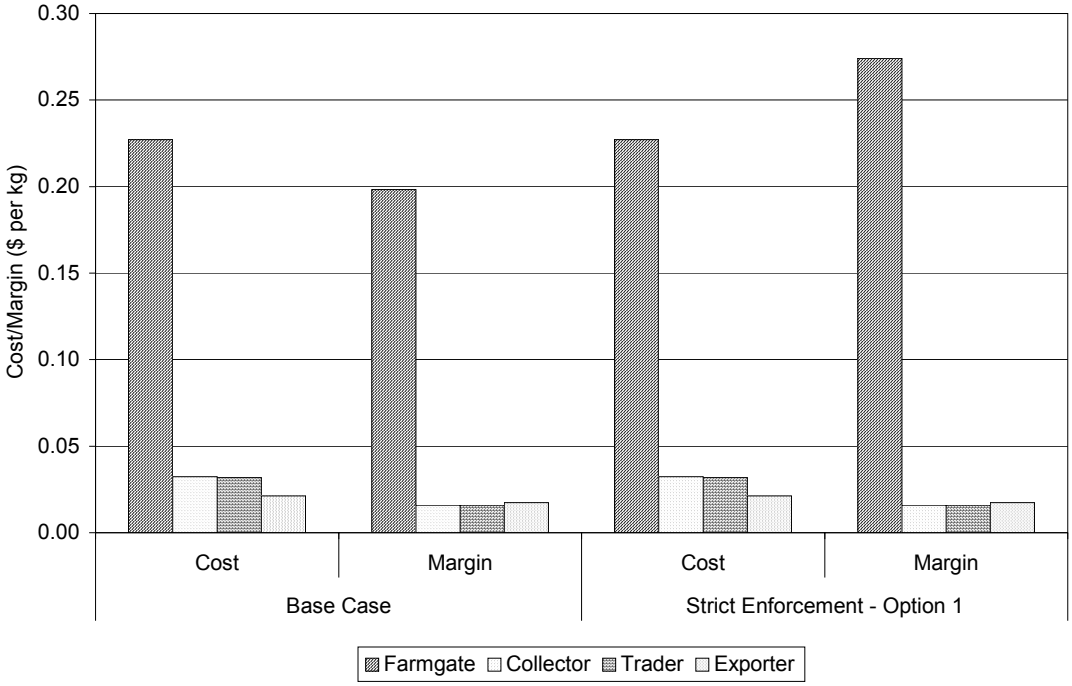
Diagram 3.17: Lampung Province, Indonesia – Costs and Margins (Strict Enforcement, Option 1)



Uganda

In Uganda, assuming that this price increase is transmitted back through the supply chain to producers, the impact would be a 3% increase in the proportion of the export price received by growers compared to the base case (Diagram 3.18).

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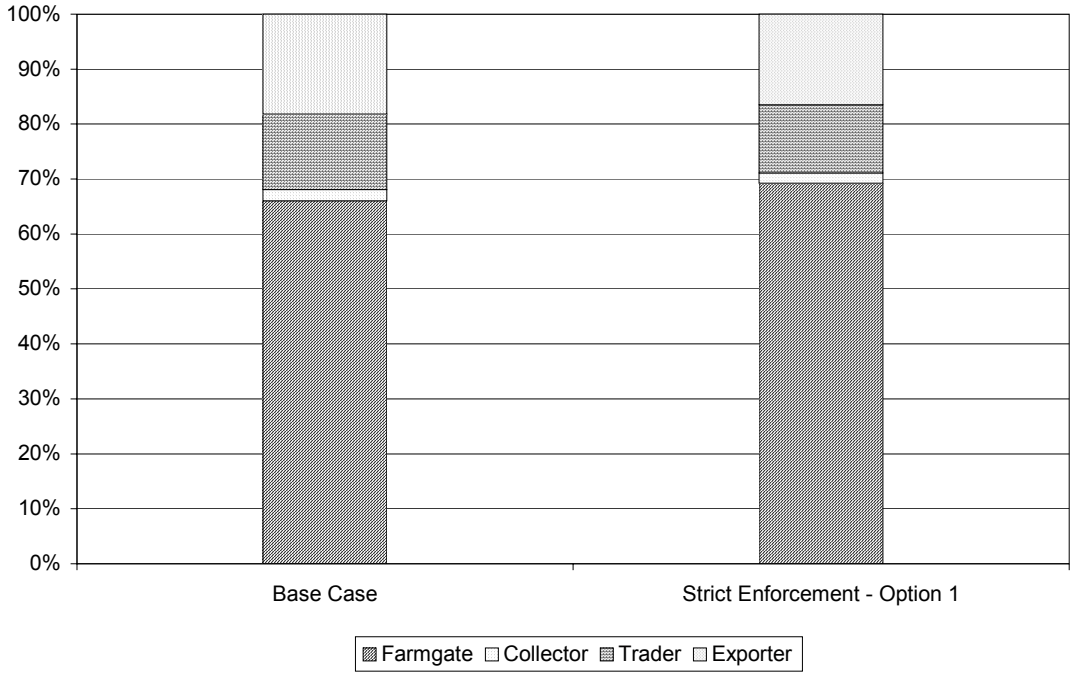
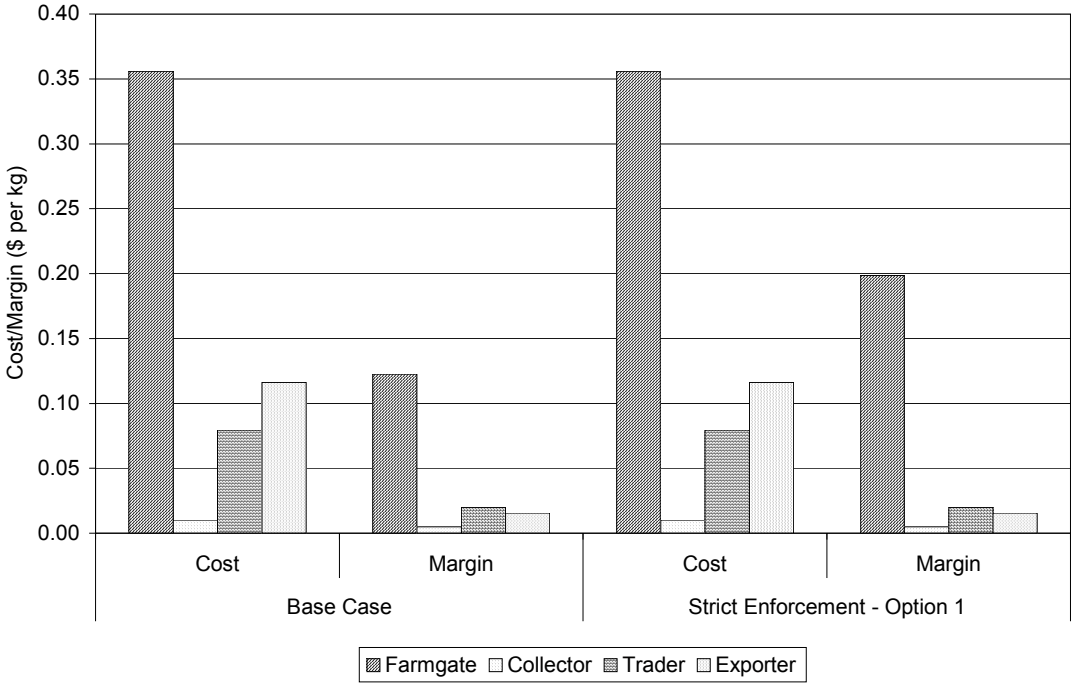
Diagram 3.18: Uganda – Natural Robusta Value Chain (Strict Enforcement, Option 1)



Assuming no change in unit production and marketing costs along the supply chain, this would translate into a 62% increase in the grower's margin compared to the base case (Diagram 3.19).

Diagram 3.19: Uganda – Costs and Margins (Strict Enforcement, Option 1)



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Costs and Benefits of Scenario B: Option 1

It is clear that reducing the export of poor quality coffee global leads to higher export prices and significantly higher returns. However, these benefits are not due to improved export quality per se, but from the destroying of coffee, which alters the supply demand balance. In the case studies, grower returns are increased by between 40% and 60%.

Option 2: Changing Farmer Behaviour

Under Option 2, farmer behaviour changes with improved harvest and post harvest techniques. This would reduce the number of defects produced but lead to higher costs for the farmer.

The outcome from this option would be the same as Scenario A Option 2, as the same volume of coffee is being marketed. However, the extent to which our assumptions are an oversimplification, and the volume of coffee produced is reduced, would lead to an increase in price. If, for instance, 2% of coffee could not be graded, the supply-demand balance would alter by this amount. A 2% reduction in global robusta exports would result in an export price increase of 2.5 US cents per kg.

Under this scenario, grower returns would be increased by between 15% and 20%.

SUMMARY

Table 3.12 highlights the findings from the above case studies.

Table 3.12: Costs and Benefits of Improving Quality – Case Studies

		Scenario A		Scenario B	
	Voluntary	Option 1	Option 2	Option 1	Option 2
Export Price Premium	0%	-10% to -2%	0% to 4%	8 c/kg	2.5 c/kg
Change in Grower Costs	6 to 8 c/kg	0%	14% to 36%	0%	15% to 20%
Change in Margin	1 to 7 c/kg	-10% to -28%	-26% to -1%	40% to 60%	15% to 20%

In today's mainstream market, no premiums are payable at the export level for improving quality at the grower level. Premiums do exist in some schemes where a roaster is purchasing coffee for their own operations; this is the case with Nestlé's direct purchases in Indonesia and Cote d'Ivoire. However, volumes are small.

In existing schemes where growers are receiving higher prices, this is because most schemes involve direct buying and hence the marketing chain is shorter and exporter's costs in drying and sorting are reduced.

Improving quality in producing countries has little if any effect on costs in consuming countries. The majority of sorting and grading occurs in producing countries. There is very little reconditioning (which comprises a different set of processes from the steam cleaning of robust referred to previously) in consuming countries. Where this does occur, it is the exception rather than the rule. This is because conditioning at origin is cheaper and all multinational exporters have invested in sorting and cleaning equipment at origin. Warehousing companies still offer these services in the major consuming countries, but costs of reprocessing and rebagging are in the order of 20

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c/kg. In addition, coffee that is reconditioned in Europe is not tenderable at the futures exchange.

Once regulation is introduced there is a marked difference between the limited and strictly enforced scenarios. Under a limited enforcement scenario (Scenario A) grower returns are lower. This is because in Option 1, where substandard coffee is destroyed, the lower export volume means a lower average price. The impact on margins is greater in completely free markets where a larger volume of coffee has to be destroyed. In Option 2, where coffee is upgraded, margins are lower because the cost of upgrading by the farmer is higher than the resulting increase in price.

Under a strictly enforced scenario (Scenario B) the returns are greater largely because the volume of coffee being marketed is reduced. This reduces supply and increases price. It is not the improvement in quality that is increasing price but the reduction in volumes (the greater the volume reduction the higher the price); therefore, grower returns are higher under Option 1 rather than Option 2.

The strictly enforced scenario though would have significant monitoring costs and these have not been incorporated into the analysis.

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Chapter 4: Potential Impact of Changes in Food Safety Legislation on the Coffee Industry

In the previous chapter we have largely discussed the effect of changes in coffee quality on producing countries. Changes in food safety legislation in importing countries would impose changes on coffee producing countries if a particular country wanted to continue to supply coffee to that market.

If there were codes of practice and standards in force in both the producing and importing countries then the responsibility of ensuring that the requirements were met would fall on each actor along the chain. The question is then one of enforcement and as the point of export is the only constriction point i.e. it is the one point in the chain where all coffee has to flow through, it is a convenient place to make checks on product. There are other ways of promoting (if not ensuring) compliance such as buying from selected farmers or traders in whom the exporters or large traders have confidence. Checks at other points of convergence such as milling factories, where they exist, could also provide convenient opportunities for checks. Under a code of practice, checks are not necessarily just checks on product, but also checks on practice. However, the further upcountry that monitoring occurs, the more expensive and unwieldy it becomes.

Where enforcement is at export level, from the exporters' view, this could either result in Option 1 or 2 (of both scenarios) as discussed in the previous chapter. In the case of the former, the coffee could either be destroyed or marketed in non-participating markets while in the case of the latter, growers could seek to upgrade their quality.

What the export standards would be is beyond the scope of this report, although some evidence from the Kenyan case study suggests that foxy, diseased and insect damaged beans are the prime source of OTA in coffee (see Chapter 2). Following further analysis, if this proves to be true, then seeking limits in these defects would have the result of reducing OTA contamination.

In order to determine the impact of such a policy, we go back to the case studies discussed in Chapter 3. The case of a policy adopted across all consuming countries would be the strict enforcement scenario (Scenario B), while we assume that a limited enforcement scenario (Scenario A) places the onus on producing countries to decide whether to adopt their own food safety legislation in order to continue supplying a particular consuming country market. Some would be expected to adopt, while others would not. This is a simplification, however; where different standards were adopted in different consuming markets, this would be more likely to lead to a two-tiered market developing, much as was the case in the old ICA days when economic clauses were in effect. Market criteria and prices would then be different in each of the market segments.

Where food safety legislation is strictly enforced, the onus would lie with both producing and importing countries to police the system.

The first part of this chapter pulls together the analyses from Chapter 3 to examine the quantifiable aspects of the potential impact of changes in food safety legislation, particularly on coffee growers. We follow the same structure as Chapter 3, discussing first the limited enforcement scenario and then strict enforcement. The second part discusses the main non-quantifiable aspects.

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QUANTIFIABLE ASPECTS

Share of Export Price Received by Growers

The share of the export price received by growers is a measure of how efficiently a coffee's value is transmitted through a producing country's supply chain, and is usually positively correlated with income.

Scenario A: Limited Enforcement

Where low quality coffee is either removed from an individual producing country's exports and destroyed, or upgraded to the nearest grade still permissible for export, i.e. Options 1 and 2, respectively, this resulted in a relatively modest change in the share of the export price received by growers compared to the base case (Diagram 4.1). This occurs because:

- There is little or no change in the export price for the improved quality coffee. This assumption is confirmed from the case studies, where it was only in the cases where local buyers were buying for local market processing that premiums were be paid.

- Under Option 1, growers are marketing a reduced volume and hence average prices are lower.

- Under Option 2, the benefits to the grower accrue from a reduction in domestic marketing costs; in particular, exporters reprocessing costs are reduced (Diagram 4.2). However, the case studies often confuse how great this benefit may be as the schemes that are in operation involve growers delivering coffee directly to the exporter or roaster and hence the marketing chain is shortened. While this is possible for small quantities, on a larger scale this is impractical and would involve considerable investment in logistical functions by local exporters. Whether this option is financially beneficial to growers is dependent upon the reduction in costs to the exporter being greater than the additional costs to the grower. The case studies point to a reduction in costs in the order of 1 to 3 c/kg.

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Diagram 4.1: Scenario A – Grower's % of Export Price

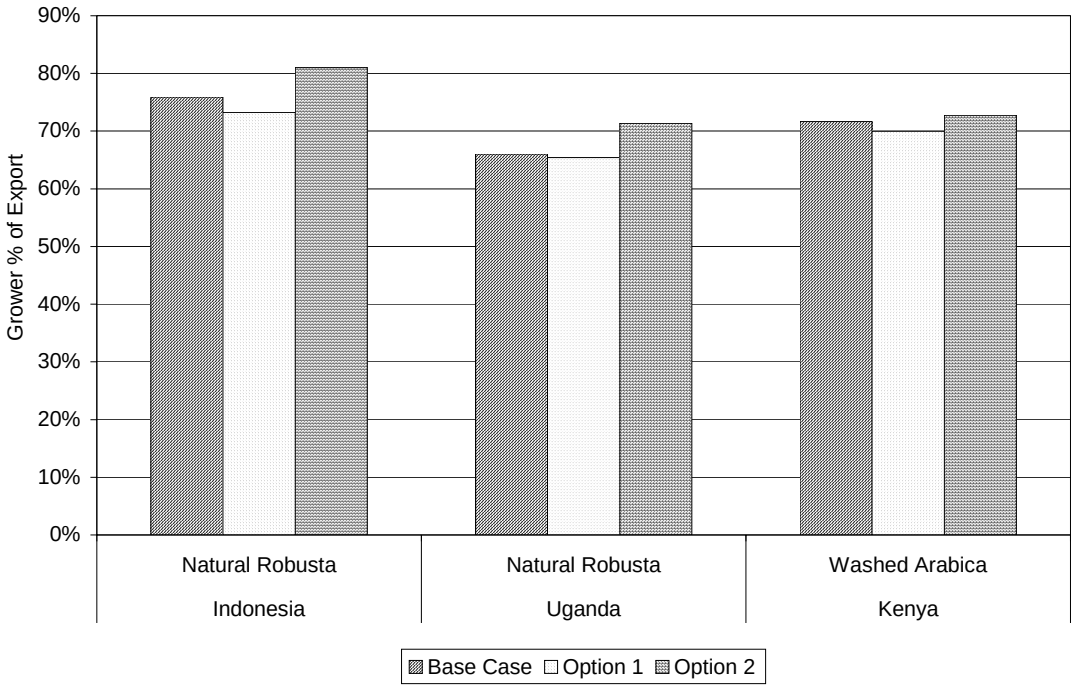
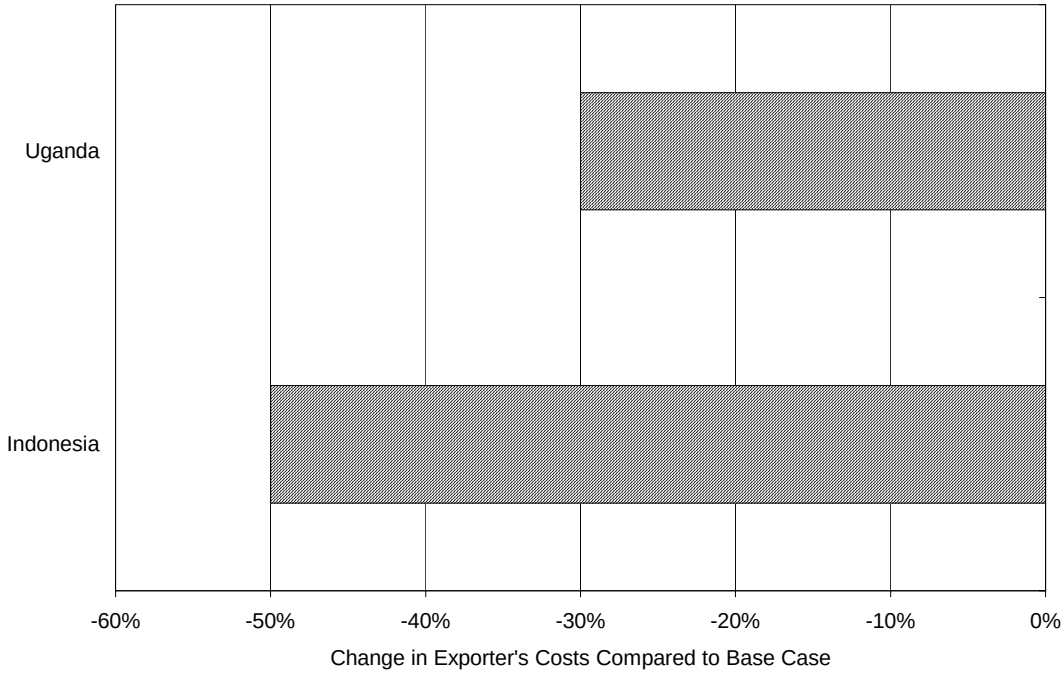


Diagram 4.2: Scenario A, Option 2 – Changes in Exporter's Costs – Uganda and Indonesia



In the case of strictly enforced hygiene standards (Scenario B) where low quality coffee is either removed from all producing country's exports and destroyed, or upgraded to the nearest grade still permissible for export, i.e. Options 1 and 2, respectively, this

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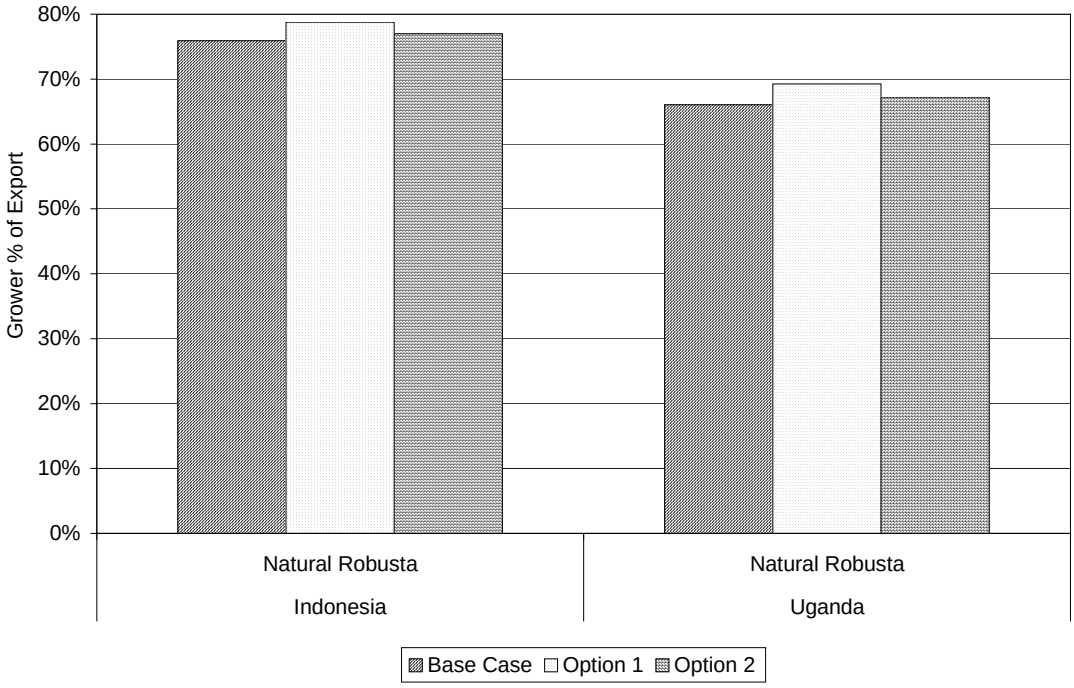
resulted in an increase in the share of the export price received by growers compared to the base case (Diagram 4.3). This is because there is an increase in the export price of coffee as lower volumes are being marketed. The reduction in volumes is greater under Option 1 and hence the price rise is greater. Under Option 2 some of the price benefits are reduced due to higher production costs.

Diagram 4.3: Scenario B – Grower's % of Export Price



Grower's Margins

An alternative and more direct indicator of how changes in food safety legislation would impact profitability along the supply chain and, in particular, the incentive to produce improved quality coffee, is to examine changes in grower's margins.

In the limited enforcement case, as a lower volume can be marketed, growers margins fall. The fall in margins is greater in countries that produce a higher proportion of low quality coffee such as Côte d'Ivoire and Indonesia. Outcomes are worst in cases where coffee is destroyed (Option 1). In the case of Option 2, the upgrading of low quality coffee to levels beyond the nearest permissible export grade could result in a more favourable outcome for growers (Diagram 4.4).

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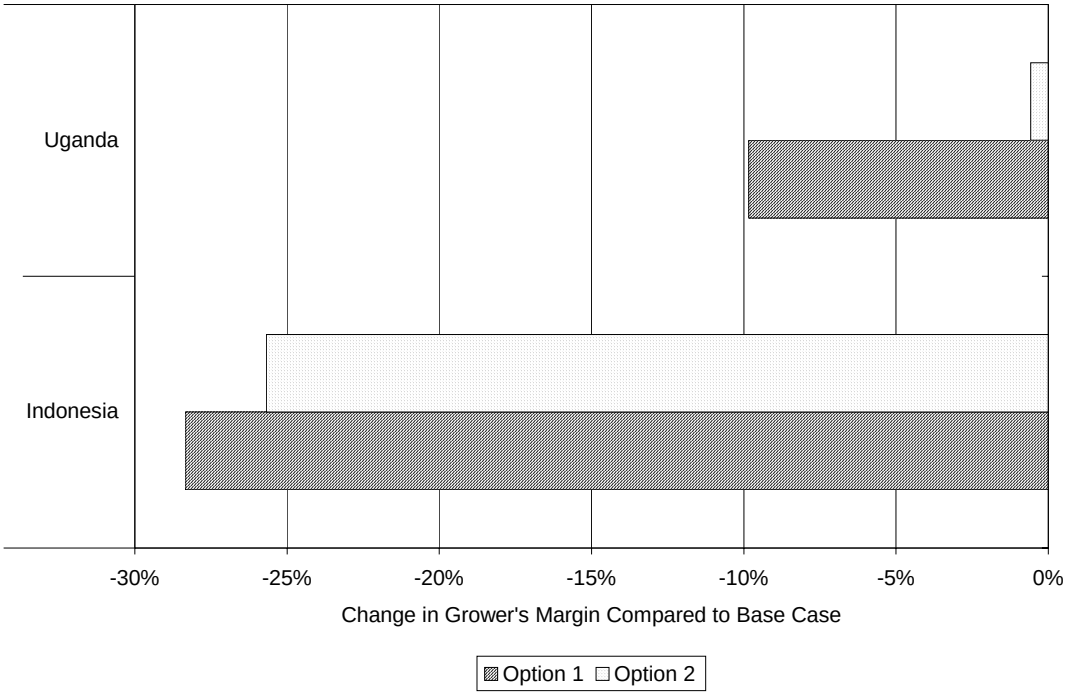
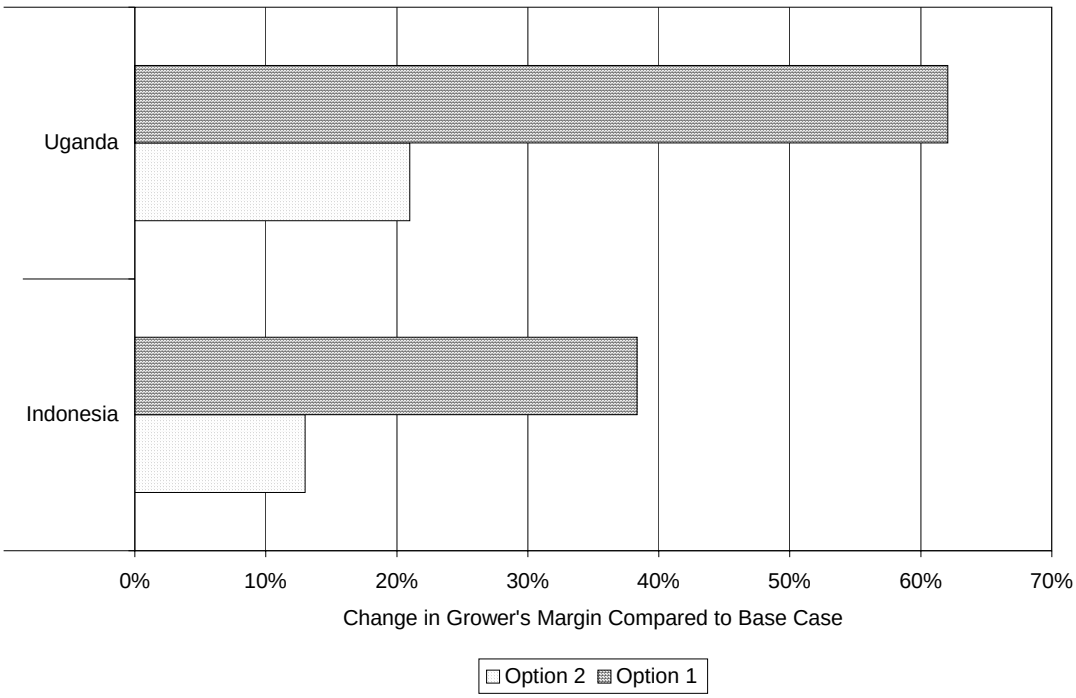
Diagram 4.4: Scenario A – Changes in Natural Robusta Grower's Margins



If the standards were enforced across all robusta producers concurrently (Scenario B), prices increase in response to a reduction in supply and grower's margins increase sharply - by approaching 40% in Indonesia and by over 60% in Uganda under Option 1. The impact is less dramatic under Option 2 (Diagram 4.5).

Diagram 4.5: Scenario B – Changes in Natural Robusta Grower's Margins



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NON-QUANTIFIABLE ASPECTS

The non-quantifiable aspects of the potential impact of changes in food safety legislation are considered in terms of, firstly, the coffee producing countries and, secondly, the international coffee trade.

Coffee Producing Countries

Limited Enforcement

The analysis suggests that grower's incomes and margins would fall if coffee quality improved under a limited enforcement scenario. There are a number of assumptions used that lead to these conclusions:

- It is assumed that there would be no export premium for these products. The evidence from the case studies suggests that in the case of **Indonesia** and **Côte d'Ivoire**, improved quality coffee is purchased for higher prices by Nestlé for their local soluble plants; however, it is not clear whether overseas markets would pay these prices, nor what volumes they would buy. Exporter schemes to produce improved quality coffee, such as the one being operated by Ibero in **Uganda**, are usually small-scale and offer limited price premiums to growers. The exporter though receives no price premium. On the other hand, these schemes do offer the possibility of differentiating the product and of facilitating traceability, which may enable growers to negotiate higher price premiums over time. Even in the cases where premiums are being paid, such as the Nestlé schemes, the market size is limited.

- Where growers receive a higher proportion of the export price this is due to lower internal trade costs. In the existing initiatives some schemes providing a market for improved quality coffee involve exporters dealing directly with growers, cutting out local traders' margins that can then be added on to the farmgate price. However, local traders often provide important services to growers; in **Indonesia**, they typically provide pre-harvest credit as well as farm inputs and household goods, while in **Uganda** local traders provide a competitive market environment, enabling those growers in urgent need of cash to sell their coffee as soon as it is harvested. This suggests that this model may be limited in its applicability.

- In addition, most coffee is produced by smallholders who are not usually in a position to negotiate price premia for higher quality coffee. This is the case in Uganda. Also, the competitive nature of the market means that even if price premia are paid, other traders will raise their prices in order to secure supplies if they are short of coffee. Buyers, on the other hand, would prefer to deal with larger volumes (whether it be from groups, associations or cooperatives), rather than individuals, in order to lower their unit transaction costs.

- Costs in importing countries are unaffected by improved quality production at origin. As the costs of reprocessing are high in consuming countries (in the order of 20 cent per kg) most traders have invested in processing equipment at origin.

Strict Enforcement

Under the strict enforcement scenario, grower's incomes and margins rose. However, the practical constraints would include:

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- Costs – costs of destruction, monitoring and compliance were not taken into account in the analysis. These are difficult to quantify but could be substantial, with the onus to pay likely to fall on producing countries.

- Institutional capacity – most producing country domestic marketing systems have been liberalised, and the capacity of industry or government agencies to police strictly enforced schemes would in most cases be extremely limited..

- Impact on consumption – consumption growth in the immature coffee markets, such as those in a number of the emerging economies as well as those in the producing countries themselves, may be contained by the non-availability of cheaper coffee. One of the reasons cited for the strong growth in coffee consumption during the coffee crisis has been the availability of cheaper coffees in emerging markets that has increased the affordability of consumption and led to strong consumption growth in these markets.

- The history of intervention in the coffee market suggests that it would be very difficult if not impossible to implement such a programme. Coordinated programmes between producers and consumers, such as International Coffee Agreements with economic clauses, have not been operational since 1989 and the Quality Improvement Programme, while raising awareness, has not reduced the volumes of poor quality coffee being traded. Presently, there is little if any political will to go back to such a system. On the other hand, food safety regulation is not equivalent to 'market intervention'. Numerous international agreements on food safety underline the responsibility of government to take action to ensure that producers adhere to hygiene requirements. Their level of activity, however, depends on the perception of regulators of the magnitude of the risk posed by OTA contamination of coffee. The level of consumer interest in this health issue could influence the attitude of regulators.

- There are also technical considerations that limit the adoption of such programmes. Where the grower is selling dried cherry, it is often difficult for the buyer to ascertain the inherent quality of the coffee; most traders do not even have the equipment to determine moisture content (for instance, in **Indonesia** and **Uganda**). This problem is compounded by the fact that most growers prefer to receive an immediate cash payment, restricting the trader's ability to pay a quality premium later on, after the coffee has been processed and graded.

International Coffee Trade

It is important to reiterate some of the points raised during interviews with the major coffee roasters and international coffee traders:

Roasters

- For most roasters, a major concern is to supply coffee to retailers that is consistent in appearance and taste throughout the year. In order to achieve this they blend together several different origins of coffee; coffees making up the blend need to be relatively easily substitutable often from a number of countries. Deliveries from traders to roasters can be from a basket of acceptable coffees, often from different countries. The baskets represent coffees that are acceptable for the same purpose in blends.

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- While the preference is for the supply of a consistent quality of raw material over time, modern roasting technology enables roasters to adjust their blends to allow for variations in cup quality from a particular origin without affecting the taste of the final product. Technology also allows for variations in physical quality during roasting, for instance broken beans (except where the final product is whole roasted beans).

- Quality definitions depend on the particular requirements of the consuming market. For instance, in emerging markets such as those in Central and Eastern Europe, the requirement is mainly for cheaper soluble and roast and ground (R&G) products in which consumers are prepared to accept the taste of coffee containing higher levels of defects. As such many roasters consider that there is no such thing as 'poor quality' coffee!

International Traders

- Traders have to adapt to the same underlying market trends as those affecting roasters, notably the increasing demand for cheaper coffees. This requires them to work closely with exporters to source raw material according to increasingly detailed price and quality specifications.

- While traders have often invested heavily in secondary processing facilities in producing countries, they consider that the majority of quality problems found in coffee can only be addressed by improving production, harvest and primary processing practices. Overall, between 5% and 10% of coffee produced is considered as being of 'poor quality' by traders.

- In the liberalised domestic markets found in most producing countries, the competition for farmers' supplies among local buyers is intense, while regulation is in practice often non-existent. Farmers exhibit a preference for receiving immediate cash payment for coffee that is usually in a form in which its quality cannot be assessed. This restricts a trader's room for manoeuvre in terms of paying the farmer a higher price for higher quality coffee.

CONCLUSIONS

International coffee traders estimate that between 5% and 10% of coffee produced is of 'poor quality'. This is a similar proportion to that used in the preceding analysis to estimate the impact of removing and destroying 'poor quality' coffee under a scenario in which hygiene standards were strictly enforced.

In a limited enforcement scenario, the benefit to farmers of upgrading coffee depends how much costs can be reduced along the supply chain, how much of this cost reduction is passed on to growers, and whether this increase in income makes it financially beneficial to upgrade coffee.

Export premiums are unlikely. The exceptions to this are the niche markets such as Utz Kapeh, Fairtrade, etc., which are considered further in Part 2 of this study.

In order to realise premiums from reducing costs along the supply chain, smallholder growers may need to organise themselves into groups that can agree on higher standards and link with traders or exporters to market their produce in bulk, although this requires coordination. One advantage of this is that the supply chain can often be shortened, which also increases the scope for higher farmgate prices.

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Growers would also need to sell their coffee in a form where quality could be assessed to receive price premiums. In the case of natural robusta, this means selling green bean as opposed to dry cherry, which would require additional investment by growers, while local traders may suffer a reduction in their margins.

In the case of a strict enforcement scenario, the analysis suggests that grower prices would rise due to the lower volumes being marketed. However, most industry participants remain sceptical about the political desirability of such programmes (among both producers and consumers) and the ability of the authorities in producing countries to enforce such legislation.

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Part 2: Introduction

Traceability is becoming increasingly important for a number of agricultural or natural resource based commodities. Retailers realise that it is important to establish the origins of the goods they sell, to improve buyer - supplier relations and marketing links, and to provide better assurance of product quality. Traceability is also necessary to enable end users to distinguish between sources according to the means of production. It can provide the basis for consumer initiatives aimed at improving production technologies or ameliorating any negative social or environmental consequences associated with producers or the production process. It can also provide a marketing basis for product differentiation.

Part 2 of this report compares approaches to traceability in different agricultural and natural resource-based commodities, with particular emphasis on applications in the coffee sector. The first chapter describes general approaches to traceability, the reasons for and needs of traceability systems and the levels of assurance that are typically provided. Chapter 2 summarises existing approaches to traceability and product differentiation in the coffee sector. The report aims to highlight the major issues for consideration when developing a system of traceability, and to indicate the strengths and weaknesses of different approaches, including cost implications, in particular with regard to application in the coffee sector. Chapter 3 draws Part 2 together providing a number of conclusions.

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Chapter 1: Description of Different Traceability Systems for Commodity Crops

A number of different approaches to traceability systems for commodity crops have been identified. The three main ones are:

- Option 1: Conventional chain of custody based on segregation throughout the production process to provide traceability from a specific plantation or primary processor to the final users (sometimes referred to as Identity Preserved- IP- approach).

- Option 2: Development of a commodity 'grade' thus allowing it to be traded as a commodity while still keeping it separate from conventional product. This would be based on the use of chain of custody, but on a large scale so there would not be any link between a particular batch of product and a specific plantation, but all product would have originated in an identifiable plantation.

- Option 3: Development of a 'book and claim' approach. In this case a user specifies a given characteristic ('sustainable') of product to a supplier who then ensures that an equivalent quantity of product is purchased from a plantation complying with the specification. This approach is based on ensuring that a given quantity of product enters the supply chain, but it does not seek to make any physical link between specific plantations and the user – the actual product delivered could be from any source.

This stage in the study concerns developing a fuller understanding of the three options by relating the three options to existing traceability approaches employed in specific sustainability initiatives in order to determine the practical applications of the options. The first part of the chapter gives a brief description of some examples of existing traceability approaches under each option and their implementation mechanisms, while the second part compares and analyses each option.

RELATING SELECTED SUPPLY CHAIN APPROACHES TO THE THREE OPTIONS

Option 1: Full Chain of Custody Based on Segregation

Many supply chain initiatives designed to enhance the social and/or environmental outcomes of production and trade do not use conventional bulk commodity markets. Where traceability is an integral part of the initiative and cannot be provided by existing market structures, alternative supply chains are often established. These tend to cut out many intermediaries, resulting in significantly shorter chains. The reality is therefore that a proportion of many products typically considered as commodities are in fact not traded as commodities, but as differentiated products in segregated supply chains.

Commodities are traded in this way when they have particular attributes distinguishing them from conventionally traded commodities. Although some of these attributes have physical elements, most relate to the geographical source, or production or process methods (PPMs), which are not inherently recognisable from the product itself. For example, tea grown on plantations with high labour standards or to organic specifications may not itself taste or look any different to tea grown under conventional systems with poor labour standards. In order for these attributes to be recognised in the marketplace, they need to be verified and guaranteed in some way. Existing initiatives that attempt to do this fall under three categories, as follows:

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Third Party Certification/Audit

Initiatives that seek to create products with a strong sustainability message often require the highest level of guarantee. Third party certification is seen by many as the favoured option in terms of credibility, although it does not necessarily imply any higher standards than other types of audit. A recognised and accredited independent body inspects the production, and in some cases the trading arrangements, and certifies that the product has been produced according to a given standard. Third party certification/ audit is appropriate for the differentiation of small-scale production e.g. thousands of tonnes per annum. Examples that are commodity specific include the Forest Stewardship Council (FSC) and the Marine Stewardship Council (MSC). Issues-based schemes that cut across a number of commodities include the organic and Fairtrade schemes. Other examples include ISO 14001 for environmental management systems and the EUREPGAP Protocol for fresh fruit and vegetables. In most cases, a dedicated institution exists to develop standards and to promote and regulate the scheme.[1] Certification may also be linked to other support or capacity building services or lobbying roles. In most cases, certified products are labelled as such at the point of sale, although certification is sometimes aimed at trade customers rather than the end consumer. A classic example of a third party certification is given in the case study of the MSC third party verification of chain of custody for use of MSC logo on fishery products.

Example: MSC Fishery Chain of Custody Verification and Use of MSC logo on Fishery products

In the Marine Stewardship Council (MSC) Certification Programme a fishery is assessed to the MSC Standard for Sustainable Fishing. Use of the MSC logo on fishery products is only permitted where there has been independent verification that the product originated from an MSC certified fishery. A Chain of Custody (CoC) Certificate provides this verification.

If there is no logo or claim made on or about a product then CoC Certification is not required. Therefore, anyone wanting to apply the MSC logo to a fish product must first obtain a CoC Certificate. Each member of the supply chain including processors, retailers and restaurants must be certified up to the point of applying the label to the product Products with a certified supply chain will be eligible to carry the MSC logo; products with a non-certified supply chain will not be eligible to carry the logo.

Only an MSC accredited certifier – either the certifier that certifies the fishery or another MSC accredited certifier can undertake MSC CoC Certification. The list of accredited certifiers is on the MSC website (www.msc.org). Any certification organization may apply for accreditation by the MSC if it meets specific requirements. The requirements are set out in the MSC's Accreditation Manual (also available on the MSC website).

CoC verification takes place at any organization in the supply chain that wants to make the MSC claim that they supply MSC certified fish or to use the MSC logo. For certification to be awarded the Certifying Body (CB) will consider the organizations supply chain all the way from the fishery. The CB will determine the intensity and type of assessment and assess various risk issues. The major risk issue for consideration is the probability that certified and non-certified fish species could be intermingled.

A company wanting to apply the MSC logo to a seafood product(s), contracts an MSC accredited certifier to assess their supplier(s) traceability. The certifier will request documentation relating to that supplier and will visit the client's site to verify that the product to which the logo will be applied originated from a certified fishery.

In most circumstances, verification of a supply chain is straightforward since companies already

[1] In addition, the leading voluntary international standard-setting, certification and accreditation schemes that are focused on social and environmental issues are have joined together as a formal association called the ISEAL Alliance. See www.isealalliance.org.

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operate product identification and tracking systems for other purposes such as ISO9000 Certification. If the certifier verifies that the product identification and segregation systems are adequate to ensure that products from certified fisheries are not mixed with products from uncertified fisheries, the company will receive a CoC Certificate.

In the case of a multiple branch or multi-divisional retailer or foodservice operator, a CoC Certificate may be sought by the retailer's head office or divisional office. The CoC Certificate would require the certification body to visit a sample of sites to verify relevant internal audit programmes covering individual outlets.

Source: http://www.msc.org/assets/docs/Chain_of_custody/

Generic certification initiatives applicable to a wide range of commodity products, including coffee, soy, and fruit and vegetables, include the IFOAM initiative for organic production, the Sustainable Agriculture Network and EUREPGAP, for all of which traceability is an essential component.

IFOAM

IFOAM deals with standard setting, promotion, and accreditation of organic certifiers worldwide. IFOAM developed from a network of organic schemes and farmers worldwide into a global standard setting and accreditation programme established in 1992. It functions as a federation of approximately 700 membership organisations including producers, NGOS, science organisations and certification bodies.

IFOAM has developed a standard (IFOAM Basic Standard for Production and Processing) and a set of accreditation procedures. The standards form the basis of standards developed by accredited organic certification bodies. Standards cover organic production in agriculture and horticulture; draft standards exist for forestry. Standards can be developed and applied worldwide. IFOAM standards also apply to processing of organic food.

Certified organic products may be labelled, either with the IFOAM or the certification body logo (or both). Labelling requires traceability from plantation to final point of sale. Products containing less than 100% certified organic products can be labelled under specific percentage labelling rules.

Sustainable Agriculture Network

SAN[2] is a coalition of conservation NGOs working in the tropics, coordinated by the Rainforest Alliance which serves as a secretariat. SAN has developed a generic standard for sustainable agriculture (available at www.rainforestalliance.org). Currently standards have been developed for a range of crops including coffee, bananas and citrus fruits. Standards for oil palm are under consideration. The network is mainly focused on Latin America but expects to start working in Asia and Africa within 5 years.

SAN offer the use of a logo for on-product labelling although currently use of the certification is largely business-to-business. Chain of custody assessments, necessary for use of the logo, can be provided.

[2] Previously the Conservation Agriculture Network

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EUREPGAP

EUREP was created by a consortium of food retailers, producers and traders. The aim is to produce unified certification standards: a protocol exists Integrated Farm Assurance, and there are also specific standards for fruits and vegetables, coffee flowers and ornamentals and aquaculture. The standards cover food safety, environmental issues and social standards. Certification bodies have been contracted to provide assessments against the EUREPGAP Protocols.

EUREPGAP aims to provide reassurances to consumers about the safety of the foods that they purchase, as well as environmental and social standards under which it was produced. In order to do so, food traceability must be assessed.

First or Second Party Certification/Audit

Where companies do not need to demonstrate the highest level of guarantee to external audiences such as consumers, or where there is limited availability of independently certified products, first- or second-party certification may be used. This also involves a given standard against which production or trading processes are compared, but a third party does not independently certify this. First-party auditing involves the producer carrying out a self-audit and keeping records to demonstrate that the proper processes have been followed. The Linking Environment And Farming (LEAF) audits in the UK work on this basis.[3] Second-party auditing involves the buyer of the product inspecting the production or trading processes, often on a sampling basis. This may be carried out by the retailer or by integrating suppliers further up the supply chain. An example of this is the Migros Criteria for Oil Palm Plantations, which are now being implemented on plantations supplying Migros in three countries. This approach is common among major retailers using their own private standards, which are often linked to quality. It may also be used to audit against external standards such as the Ethical Trading Initiative base code.

Identity Preserved Mechanism

As noted earlier, the international trade of agricultural products is based on a commodity system. Traditionally, traceability has been limited by bulk handling and the undifferentiated nature of commodity markets, where companies bought according to a narrow range of attributes (e.g. protein content, moisture, percentage of extraneous material quality). The bulk commodity system works on the basis that crops from different farms are sufficiently alike to be traded at a common price and to a common grading specification. Usually, commodities from different origins are blended to meet specific grades. Such 'blend and send' bulk handling is very efficient - Cargill has calculated that ocean transport from the US to Europe may only add 13 € to the price of a tonne of soybeans (180 – 225 €) if 50,000 tonnes are shipped at a time. But it has disadvantages: the co-mingling that occurs to take advantage of bulk handling means that signals cannot be sent from consumers (or more accurately, the processor or retailer) to producers. Trading is disconnected, and conducted with very little accompanying information.

Identity Preserved (IP) mechanisms of commodity production were therefore developed to redress this trade disconnection between producers and processors or retailers and

[3] As well as self-certification, LEAF also offers farmers the opportunity to have an external audit.

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consumers. Unlike conventional bulk commodity production, IP commodity production allows a commodity to be differentiated in the market. This is achieved through a combination of contract farming, information and tracking technology[4], production, processing, and distribution technologies, and process standards. IP technology has so far largely been applied to managing risk, for example in excluding GMOs from supply chains, or ensuring quality, such as enhanced starch quality in maize. Use of this technology is growing. There are possibilities of widening the set of attributes to include sustainability of production, processing and handling. It can be concluded that if the retail or processing end of the chain starts to demand products from environmentally friendly production systems, the technology exists for commodity systems to respond to meet those demands, albeit with cost implications. A case study of how IP mechanisms can be used for handling crops is described in the box below.

Case study: handling of IP crops from the seed company to the end customer in a supply chain that involves an increasing number of critical members

Stage 1 Production

- Grower and customer define specifications, testing procedures, and other procedures and sign contract.
- Seed Company supplies seed to grower and provides certificate to grower.
- Grower tests sampling of the seed to reconfirm purity; selects field locations based on ability to segregate to prevent contamination; cleans all planting, handling, and harvesting equipment used throughout the process; plants field.
- Customer inspects field for contamination and management practices

Stage 2 Shipment handling

- Grower cleans transportation and handling equipment; separates and cleans storage facilities; harvests and stores product; tests product; determines order of shipping beans based on storage condition.
- Customer calls for delivery of specified quantity of product.
- Grower cleans handling and transportation equipment, loads product, assures no contamination during shipment (e.g., uses bulk liner in container); ships product, and provides certificates to the customer.

Stage 3 Delivery documentation

- Any handling facilities separate and clean storage as well as handling equipment and provide certificates to customer. Customer separates and cleans storage as well as handling equipment; tests delivered product; stores product; processes each lot of product separately to allow for traceability of product back to grower.

Stage 4 Archiving documentation for future reference

- Grower retains all records for two years (e.g., planting date, field number, seed identity, inputs used, harvest date, storage bin number, handling and transportation, equipment numbers, delivery date, etc.).

[4] Such as that developed by IdentityPreserved (see http://www.identitypreserved.com) or efarm (see http://www.efarm.com/)

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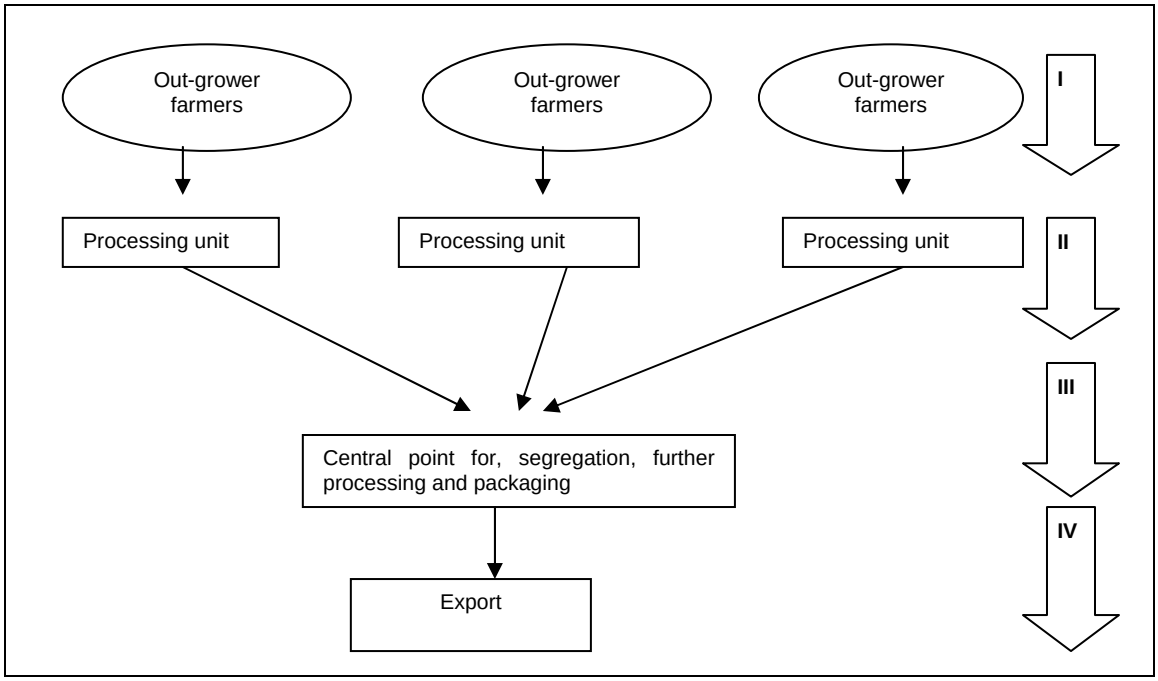
Option 2: A 'Grade' Commodity Separate from the Conventional Product

This mechanism is based on the use of chain of custody applied on a large scale so that there would not be any link between a particular batch of the 'grade' commodity/ product' but all would have come from production centres using criteria or standards developed for the particular 'grade' commodity / product. This approach is appropriate for supply and demand situations reaching tens or hundreds of thousands of tonnes per annum. It can be applied in conjunction with a first/ second party certification/ audit especially where companies do not need to demonstrate the highest level of guarantee to external audiences such as consumers.

The 'grade commodity' supply chain approach can be applied to out-grower schemes or cooperatives in the large scale, also known as 'area-wide initiatives' where a community of growers within a region is involved. This requires that buyers exercise strict control over producers by ensuring that the producers operate according to the 'grade' standards. With out-grower schemes, it is may also be important to determine the critical control point at which raw material segregation is crucial for the credibility within the supply chain; this will depend on the scale of raw material processing and that the type of product (e.g. crude palm oil, further processed etc) to be sold for export. In all cases, the main issues for consideration with this option are:

- Appropriate determination of the attributes-'grade'-for describing and identifying the commodity product (e.g. responsibly produced, high environmental and social standards, etc)
- Determination of the control/ governance procedure for handling production in-flows and marketing
- Determination of an appropriate mechanism for out-competing substitutes
- The appropriate chain of custody guaranteeing consumer credibility

A schematic representation of how 'grade commodity' supply chain approach might work with out-growers is presented in the figure below:



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This shows 4 stages in the production process for the 'grade commodity'. These productive stages are (i) raw material production (by out-growers) (ii) supply to processing units for initial processing (iii) Delivery to a central point for further processing and packaging-optional and (iv) export. The main chain of custody issues to be considered under each of the production stages described have been detailed below:

Stage I: raw material production (by out growers)

- Ensuring that the out-growers are involved in the process
- Ensuring that the out-growers apply the criteria for production
- Ensuring that out-growers meet the 'grade' specification
- Ensuring that delivery from the out-grower plantations are marked and identified on arrival at the mills

Stage II: Initial processing and delivery to central point

- Ensuring that the mills are included in the process
- Ensuring that processing and handling at the mills meet the criteria
- Ensuring that processed materials are marked and differentiated by the 'grade' identification mark
- Ensuring that packaging and transporting to the central further processing point is adequate to avoid mixing with 'non-grade' products

Stage III: Central point for further processing-optional

- Ensuring that materials arriving at this point are clearly identified with the 'grade' mark
- Ensuring that further processing is adequate to keep the 'grade' product separate from other sourced materials
- (If required) ensuring that products from each plantation are kept separate from each other to allow for traceability
- Ensuring that final packaging carries the 'grade' identification mark

Stage IV: Export

- Ensuring that export products carries the 'grade' identification mark. This require due diligence at the shipment bay
- Ensuring that the 'grade' products are clearly differentiated at their export destinations

This approach has been used in implementing a GM-free supply chain for soybeans, which has been the subject of certification inspections since at least 1999. The volume of non-GMO Brazilian soy meal certified by one certification body, Cert ID, in the 2004 harvest season alone amounted to just below 8 million tonnes, equivalent to

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approximately 25% of the soy meal consumption of the EU feed industry.[5] The Basel Criteria for Responsible Soy Production have also now been developed as a generic set of guidelines prepared by ProForest for the Swiss Coop and WWF Switzerland. The criteria were developed by drawing on existing standards such as Eurepgap, and relevant ILO conventions. The intention was to form a set of guidelines that were compatible with the requirements of other users and schemes. Area-wide initiatives, utilising the grade approach, will be able to be applied for the implementation of the Basel Criteria.

Forest certification supply chains, using 'physical separation' methodology, also work on the basis of a grade commodity approach.

Option 3: The 'Book and Claim' Approach

The 'book and claim' supply chain approach has been actively utilised in the forest products sector for certified material for some years, and is now under consideration for 'sustainable' palm oil. This involves a user specifying the desired product, such as certified timber, in a contract to a supplier who then ensures that an equivalent quantity of the product is purchased from plantations implementing the certification criteria. The required quantity of specified product enters the supply chain, but this approach does not seek to make any physical link between plantations implementing the required specification criteria and the user making the specification - the actual product delivered could come from any source. One of the strengths of this approach is that theoretically it could be used at any scale of production and use. This approach can operate in practice using the chain of custody procedures described above; but without segregating at stage III.

The energy sector provides classic examples of how this approach can be implemented in practice.

One example in commodity products is provided by forest certification schemes. The Programme for the Endorsement of Forest Certification Schemes (PEFC) refers to this as the percentage based method. The analogous FSC approach is known as the FSC credit system.

Example: FSC Credit System

The FSC chain of custody requirements include a number of options for chain of custody control. Products containing 100% FSC certified material are based on a certified grade approach to traceability. Products containing a mixture of FSC certified wood material and non-certified materials are controlled either through a threshold certified content approach, or by the credit system. The latter is now being phased in to replace the former.

The FSC credit system depends on the maintenance of accounting records, to monitor the proportion of FSC certified material entering a product line. After application of a conversion factor to allow for processing, the equivalent proportion of final product can be labelled as 'FSC Mixed'. A new FSC Mixed material label is used for selling the mixed wood fibre products.

Source: www.fsc.org

[5] Figures from Genetic ID (Europe) AG

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Chapter 2: Applications in the Coffee Sector

The issue of traceability in the coffee sector has its roots not so much in food hygiene as in a response to the "coffee crisis", the view being that greater differentiation of production can lead to higher prices for producers. Traceability provides one way of differentiating production and guaranteeing that the claims made by marketers are correct. Mostly, initiatives have focused on the production of coffee destined for niche markets, usually at the higher end of the market.

Coffee production and trade are challenged on economic, environmental and social fronts. Coffee prices received by producers declined dramatically during the late 1990s (the "coffee crisis") as coffee supply outstripped demand, resulting in a situation of considerable oversupply. Prices have since recovered, but coffee prices also show extreme price volatility, partly due to climatic variability, but also due to speculation on commodities markets and deregulation of national markets.

Declining prices and the push to obtain greater productivity has encouraged producers to intensify coffee production. Negative environmental impacts caused by intensified farming methods include the loss of tree species as traditional 'shade grown' coffee is replaced by 'sun' coffee, and the increased use of artificial inputs. Coffee hulling (the initial stage in processing) can also have significant negative impacts on the environment through discharges of wastewater with an extremely high Biological Oxygen Demand (BOD).

Coffee producers often have few viable alternatives when coffee production becomes uneconomic. Producers' investments in long-cycle coffee plantings mean that they cannot easily switch to other crops. Even where prices do not cover the production costs, producers may have no alternative but to continue production and survive by reducing expenditure on other necessities such as education and healthcare.

TYPICAL VALUE CHAINS IN COFFEE

Value chains in coffee are variable from country to country, but often follow the general structure shown below.

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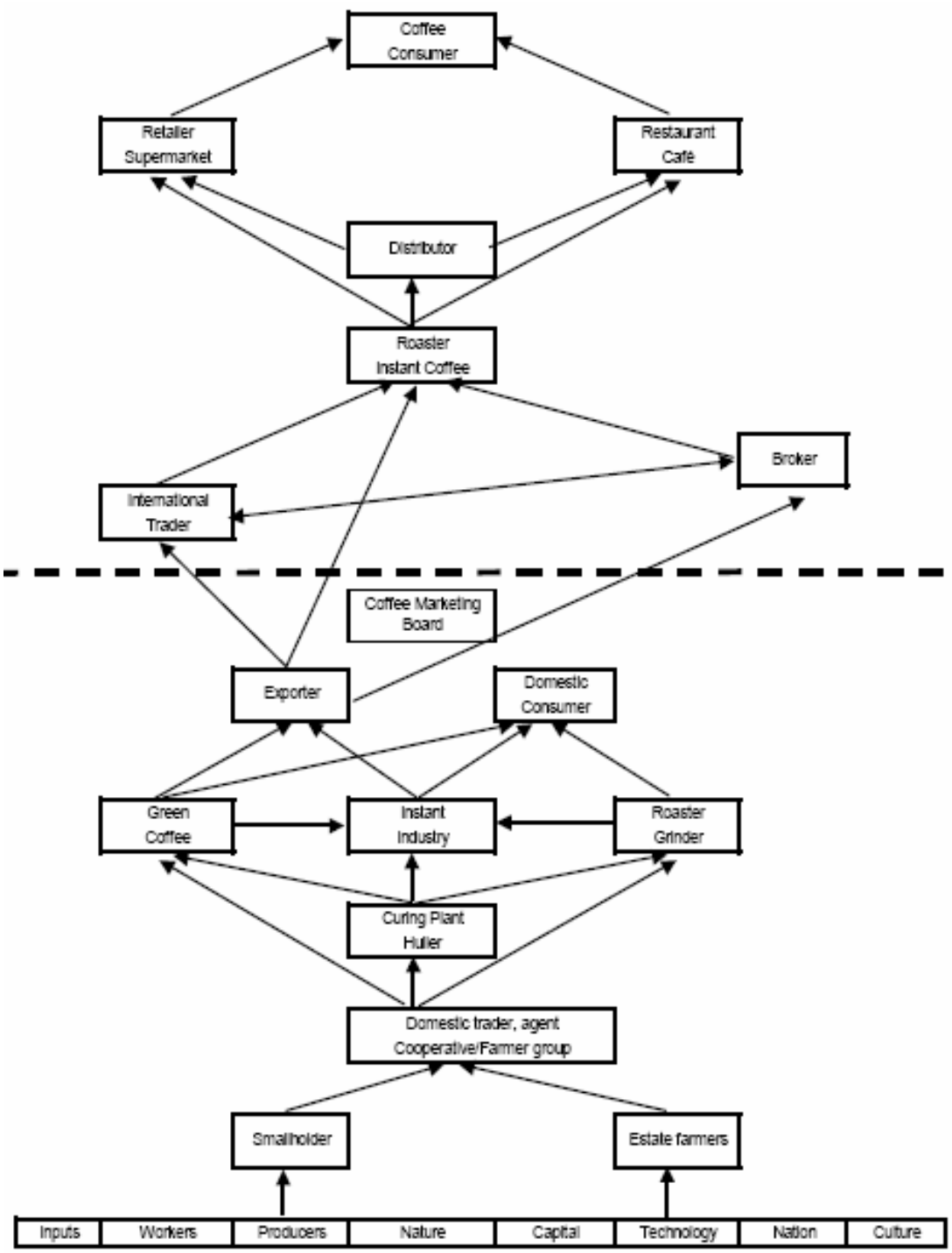

General structure of the coffee market chain (source May, Mascarenhas and Potts, IISD, May 2004)

MAINSTREAM AND NICHE MARKETS

Although the coffee market has become increasingly segmented over recent years, mainstream coffee still makes up the bulk of the global coffee trade. Mainstream coffees, including robusta, make up 85-90% of world coffee consumption, while speciality and niche coffees comprise only 10-15% of the market.

For most roasters, a major concern is to supply coffee to retailers that is consistent in appearance and taste throughout the year. In order to achieve this they blend together

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several different origins of coffee; coffees making up the blend need to be relatively easily substitutable and from a number of countries. Traders often agree future deliveries to roasters of a basket of acceptable coffees, often from different countries. The baskets should represent coffees that are acceptable for the same purpose in blends.

Niche coffees differentiate themselves from the bulk market by their particular taste qualities (such as some speciality coffees) or by other attributes that appeal to particular consumers, such as the methods involved in their production (organic, shade grown) or trading (eg. Fairtrade). Niche coffees often, but not always, command a premium over the mainstream coffees. However, the costs of producing and marketing niche coffees – especially where knowledge of their origins is important – may absorb most of the premium.

SUPPLY CHAIN INITIATIVES IN THE COFFEE SECTOR

In response to the array of economic, environmental and social challenges facing the coffee sector, a wide variety of supply chain initiatives have developed. The various initiatives have different, but often overlapping objectives, addressing aspects of sustainability.

Given the relatively small size of niche markets, this may be seen as a limit to their effectiveness. Globally, the volume of certified "sustainable" coffee (including organic, fair trade and shade grown) was around 16,000 tons, with a retail value of US$490 million in 2000. This amounted to less than 1% of the global coffee market (Ponte, 2004).

Four supply chain initiatives are analysed in this report. These were chosen on the basis of their different objectives, governance mechanisms and levels of implementation, and the implications of these for traceability in the supply chain. The four initiatives chosen are:

- Fairtrade, an NGO initiative that aims to facilitate sustainable development for excluded and disadvantaged producers, particularly through ensuring a fair price for their products;
- Starbucks Coffee and Farmer Equity (CAFE) Practices (formerly Starbucks Preferred Supplier Programme), a private initiative that aims to reward suppliers to Starbuck's Coffee Trading Company who meet their guidelines with preferred supplier status.
- Common Code for the Coffee Community (CCCC), a joint initiative between the German Coffee Association and GTZ, that aims to increase the supply and demand for coffee on its way to sustainability based on market mechanisms, within the mainstream coffee market.
- Utz Kapeh, a certification programme that aims to provide assurance of environmentally and socially responsible growing practices, benchmarked against European retailer (EurepGAP) protocols.

The Fairtrade and Starbucks schemes belong to the speciality market, while the schemes operated by Utz Kapeh and the proposed CCCC are more aimed at the mainstream. Other initiatives include:

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- Nespresso: Green coffee purchases by Nestlé for their Nespresso products enjoy a high degree of traceability, to farm level in some cases.

- Rainforest Alliance: This certification scheme is based upon the use of less intensive sustainable production system. Farms that meet the comprehensive standards for coffee production established by the Rainforest Alliance along with their partners in the Sustainable Agriculture Network (SAN) - a coalition of nine leading Latin American conservation organisations - receive the Rainforest Alliance Certified seal of approval, which they can use to distinguish their product in the marketplace. At present, Kraft Foods is committed to purchasing a proportion Rainforest Alliance certified beans in their blends.

Fairtrade Labelling Organization (FLO)

Fairtrade is an initiative aimed at small producers and waged workers in the south who are disadvantaged by the conditions of trade.

The Fairtrade Labelling Organization (FLO) is based in Bonn, Germany and sets standards for a number of products, including coffee, cocoa, rice and sugar. As of May 2004, FLO was working with 389 producer organizations of a variety of products worldwide, representing some 800,000 families. FLO had also registered 350 traders, consisting of importers, exporters, processors and manufacturers, and 550 licensees were authorised by FLO National Initiatives in 19 consuming countries to use the FLO logo on product (www.fairtrade.net). Total imports of fair trade coffee in 2001 amounted to 0.38% of total conventional imports (source FLO, quoted in Ponte, 2004, IISD). Although this represents a tiny proportion of the market, sales of Fairtrade labelled products across the world grew by 42.3% between 2002 and 2003 (www.fairtrade.net).

Fairtrade producer certification and trade registration is carried out by FLO-Cert Ltd., which was separated from FLO in 2004. FLO-Cert is funded in part by contributions from FLO National Initiatives, and, recently, by charging a registration or certification fee paid by producer organisations and traders.

Producer organisations and traders can seek certification against fairtrade standards. Buyers are required to:

- Pay producer organizations a minimum fairtrade price (set in the standards);

- Pay a fairtrade premium (also set in the standards) to allow producer organizations to invest in their social and economic development.

- Purchase directly from grower organizations with contracts extending beyond one harvest cycle.

Producers can apply for Fairtrade certification if they form democratically controlled organisations that can contribute to the social and economic development of their members. FLO certification therefore applies at the level of the producer organisation, not the individual producer.

The Fairtrade Standard for Coffee (Version June 2004) is structured around Minimum Requirements and Progress Requirements. Two particularly relevant areas of the standard relate to distribution of fairtrade revenues and production by small producers. Producer organisations must be able to demonstrate that fairtrade revenues will promote social and economical development of small farmers; a subsequent progress

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requirement stipulates that a monitored plan should be developed under which benefits of fairtrade are shared based on a democratic decision taken by beneficiaries.

Secondly, the coffee standard requires that the majority of members of the producer organisation are small producers; and that of every fairtrade product sold by the organisation, small producers must produce more than 50% of the volume.

These two requirements demand traceability of coffee entering the producer organisation, in order to ensure that fairtrade revenues are distributed accordingly and that an appropriate volume of coffee is sourced from small producers.

Starbucks Coffee and Farmer Equity (CAFE) Practices

Starbucks Coffee Company introduced the Preferred Supplier Programme in November 2001, in order to evaluate, recognize and reward producers of high quality sustainably grown coffee. The programme, originally devised with Conservation International, has been developed in collaboration with the certification company Scientific Certification Systems (SCS) to form CAFE Practices.

CAFE Practices seeks to ensure that Starbucks sources sustainably grown and processed coffee by evaluating the economic, social and environmental aspects of coffee production against a defined set of criteria, detailed in the CAFE Practices Guidelines (www.scscertified.com). Suppliers are also required to be financially transparent regarding payments up the supply chain (ie. From suppliers to processors to farmers) and must assure equity in terms of the distribution of financial benefits. This depends on the supply chain from the farmer or estate being known.

The CAFE Practices program is a private initiative and applies to coffee sourced through the Starbucks Coffee Trading Company (SCTC). The supply chain is complex and highly variable and may involve purchasing coffee through supplier networks or directly from estates, producer associations and processors. Within these supply routes there are varying levels of vertical integration. The CAFE Practices Guidelines are designed to be applied in a modular fashion at the different levels of the supply chain. Suppliers (who may also be providing marketing, dry milling, technical expertise and financing services to growers) are assessed on a sample basis; the supplier's cumulative aggregated CAFE practices rating is defined by the socio-environmental performance of the processors and growers contributing coffee that is sold by the supplier to SCTC. Individual estates and farms, producer associations and processors can also apply for assessment, also on a sample basis.

Although the CAFE Practices program is based on environmental, social and economic guidelines, it is a prerequisite that the supplier has already fulfilled a contract with SCTC. Coffee supplied to SCTC must meet Starbuck's exacting taste and quality requirements. Suppliers meeting these quality requirements, and scoring 80% or more in their CAFE Practices evaluation are awarded Strategic Supplier status. Suppliers scoring 60% or more are awarded Preferred Suppliers status. Suppliers are listed on the Starbucks preferred supplier roster in descending order of scores.

By 2004, 248 coffee farmers and suppliers from 22 countries had applied to become Starbucks' Preferred Suppliers; 139 were approved. During 2004, Starbucks purchased 19.7 million kgs (328,333 bags) from preferred suppliers. Starbucks pays a higher price to suppliers for their high quality coffee; on average during the fiscal year 2004, the Starbucks price was 74% higher than coffee purchased at New York "C" market prices (Starbucks Brochure 'What's the relationship between the price of a cup of Starbucks coffee and what Starbucks pays for coffee beans?' www.starbucks.com). Suppliers are

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assessed on the transparency with which they pass this premium on to producers, which requires them to maintain clear traceability of their sources.

Common Code for the Coffee Community

The Common Code for the Coffee Community (4Cs) is a market-based and open initiative to encourage sustainability in the mainstream green coffee chain. The initiative was started by the German Coffee Association (DKV) and GTZ, on behalf of the German government. The code has been developed by a tripartite multi-stakeholder group including producers, trade and industry (including some of the largest roasters such as Kraft Foods, Nestlé, Sara Lee/Douwe Egberts) and civil society groups.

The most recent version of the Common Code was produced in September 2004 (www.sustainable-coffee.net). The code is currently being tested in a series of pilot projects, financed by international companies in collaboration with the public sector and local producer organisations. The system for implementation of the code is partially developed, but lacks agreement on arbitration procedures and the rules of participation.

The Code is intended to apply to the mainstream market that supplies 85-90% of coffee consumption. In mainstream coffee production and trading, coffee is sold in containers (18 tons, or 300 bags). The Code is therefore expected to apply at the level of a 'Common Code Unit', which is the level where the aggregated volume of coffee composes at least one container. A Common Code Unit may therefore be a producer, farm, estate, producer association or cooperative, a buying station, mill or exporter.

The Common Code is presented as a matrix composed of principles and criteria. For each principle, criteria for continuous improvement are defined in a traffic light system:

- Red indicates the current practice must be discontinued (within 2 years maximum of entry into the scheme);
- Yellow indicates a practice that needs to be improved (within a specified timeframe);
- Green indicates a desirable practice.

The supply chain principle requires that 'The coffee is traceable from 4C Unit to cup (chain of custody).' The attached criteria specify:

- Red – Coffee is not traceable below export level
- Yellow – Documentation methods to trace the coffee along the chain have been developed.
- Green – Identity preservation is ensured by written standardized documentation.

Hence, it is only at the level of the best practice, potentially after several years of participation in the scheme, that full traceability to the container level can be expected.

The Code includes social, environmental and economic principles. In addition a number of 'Unacceptable Practices' have been identified and must be excluded before a Common Code Unit can be admitted to the scheme. Common Code Units will be expected to communicate the Code requirements up and down the chain to its business partners. All parts of the supply chain will be required to accept random audits. National Common Code Bodies are expected to manage the implementation of

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the Common Code. Independent third-party verifiers will be approved and registered by the National Common Code Bodies to carry out audits.

General guidelines have been developed for the use of the Common Code system, and in particular on the way in which participation can be communicated and reported. Common Code coffee will not be communicated through labels attached to the final consumer product. However, buyers will be free to report on the volumes of Common Code coffee purchased.

Utz Kapeh

Utz Kapeh (meaning Good Coffee in the Maya language Quechua) is a certification programme that was founded in 1997 by Guatemalan coffee producers and the Dutch roaster Alhold Coffee Company. Certification activities began in 2002; by the end of 2004, Utz Kapeh was working in 14 countries in Central and South America, Asia and Africa. Sixty-six producers had been certified, with another 50 in transition. A total of 53,600 tons of green coffee was certified, of which 21,000 tons (350,000 bags) was actually purchased as certified coffee. In May 2005, Sara Lee Douwe Egberts Belgium announced that they would be sourcing 10% of their coffee from Utz Kapeh certified producers.

Utz Kapeh has developed a Code of Conduct, which includes all the requirements of the EurepGAP Protocol for Fruits and Vegetables. The Code includes additional criteria from the ILO Conventions covering workers rights and conditions. Utz Kapeh certification is aimed at mainstream coffee roasters and brands, and focuses on providing assurances of food safety, appropriate growing practices, social responsibility and complete traceability.

The Utz Kapeh Code of Conduct applies at the farm level. Utz Kapeh has approved a number of independent third-party certification bodies to carry out annual inspections of producers' compliance with the Code of Conduct and Chain of Custody assessments. Utz Kapeh expects a price premium to be paid to producers for certified coffee. This premium is explicitly negotiated between the buyer and producer; Utz Kapeh is not involved in the price negotiations.

Utz Kapeh certification aims to provide complete traceability through the supply chain with a web-based 'Track and Trace System' and chain of custody requirements. When a certified producer sells coffee to a registered buyer, the producer informs Utz Kapeh of the sale and contract information. Utz Kapeh sends a unique tracking number for the contract to the producer. This number is forwarded to the first buyer and onward through the chain. The first buyer in the chain is charged an administration fee by Utz Kapeh of US 1cent per pound of green coffee. This fee pays for the traceability system, regional assistance and marketing materials.

To back up the track and trace system, chain of custody requirements have also been developed. These include criteria for the separation of certified and uncertified coffee, and record keeping by direct suppliers and buyers. Producers are required to be chain of custody certified by January 2006. Brands making on-product claims must be certified to the chain of custody requirements for destination countries by July 2005 (www.utzkapeh.org , July 2005). Utz Kapeh also strongly recommends that these brands ensure their whole supply chain is chain of custody certified, but it is not a requirement. In July 2005, of 136 Utz Kapeh registered buyers (including exporters, roasters and traders), only 3 were chain of custody certified.

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APPROACHES TO TRACEABILITY IN THE COFFEE SECTOR

Three main levels of traceability can be identified in the coffee sector, although there is some overlap between them.

Mainstream (Bulk) Markets

Mainstream coffee makes up 85-90% of coffee consumption. Coffee in mainstream markets is generally traded on the basis of quality and issues such as delivery period, packaging, transport, etc. Characteristics related to the production processes or origin of the coffee are not generally referenced in contracts, except where they affect the quality of the coffee as defined by standard classification systems (May et al, 2004).

As described earlier, many traders will offer roasters a basket of coffee types that can be substituted for each other. Contracts may be fixed up to 18 months in advance; often the seller will agree to supply a certain amount of a particular type of coffee at a certain date; they actually source that coffee nearer the time. This means that coffee traders need to maintain a degree of flexibility in their sourcing, rather than rely on one source or country (www.thecoffeeguide.org). At this level of substitution, a buyer is likely to know the country of origin when the coffee is delivered; warehouse information from the export country is also likely to be available, but further traceability is unlikely.

In addition to the physical coffee market, coffee is extensively traded on the futures market. The futures market plays an important role in helping to establish price levels, and in transferring risk of price movements to speculators. In order for the futures market to exist, there must also exist a physical market with sufficient volume of product with well-defined standards, a large number of competing participants, in a market with significant price fluctuation and volatility (May, Mascarenhas and Potts, IISD, May 2004). Trading on the futures market requires a high level of standardization: thus buyers on the futures market do not have the option of demanding particular quality characteristics, and may not know the origin or quality of the product until delivery (May et al, IISD, May 2004).

The implication of this form of trading for traceability is that, while the futures market is central to the current mainstream coffee market, it does not facilitate traceability, or the evolution of sustainability initiatives within bulk markets.

However, this does not mean that sustainability criteria cannot be introduced into supply chains for mainstream markets. In theory, sustainability criteria and knowledge of origin could become standardized characteristics, at least to the level of the container. May et al point to the potential to implement sustainability tools in coffee contracts, for example by developing pricing differential that recognise sustainable production practices within the quality grading systems used for futures markets.

At present this information is not necessarily recorded but as information systems develop, such data could be incorporated. The increasing use of electronic commerce may provide opportunities to include extra information about coffee attributes.

For example, the New York Board of Trade (NYBOT) introduced the Electronic Commodity Operations and Processing System (eCOPS) in March 2004. Other e-commerce systems in the coffee market include the Bolero paperless documentation system, and the Green Coffee Association XML contract.

eCOPS provides electronic documentation and transfer capabilities through the creation of electronic warehouse receipts, delivery orders, sampling orders, weight

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notes, invoices, insurance declarations and other related instruments. Warehouses wishing to use eCOPS have to register (which is free) and users pay a charge for documentation. NYBOT recognise that there is a demand for increased levels of standardization and transparency in physical market practices. “Governments are legislating greater accountability and detail in the sourcing of commodities – a documented and verifiable product trail that goes all the way back to the point of origin” (eCOPS Project Update, November 2004). There is clearly a future possibility to include such information in electronic documentation systems.

Mainstream markets and the physical and futures trading systems currently provide little possibility for introducing supply chain initiatives for improving social, environmental and economic aspects of production. Information related to coffee markets is generally related to quality rather than origin. However, with increasing demand for knowledge about the origin and production methods used for commodities, and constantly improving technology there is a strong possibility that such information could be incorporated in future.

An Intermediate Step – Traceability to Container

The Common Code for the Coffee Community is aimed at improving sustainability of production and trade within the mainstream coffee market. The 4Cs initiative has therefore explicitly focused on the smallest unit to which production could be traced in a cost effective manner, which is the level at which the aggregated volume of coffee composes at least one container. The Common Code Unit, at which verification of compliance with the code will occur, might be at any stage in the producing country chain, such as a producer, estate, cooperative, mill or exporter.

Common Code Units must be recognizable organized units. The Unit is responsible for communicating the requirements of the Code both up and down the supply chain. While the logic of adopting the ‘container-filling stage’ as the basic unit of assessment, this will require a good deal of flexibility in the application of the code. As the system is still in a pilot stage, it remains to be seen how effective this strategy will be.

As noted above, full traceability to the container level is not required initially. Responsibility for ensuring traceability is set at the 4C unit and above. It may take several years before a particular supply chain is expected to be able to trace coffee back to the 4C unit.

Full Traceability to Producer Level

Full traceability of coffee production has tended to be associated with niche markets, where knowledge of origin and the production and process methods (PPMs) are important characteristics of the coffee. These coffees tend to be more directly traded, with greater knowledge at each stage of the preceding provenance.

For practical shipping reasons, coffee needs to be exported in container-sized lots, which means a producer organisation must be able to produce a minimum exportable production of about 18 tons. This may require very small producer organisations (such as some involved in fair trade) to combine together in an umbrella organisation to achieve economies of scale. In order to ensure traceability, it is important that good records are kept by the producer/umbrella organisation, which can be a practical difficulty for some organisations.

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Where full traceability of every bag of coffee is required, there may be additional costs involved. Coffee has traditionally been shipped in bags within a container. Recent years have seen a substantial increase in the use of dry containers fitted with a liner, without bags. This saves on the cost of the bags, increases the capacity of the container (from 18 to 21 tons), representing a freight saving of about 15% per container. Bulk coffee also creates time and labour savings because bulk containers can be emptied mechanically. In addition, coffee in bulk arrives in better condition than bagged coffee resulting in fewer compensation or insurance claims on coffee shipped in bulk (www.thecoffeeguide.org). Any initiative that requires traceability below the level of container forgo these potential savings.

Fairtrade, Starbucks CAFE Practices and Utz Kapeh all aim for traceability back to the producer. This is achieved in different ways in the three initiatives:

- Registered buyers of Fairtrade coffee are required purchase directly from grower organizations with contracts extending beyond one harvest cycle. Buyers are required to register with Fairtrade National Initiatives who control use of the Fairtrade logos. This means that the traders directly know the producer organization from which it is sourcing. In addition, in order to meet FLO coffee certification requirements that small farmers must supply at least 50% of the volume of a product, the organization must maintain records of the farmers who supply them and the quantities supplied. The organisation must also be able to demonstrate that they have passed on the fairtrade price premium to the producers, which again requires traceability.

- Starbucks sources its coffee through its own trading company (SCTC). Although this coffee may in turn be sourced through a number of channels, suppliers and traders, Starbucks is increasingly demanding that there is full traceability and economic transparency along the supply chain. Offering the incentive of preferred supplier status, Starbucks can make such demands of its suppliers, which would be difficult in a more open supply chain. Independent certifiers for the CAFE Practices program assess a sample of producers and suppliers along the supply chain. Applicants to the CAFE Practices program are responsible for paying the costs of certification. Under the requirements for Economic Accountability, suppliers are required to demonstrate economic transparency and equity of financial rewards along the chain. However, Starbucks admits that a current challenge is to achieve economic transparency along the supply chain because they are relying on parties that have traditionally lacked reliable information systems for tracking payments throughout the supply chain.

- The Utz Kapeh programme aims to provide assurances about environmental and social standards of production and food safety guarantees, through its track and trace programme and linked chain of custody requirements. In theory these twin approaches should identify coffee from the producer to the consumer. Track and trace ensures that the quantities of coffee sold as Utz Kapeh certified do not exceed those entering the chain. However, because of the lack of chain of custody assessments in the intermediate parts of the chain it cannot be guaranteed that the Utz Kapeh coffee entering the chain is the same as the final Utz Kapeh certified product.

STRENGTHS AND WEAKNESSES OF DIFFERENT APPROACHES IN THE COFFEE SECTOR

A summary of the strengths and weaknesses of the three main approaches detailed above are as follows:

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- Bulk commodity:
  - Low cost
  - Quality standards established and testable by sampling, so full traceability not so essential
  - Contracts, futures markets, etc rely on the bulk market being unsegregated and one product being substitutable by another
  - But with improving documentary tracing systems (e.g. ECOPS) increased traceability becomes more possible
- Traceability to container level:
  - Relatively low cost (information may exist, but systems needed to document it)
  - Doesn't permit labelling of final product re. social, environmental or economic standards of production
  - Doesn't allow tracing of pesticide use or food quality assurance
- Full traceability:
  - High costs – where borne by producer and not associated with a premium/ assured market access can have negative impact on livelihoods
  - Only fair trade assists with certification costs, and producers hampered by limited market space
  - High assurance of social, environmental, economic standards and food quality assurance
  - Permits claims on products, important in high value, niche markets.

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Chapter 3: Conclusions and Comparative Analysis

A COMPARATIVE ANALYSIS OF THE THREE SUPPLY CHAIN OPTIONS

To provide a common basis for comparative analysis of the three-supply chain options, each was assessed against a set of thematic issues. These issues are based on the main implications of the three supply chain options, and consist of the ability to meet supplier's needs and wants, supply chain control, degree of credibility, potential usefulness of scheme, specific technical issues for consideration and cost. The analysis is presented in the table below:

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Table 3.1: Analysis of Supply Chain Options

Supply chain option	Ability to meet customer's needs	Supply chain controls	Degree of credibility	Potential usefulness (up-scaling and future markets)	Technical issues	Cost implication
Option 1: Segregation and complete chain of custody	Allows for full traceability; differentiated products, marked or identified are likely to appeal to customers-provide consumer satisfaction through authenticated claims Not suitable for large scale market production demands	High degree of control can be achieved through the supply chain by following stringent auditing and monitoring procedures	High degree of credibility can be achieved with stakeholders (e.g. NGOs) and consumers etc. through maintaining a strict control and credible supply chain	High degree of credibility may guarantee long-term usefulness of the approach in the marketing of products. This may facilitate market improvements for the creation of a unique selling point and eventually market niche.	Needs adequate capacity for developing internal management systems, internal monitoring, and database and information management. Needs operational capacity (on the farm and at the mills) for implementing standards requirements and requirements for chain of custody.	High cost implication. Cost to be covered include: -Implementing requirement of the standards -Maintaining a chain of custody system -Capacity building for staff -Auditing and certification -Governance an monitoring
Option 2: Trading as a 'grade commodity' but separated from conventional products	Suitable for situations where customers do not require a demonstration of a highest level of product attribute guarantee. Customer's need may not be met in situations where the dictates of the market points towards the demonstration of the highest level of sustainability qualities of product manufacture and use. Capable of meeting large scale market production needs	Supply chain control is likely to be weakened by the lack of complete traceability to the farm level Effective control may be achieved by identifying the critical control point in the supply (i.e. the point at which one can make an adequate guarantee of the origin of the 'grade' commodity) which, then can be easily substantiated by random auditing	The degree of credibility may be affected by the potential weakness in the supply chain control in not ensuring full traceability However, if the critical control point is satisfactory, credibility may be enhanced	Potential usefulness and market improvements depends on the credibility of the scheme, which in turn depends on the credibility of the procedures for enabling possible traceability to the origin of the 'grade' product	-Capacity for monitoring to ensure that production source operate according to the 'grade' specifications -Management system for guaranteeing a possible traceability (this is crucial for credibility) -Marketing strategy for promoting credibility	Not as high as it is with option 1. Cost to be covered include: -Capacity building for monitoring and guaranteeing credibility at the critical control points - Implementing requirement of the standards according to the 'grade' specification -Marketing and promotional strategy

Supply chain option	Ability to meet customer's needs	Supply chain controls	Degree of credibility	Potential usefulness (up-scaling and future markets)	Technical issues	Cost implication
Option 3: 'Book and Claim' approach	Suitable for situations where customers do not require a demonstration of a highest level of product attribute guarantee. Could be used at any scale of production of production	Very weak supply chain; there is no physical link between producers and customers requesting the use of the particular product	Questionable. May be difficult to achieve among stakeholders (such as NGOs); the supply chain control is very weak. A careful strategy may be required to define what may become a credible practice	Potential usefulness and market improvements may be highly limited by the lack of stakeholder support for the credibility of the approach	-Developing and running the 'book and claim' procedures -Determination of monitoring procedures -Determination of a credibility promotion strategy	Lower than options 1 and 2 above. The main costs include: -Development and impregnation of the 'book and claim' procedures -Supply chain monitoring -Implementation of standards -Marketing and promotion of products -Credibility advocacy strategy

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SOME ADDITIONAL COST ISSUES

The costs of implementing increased traceability for commodity products are related to the length and complexity of the supply chain. In addition, the costs are incurred at different parts of a supply chain. These issues are outlined below, with specific reference to coffee.

Costs of Traceability Relative to Complexity of Supply Chain

When compared to some other commodity crops, coffee does not have a particularly complex processing chain. Looking at the general structure of the coffee market diagram, the main processing points are:

- Cherry coffee to green coffee, undertaken domestically somewhere near the producer end
- Roasting and blending, undertaken in the consumer country

In between these processing points, the coffee may be stored, traded many times (without necessarily physically moving) and transported, but is not actually processed. In contrast, palm oil and timber, for example, may go through many processing stages before final product manufacture.

In addition, supply chain initiatives that encourage shorter chains (e.g. Fairtrade requires direct contacts with buyers; Starbucks have their own purchasing company) reduce the complexity of the chain and therefore reduce the overall costs of traceability.

The overall incremental costs of traceability of relatively small amounts must also be related to the conventional transport and handling options. Coffee is shipped in 18 ton containers, which is a relatively small amount that can be filled by a group of small producers. This facilitates traceability when compared to, for example, palm oil, which is conventionally shipped in massive bulk containers.

Studies and data relating to the costs of certification almost invariably focus on the costs of compliance and certification at the grower level, with less attention to traceability issues. Studies conducted by Genetic ID (Europe) AG on the implementation of traceability for non-GM identity preserved soy meal estimate an higher FOB cost of US$9.00 – US$10.00; this would include the costs of traceability as well as any market premium.

Distribution of Costs in the Supply Chain

The costs of traceability fall mainly to the traders and processors, not the growers themselves. Growers generally deliver their coffee in to the coop/processing plant in sacks, which will be their traceability unit. However, in order to preserve margins these costs are pushed either up or down the marketing chain. Where they actually fall will depend on each individual market. For instance, under a voluntary system where consumers buy into the concept of traceability, consumers appear willing to pay and the costs fall on the consumer. This cost is reflected in the premiums that are paid for these products. Under a mandatory system, it is possible that the costs would fall on the grower as there would be no market access without compliance.

For growers, there are costs of compliance and costs of certification/verification for participation in a supply chain sustainability initiative, and the viability of this depends

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on the proportion of the product value being retained by them. I.e. a premium has to cover the sustainability qualities (e.g. Utz Kapeh compliant/CAFÉ practices compliant) and the additional costs of verification and compliance, otherwise it becomes a barrier to market entry. Ponte (2004) says: "The overall income impact of sustainability standards on producers depends on the balance between the extra costs of matching these standards (including labour costs and the cost of certification) in comparison to the extra income earned from the premium plus/minus the impact of changing farming practices on yields and quality…. The balance sheet for fair trade is invariably positive, since farmers do not pay for certification, the premium is very high and the necessary changes in farming systems fairly limited." The main costs of traceability come further up the chain, where the systems for tracing origin and the costs of chain of custody certification will fall. However, the development of traceability systems may also improve efficiency and eventually reduce costs; and the technology for traceability systems (like the electronic trading systems, and electronic chips for coffee bags) is getting cheaper all the time.

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Appendix 1: Coffee Quality Descriptors

This appendix lists the terms commonly used to describe physical and sensory coffee quality. It is largely based on the glossary section of the FAO *Reducing Ochratoxin A in Coffee* web site[1].

PHYSICAL QUALITY

Physical defects are related to agronomic/climatic factors, appearance/coloration, pest damage, and processing.

Agronomic/Climatic

Coated: Beans to which the silver skin adheres. Caused by drought, overbearing or unripe cherries. See also 'Softs' below and 'Harsh liquor' and 'Common liquor' under 'Organoleptics and Tasting - Aromas/Flavours', below.

Drought-affected or Droughty: Either coated or misshapen, pale and light in weight. See also 'Coated', above, and 'Ragged', below.

Floats or Floaters: Under-developed, hollow beans – the fruit floats in water and is 'floated-off' during wet processing. In washed coffee a sign of inadequate grading during wet processing. With reference to cherries usually comprises overripe cherries almost dried; cherries with one sound and one aborted bean; and cherries with two aborted seeds. In regard to parchment, includes under-developed, hollow and CCB-damaged beans. See also 'Lights', below.

Hail-damaged: Show blackish circular marks on the oval side of the bean.

Lights: A bean the specific weight of which is below normal, caused by drought or die-back and under-development. The parchment in most cases contains empty pods, sometimes filled with air and which do not sink in water. See also 'Floats/Floaters', above.

Ragged: Frequently refers to drought-affected beans. Harvesting a mixture of mature and immature cherries can result in beans having a ragged appearance.

Shrivelled: A bean shrivelled owing to drought or poor husbandry standards.

Withered: Lack of development in growth causing a coffee bean that is wrinkled, thin and light in weight, caused by drought or poor husbandry. See also 'Shrivelled', above.

Appearance / Coloration

Amber: Smooth, yellowish beans caused by iron deficiency in the soil.

Black: Caused by harvesting immature beans, or gathering them after they have dropped to the ground. Development of black beans also arises as a result of beans coming in contact with water and heat. They are often taken as the yardstick for rating a defect count. Other causes are insect-damaged, or metal-contaminated beans.

[1] http://www.coffee-ota.org

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Under ISO 3509 black beans are termed as such if 50% or less of their surface is black, and the interior is black.

Blackish: Pulper-nipped beans which have partly oxidized. See also 'Discoloured', below, and 'Pulper-nipped', under 'Processing Related', below.

Blacks: Beans with more than a quarter of their surface black, deep blue or dark brown.

Bleached: Colourless beans are often caused by drying too rapidly and/or over drying. These are also known as 'soapy' and 'faded' beans, and are usually associated with mechanical drying.

Blotchy: This is due to defective and uneven drying of coffee; as a result, the colour of the beans is far from uniform, showing irregular greenish, whitish or sometimes yellowish patches. It is always advisable to dry beans both thoroughly and slowly.

Boat-shaped: Beans whose two ends curve upwards and appear boat-shaped.

Brilliant or Bright: Extremely bright looking roasted beans, appearing to have an oil-like surface.

Brown: Beans that are brown in colour. May be caused by faulty fermentation, improper washing or over drying. See also 'Foxy', below.

Caracol: See 'Peaberry', below.

Deformed: Ugly, misshapen beans, also includes 'semi-elephants'.

Discoloured: Often pulper-nipped. Other causes of discolouration are contact with earth, metal and foul water, as well as damage after drying and beans left over in fermentation tanks. See also 'Stinkers', under 'Processing Related', below.

Double-centre cuts: Two dividing lines of silver skin, which are not well defined, running through the flat side of the bean. Coffee with a double centre-cut is of poor quality. When the bean is roasted, it opens and contributes to a commonish liquor.

Dull: Due to faulty drying, often associated with metal contamination.

Ears: Part of a broken elephant bean.

Elephant beans: An assembly of beans (usually two, sometimes more) resulting from false polyembryony. They are beans of irregular shape having two or more parts, closely locked together, which may separate either in the peeler or during roasting.

Faded: Beans from an old crop, or dried too rapidly. See also 'Bleached', above.

Flaky: Usually very thin, light and ragged in appearance. See also 'Drought-affected' and 'Ragged', under 'Agronomic / Climatic', above.

Flat: A coffee bean with one perceptibly flat face.

Foxy: Rusty or reddish coloured due to harvesting of overripe cherries, faulty washing, delays in pulping, improper fermentation or slow drying.

Immature: See 'Quaker', below.

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Mottled: Blotchy, stained or spotty, usually caused by uneven drying.

Murram coloured: See 'Foxy', above

Mouldy or Musty: Beans that are partly or wholly discoloured, with greenish-whitish fur-like colour and texture indicating mould growth, or evidence of attack by mould, that is visible to the naked eye. See also 'Musty', under 'Aromas / Flavours', below.

Open: An open bean is one in which the centre cut is inclined to part on roasting. Some open beans derive from lights and of these, some can be eliminated in the washing channel, and some by air separators at the curing works/mill. However, all open beans are not necessarily light coffee.

Overripe: Brownish-yellow in appearance, also known as foxy. Used mainly when referring to cherries. See also 'Foxy', above.

Pales or Semi-pales: Yellow in colour, they stink when crushed or ground. Pales come from immature or drought-affected coffee and are beans with little or no grain. These can largely be eliminated in the washing channel. Amber beans and green parchment beans also frequently cause pales in the roast.

Peaberry: A single, rounded bean from a coffee cherry which bears one bean instead of the usual flat sided pair of beans. Also known as 'caracol', 'perla' and 'perle'. These are frequently separated and sold as a distinct varietal. Papua New Guinea is one of the more popular ones.

Perla: See 'Peaberry', above.

Perle: See 'Peaberry', above.

Quakers: Unripe coffee bean, often with a wrinkled surface. These show up as roast defects being yellow in colour, and will not darken satisfactorily in roast.

Ragged or Deformed: Frequently refers to drought-affected beans. Harvesting a mixture of mature and immature cherries can result in beans having a ragged appearance.

Shell: Malformed bean presenting a cavity.

Shrivelled: A bean shrivelled owing to drought or poor husbandry standards.

Soapy: See 'Bleached', above.

Softs: Beans without grain, and often of a dull yellowish colour. Coated raw beans often produce softs to pales. Good quality coffee is often spoiled by the presence of softs.

Spongy: Beans with a cork-like texture. These beans will be generally whitish in colour.

Spotted: See 'Blotchy', above.

Three-cornered beans: Semi-peaberry in character. See also 'Peaberry', above.

White: Coffee bean that is white in colour, and very light in weight with a density below that of a healthy bean.

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Withered: Lack of development in growth causing a coffee bean that is wrinkled, thin and light in weight, caused by drought or poor husbandry. See also 'Shrivelled', above.

Pest Damage

Antestia: Beans damaged by the Antestia bug, resulting in blackish markings on the bean to almost entirely black beans, which are often completely shrivelled.

Broca-damaged: Beans partially eaten by the coffee berry borer (*Hypothenemus hampei* (Ferrari 1867)), a 2mm long black scolytid beetle which bores galleries through the coffee bean. 'Broca' is the widely used Spanish term for the coffee berry borer, which is one of the most significant pests of coffee.

CBB-damaged: CBB stands for 'Coffee Berry Borer'. See 'Broca-damaged', above.

Diseased: Beans which have been attacked by disease due to poor field husbandry.

Fungal: Beans damaged by fungal (mould) infestation.

Mouldy or Musty: See 'Mouldy' under 'Appearance/Coloration', above. See also 'Musty', under 'Aromas/Flavours', below.

Processing

Bits: Broken coffee bean pieces as a result of damage during processing, less than ⅓ of 'ordinary' bean size.

Black-jack coffee: Coffee which has turned black after picking, during shipping or during reprocessing.

Crushed: Pulper-damaged beans, which often split and fade. Also caused by manual pounding of dry cherry to separate beans from husk. Also the result of too much trampling in fermentation tanks.

Dullish or Dull: Beans lacking lustre and associated with faulty drying, often suggestive of metal contamination, poor processing and age.

Green or Water-damaged: Usually brought about by dry parchment or hulled coffee becoming wet. Occurs at the skin drying stage if the parchment is kept without stirring and is subject to micro-organism attack.

Mottled: Caused by uneven drying. Such beans are not always detrimental to cupping when the coffee is fresh, but coffee of this type will not keep long, and deteriorates in transit.

Over-fermented: A bean that will impart an unclean, fermented or foul taint to a coffee liquor as a result of over-fermentation during wet-processing.

Pulper-cuts: See 'Pulper-nipped', below.

Pulper-nipped: Wet processed beans that are cut or bruised during pulping. These beans will usually present brown or black marks, damaged by the incorrect setting of the pulping knives. Discoloration develops through oxidation in pulping or fermenting water, or through contact with metals (See also 'Discoloured', under 'Appearance/Coloration', above) and may produce off-flavours. Providing that the

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nipped beans are clean and not too prevalent, coffee will not be reduced in classification. Pulper damaged beans lead to uneven roast, age rather rapidly and are also susceptible to chemicals, dust and other adverse environmental effects.

Sour: Coffee beans deteriorated by excess fermentation, with a light brown/reddish colour and producing a sour taste when roasted and infused.

Stinkers: Stinker beans are generally caused as a result of over-fermentation, and due to improper cleaning of fermentation tanks and washing channels. Beans adhering to the pulper vats, if not cleaned meticulously, become stinkers. Stinker beans, when crushed or cut, emanate a very unpleasant odour. They taint the liquor, producing an unpleasant taste in the cup, and give a flavour described as 'over-fermented', 'unclean' or even 'foul'. One or two stinker beans can contaminate and spoil a whole batch of coffee. See also 'Discoloured', under 'Appearance/Coloration', above.

Under-dried: Beans with a moisture content above 12%.

Uneven fermentation: Occurs when part of the coffee is either over-fermented or under-fermented. Both errors in processing produce equally poor coffee.

Unevenly dried: Beans which are improperly dried, often due to lack of sufficient stirring whilst drying, or overly deep drying layers.

Waxy: An over-fermented bean presenting a waxy appearance.

SENSORY QUALITY

Sensory quality terms refer to aromas/flavours and liquor.

Aromas/Flavours

Animal-like: This odour descriptor is somewhat reminiscent of the smell of animals. It is not a fragrant aroma like musk but has the characteristic odour of wet fur, sweat, leather, hides or urine. It is not necessarily considered as a negative attribute but is generally used to describe strong notes.

Ashy: This odour descriptor is similar to that of an ashtray, the odour of smokers' fingers or the smell one gets when cleaning out a fireplace. It is not used as a negative attribute. Generally speaking this descriptor is used by tasters to indicate the degree of roast.

Bricky: Produced as result of the use of Benzene hexachloride (BHC) based insecticides to control mealybug, etc. Now practically non-existent.

Bright: Tangy acidity is often described as bright.

Burnt or Smokey: This odour and flavour descriptor is similar to that found in burnt food. The odour is associated with smoke produced when burning wood. This descriptor is frequently used to indicate the degree of roast commonly found by tasters in dark-roasted or oven-roasted coffees.

Caramel or Caramelized: This aroma descriptor is reminiscent of the odour and flavour produced when caramelizing sugar without burning it. Tasters are cautioned not to use this attribute to describe a burning note.

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Carbonic or Chemical or Medicinal: This odour descriptor is reminiscent of chemicals, medicines and the smell of hospitals. This term is used to describe coffees having aromas such as rioy flavour, chemical residues or highly aromatic coffees which produce large amounts of volatiles. Can be caused by workers with treated leg wounds who subsequently work in fermentation tanks. Certain emulsions in the manufacture of sacks can also present a problem. See also 'Rioy/Phenolic', below.

Cereal or Malty or Toast-like: This descriptor includes aromas characteristic of cereal, malt and toast. It includes scents such as the aroma and flavour of uncooked or roasted grain (including roasted corn, barley or wheat), malt extract and the aroma and flavour of freshly baked bread and freshly made toast. This descriptor has a common denominator, a grain-type aroma. The aromas in this descriptor were grouped together since tasters used these terms interchangeably when evaluating standards of each one.

Chemical: See 'Carbonic/Chemical/Medicinal', above.

Chocolate-like: This aroma descriptor is reminiscent of the aroma and flavour of cocoa powder and chocolate (including dark chocolate and milk chocolate). It is an aroma that is sometimes referred to as sweet.

Citrus: See 'Fruity / Citrus', below.

Coarse: A raspy, harsh flavour, lacking in fineness.

Earthy: The characteristic odour of fresh earth, wet soil or humus. Sometimes associated with moulds and reminiscent of raw potato flavour, considered as an undesirable flavour when perceived in coffee. Not to be confused with 'grassy'.

Floral: This aroma descriptor is similar to the fragrance of flowers. It is associated with the slight scent of different types of flowers including honeysuckle, jasmine, dandelion and nettles. It is mainly found when an intense fruity or green aroma is perceived but rarely found having a high intensity by itself.

Fruity or Citrus: This aroma is reminiscent of the odour and taste of fruit. The natural aroma of berries is highly associated with this attribute. The perception of high acidity in some coffees is correlated with the citrus characteristic. Tasters are cautioned not to use this attribute to describe the aroma of unripe or overripe fruit.

Grassy or Green or Herbal: This aroma descriptor includes three terms which are associated with odours reminiscent of a freshly mowed lawn, fresh green grass or herbs, green foliage, green beans or unripe fruit. Seldom found in coffees that have been fully dried.

Green or Greenish: See 'Grassy/Green/Herbal', above.

Medicinal: See 'Carbonic/Chemical/Medicinal', above.

Malty: See 'Cereal/Malty/Toast-like', above.

Muddy: A dull, indistinct but thickish flavour. Can be due to grounds being agitated.

Musty: Can be caused by piling or bagging wet parchment, or as result of parchment getting wet after being dried.

Nutty: This aroma is reminiscent of the odour and flavour of fresh nuts (as distinct from rancid nuts) and not of bitter almonds.

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Onion: Off-flavour bordering on the foul. Often associated with the use of badly polluted and/or stagnant water. Can be minimised by the recycling of pulping water.

Phenolic: See 'Rioy/Phenolic', below.

Rancid or Rotten: This aroma descriptor includes two terms which are associated with odours reminiscent of deterioration and oxidation of several products. Rancid as the main indicator of fat oxidation mainly refers to rancid nuts, and rotten is used as an indicator of deteriorated vegetables or non-oily products. Tasters are cautioned not to apply these descriptors to coffees that have strong notes but no signs of deterioration.

Rio: See 'Rioy / Phenolic', below.

Rioy or Phenolic: A taste with a medicinal odour and off notes, of slightly iodized phenolic or carbolic. Cannot be hidden by blending as it always returns. See also 'Carbonic/Chemical/Medicinal', above.

Rubber-like or Rubbery: This odour descriptor is characteristic of the smell of hot tyres, rubber bands and rubber stoppers. It is not considered a negative attribute but has a characteristic strong note highly recognisable in some coffees, especially fresh Robustas.

Smokey: See 'Burnt', above.

Sour: Sour coffee occurs when yeasts turn alcohol into vinegar type acids which cause the 'sour' taste, as a result of over fermentation. The best way to avoid this cup defect is to wash the parchment coffee as soon as fermentation has finished and the parchment feels rough when rubbed between the hands.

Spicy: This aroma descriptor is typical of the odour of sweet spices such as cloves, cinnamon and allspice. Tasters are cautioned not to use this term to describe the aroma of savoury spices such as pepper, oregano and Indian spices.

Sweet: See 'Chocolate-like', above.

Taint or Tainted: A term to denote the presence of flavours which are foreign to a good clean liquor, but which cannot be clearly defined or placed in any category. It is often described as an off taste or peculiar flavour for lack of a clear definition. Where the foreign flavour can be defined, it is of course named accordingly. Presence of pulp in fermenting parchment produces tainted coffee. Can be substituted by the phrase 'unclassified flavour'.

Toast-like: See 'Cereal/Malty/Toast-like', above.

Tobacco: This aroma descriptor is reminiscent of the odour and taste of tobacco but should not be used for burnt tobacco.

Unclassified: See 'Taint /Tainted', above.

Winey: This terms is used to describe the combined sensation of smell, taste and mouthfeel experiences when drinking wine. It is generally perceived when a strong acidic or fruity note is found, not necessarily unpleasant. Tasters are cautioned not to apply this term to a sour or fermented flavour.

Woody: This aroma descriptor is reminiscent of the smell of dry wood, an oak barrel, dead wood or cardboard paper. A coarse common flavour peculiar to old coffee. This defect results when beans are stored for an extended period of time under unsuitable

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conditions. Coffee stored at low altitudes with high temperatures and humidity (as in many ports of shipment) tends to deteriorate and become woody rather quickly. All coffees become woody if stored for too long.

Liquor

Common or Commonish: Poor liquor lacking acidity, but with full body. Usually associated with coated raw beans, and softs or pales in roast. See also 'Coated beans', under 'Agronomic/Climatic', above, and 'Pales' and 'Softs', under 'Appearance/Colorization', above.

Fiery: A bitter charcoal tasting liquor generally due to over roasting.

Flat: A lifeless coffee lacking any acidity

Foul: Objectionable liquor often similar to rotten coffee pulp. Sometimes the most advanced stage of fruity and sour coffees. The causes are mostly bad factory preparation using polluted water. One badly discoloured pulper-nipped bean is sufficient to give a foul cup to an otherwise good liquor.

Harsh: A harshness of body. Coffee of immature raw appearance (not necessarily from green cherry) frequently has a harsh flavour. Drought-stricken or overbearing trees producing mottled cherry very frequently give this flavour.

Liquoring: The term given to the organoleptic quality assessment of coffee liquor.

Neutral: An insignificant liquor not distinct in any powerful main flavours. Often used for blending.

Pointed: A fine acidity, and sharpness taste.

Smooth: A full-bodied coffee, but with low acidity.

Strong: An unbalanced liquor where body predominates to the point of being tainted.

Taint or Tainted: See 'Taint/Tainted', under 'Aromas/Flavours', above.

Thin: Lacking body and acidity, can be caused if the coffee is under brewed.

Twisty: A liquor which, though not directly unclean, is suspect and may become unclean. See also 'Unclean', below.

Unclean: A coffee which has an undefined taste, almost foul.

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Appendix 2: Survey Country Background

INDONESIA

Production System

Indonesia is primarily a robusta producer, producing between 5 million and 7 million bags per annum; arabica production is between 800,000 to 900,000 bags. Approximately 95% of the coffee area is smallholder coffee. According to AEKI, over 1 million households grow coffee, with the average size of holding 1.44 hectares (Table A2.1).

Table A2.1: Size of Smallholdings and Number of Producers

	Average Size of holding (ha)	Number of Households ('000)
Sumatra	1.71	601
Java	0.79	182
Sulawesi	1.53	105
Bali/Nusa Tenggara	1.56	110
Others	2.07	31
	1.44	1,029

Source: AEKI.

The island of Sumatra dominates both coffee production and the area under coffee. Approaching 75% of production is from the island, with Lampung and South Sumatra the largest producing regions (Table A2.2).

Table A2.2: Average Production by Region ('000 bags)

Aceh	667	9%
North Sumatera	417	6%
West Sumatera	167	2%
Bengkulu	667	9%
South Sumatera	1,667	24%
Lampung	1,500	21%
Total Sumatra	***5,083***	***72%***
Central Java	217	3%
East Java	250	4%
Total Java	***467***	***7%***
Bali	250	4%
Nusa Tenggara	167	2%
Total Bali/Nusa Tenggara	***417***	***6%***
South Sulawesi	167	2%
Other	950	13%
Total	**7,083**	**100%**

Source: AEKI.

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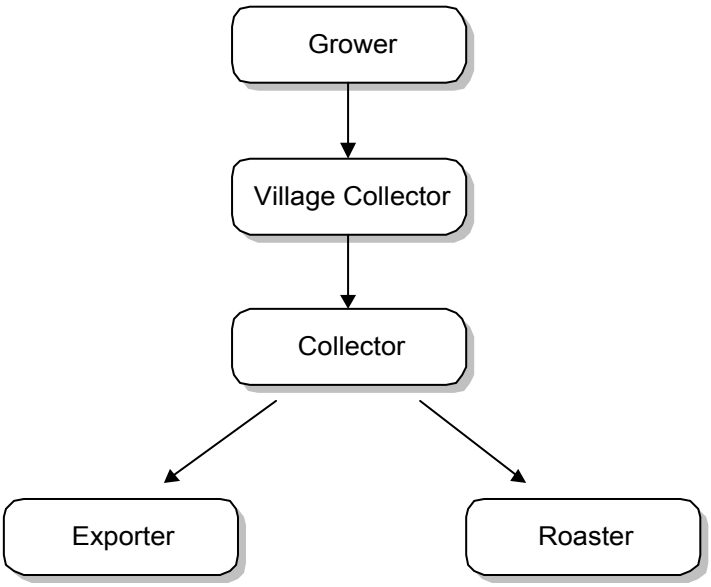
Marketing System

Diagram A2.1 presents the major input-output relations in the Indonesia supply chain.

Diagram A2.1: Indonesia Input-Output Relations



The coffee marketing system is fully liberalised. Coffee passes from the grower to the exporter or local roaster via a series of collectors. The number of intermediaries in the chain partly depends on the location and farm size. A number of the larger collectors/traders also hold coffee for speculative purposes.

Export Grading System

Indonesian export grades are principally based on the defect system:

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Table A2.3: Indonesia – Export Standards for Main Coffee Grades

Grade	Requirements (per 300g sample)
1	Total value of defects maximum 11
2	Total value of defects between 12 and 25
3	Total value of defects between 26 and 44
4	Total value of defects between 45 and 80
5	Total value of defects between 81 and 150
6	Total value of defects between 151 and 225

Type of defects	Value of defects
1 black bean	1
2 partly black beans	1
2 broken black beans	1
1 husk coffee	1
4 brown beans	1
1 large husk fragment	1
2 medium husk fragment	1
5 small husk fragment	1
10 beans in silverskin	1
2 beans in parchement	1
2 large parchment fragment	1
5 medium parchement fragment	1
10 small parchement fragment	1
5 broken beans	1
5 immature beans	1
10 beans with one hole	1
5 beans with more than one hole	1
10 spotted beans	1
1 large stick, piece of hard earth or stone	5
1 medium stick, piece of hard earth or stone	2
1 small stick, piece of hard earth or stone	1

Source: ICO, Supremo.

Apart from the above, the additional Indonesian coffee export requirements are:

- Moisture: maximum 12%/13% (wet processed/dry processed);
- Extraneous matter: maximum 0.5%;
- Free of live insects, stinker beans, mouldy odour and mouldy beans;
- Bean size not specified for arabica. For robusta:
  - Large – if retained by a 7.5 mm screen;
  - Medium – if pass through a 7.5 mm screen and retained by a 6.5 mm screen;
  - Small – if pass through a 6.5 mm screen and retained by a 5.5 mm screen.

Over half of Indonesia's green robusta exports are Grade 4, with Grade 3 accounting for a further 25% of exports; Grade 6 exports, containing over 150 defects per 300g sample, represented 12% of total green robusta exports on average between 1998/99 and 2003/04 (Diagram A2.2).

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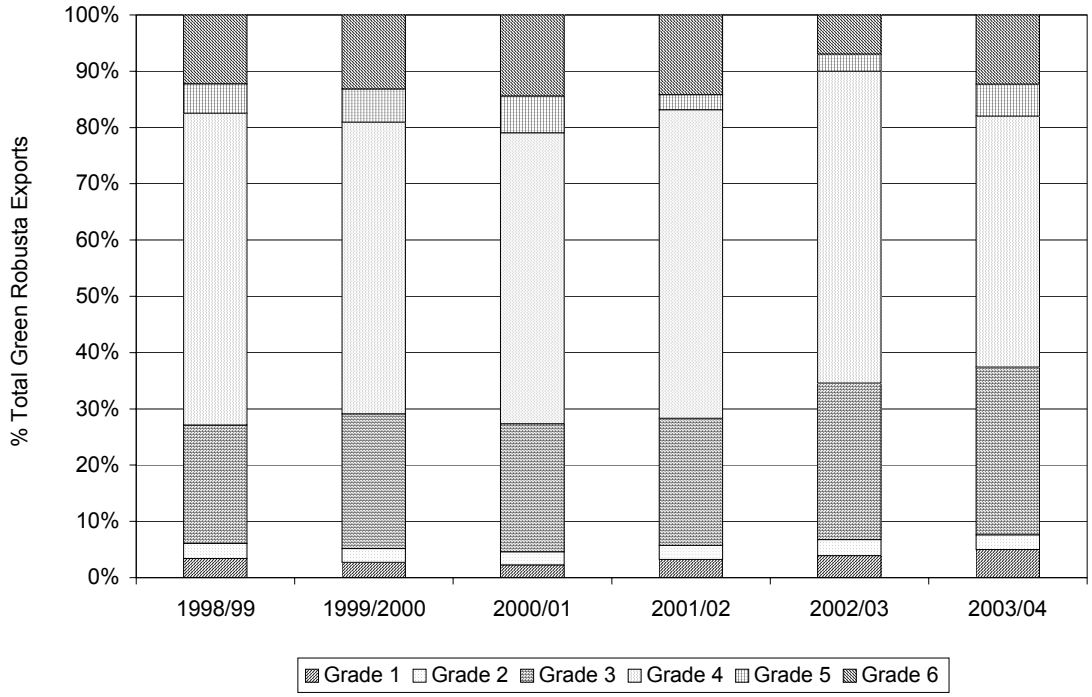
Diagram A2.2: Indonesian Robusta Exports by Grade



UGANDA

Production System

Uganda produces in the region of 3 million bags of coffee per year, between 80% to 90% of which is robusta coffee. Coffee is mainly produced by smallholders; there are around 500,000 growers with an average holding size of 0.3 hectares. The total coffee area is estimated at almost 290,000 hectares, with the Mukono and Mpigi districts of the Central region accounting for 18% and 12% of the total area, respectively (Table A2.4).

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Table A2.4: Uganda – Area Under Coffee in 1999/2000

Region	District	Area Under Coffee (Ha)
South Western	Ntungamo	4,111
	Mbarara	5,086
	Bushenyi	8,117
	Rukungiri	2,640
	Kabale	442
	Kisoro	900
	Kasese	3,108
Western	Kabarole	2,375
	Kibaale	4,996
	Hoima	4,052
	Masindi	2,415
	Kiboga	12,150
	Mubende	18,406
	Nakasongola	2,000
	Bundibugyo	195
Masaka	Masaka	38,018
	Rakai	10,400
	Sembabule	4,126
	Kalangala	2,632
Central	Mpigi	35,277
	Luweero	17,843
	Mukono	52,650
Eastern	Jinja	7,300
	Iganga	8,720
	Kamuli	6,100
	Kapchorwa	8,351
	Mbale	16,266
	Bugiri	4,000
North Western	Arua	2,500
	Nebbi	3,500
Northern	Lira	80
	Kitgum	50
	Apac	50
	Gulu	70
Total		**288,926**

Source: Uganda Coffee Development Authority.

Marketing System

In 1991, the Ugandan government abolished the Coffee Marketing Board (which had previously held a monopoly on external marketing) and liberalised the domestic marketing system. This allowed private companies to compete with co-operatives in sourcing coffee, leaving growers, buyers, processors and exporters to freely trade with each other.

Growers can sell red cherries, sun-dried dried cherries (*kiboko*) or hulled coffee (FAQ), either individually or as informal groups, to any of the following parties:

- Private buyers (who may act as agents for exporting companies and/or may themselves be larger growers);
- Exporters (who typically set up coffee buying depots in the countryside during the harvest season);

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- Farmer associations (mostly voluntary, but registered as for-profit or not-for-profit groups); or
- Co-operative societies.

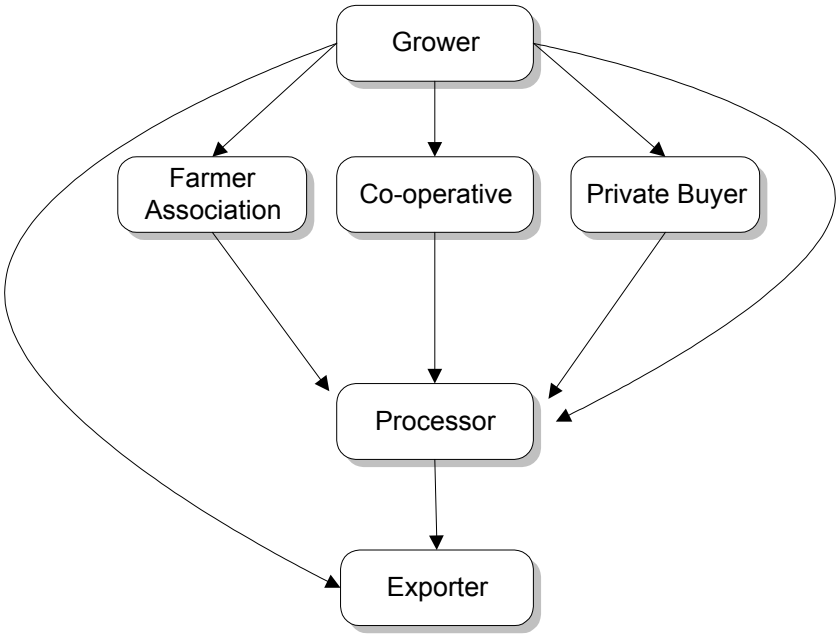
Depending on the state of the coffee purchased from growers, processors can cover a number of stages:

- In the case of wet cherries purchased from growers, these are either sun-dried into *kibiko* or fermented and pulped into washed parchment;
- *Kiboko* or washed parchment is then hulled to remove the outer skin, giving FAQ coffee.

Exporters receive FAQ coffee, which they re-process by cleaning, grading and packaging it in either 60 kg bags or bulk containers for export. Exporters tend to be either subsidiaries of multinational coffee traders; joint ventures between local and international traders; owners or operators of processing facilities; or, co-operatives.

Diagram A2.3 shows the flows of coffee through the Ugandan coffee marketing chain.

Diagram A2.3: Uganda Coffee Marketing Chain



In the mainstream coffee market, buyers lower their FAQ price to account for excess moisture (over 13%); the payment of premiums for low moisture and defect levels is rare due to the strong competition between buyers, however.

Export Grading System

Grading standards are mainly set according to bean size and number of defects. For robusta, there are three main export grades, Scr-18, Scr-15 and Scr-12, with BHP and Black Beans accounting for the leftovers from sorting. Arabica grades include Bugisu AA/A and Wugar washed and Drugar unwashed, with poor quality arabica marketed as triage, which mainly comprises broken pieces (Table A2.4).

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Table A2.4: Uganda — Export Standards for Main Coffee Grades

Grade	Description	Screen	Defects	Moisture
Robusta				
Scr-18	Dry processed robusta coffee beans of good appearance for the grade, free from all traces of fermentation, mustiness and other undesirable smells and taints	Min. 92% milled above 18, max. 1% milled below 12	Max. 7%	Max. 12.5%
Scr-15	Dry processed robusta coffee beans of good appearance for the grade, free from all traces of fermentation, mustiness and other undesirable smells and taints	Min. 90% milled above 15, 7% milled above 18	Max. 12%	Max. 12.5%
Scr-12	Dry processed robusta coffee beans of good appearance for the grade, free from all traces of fermentation, mustiness and other undesirable smells and taints	Min. 90% milled above 15, 7% milled above 18	Max. 12%	Max. 12.5%
BHP-1199	Unwashed robusta coffee beans, mainly light/broken pieces and chips			Max. 12.5%
Black Beans	Black and discoloured beans separated from clean coffee electronically or by hand			
Other	Includes washed, organic			
Arabica				
Bug-AA	Washed arabica coffee beans, heavy, solid and of good appearance for the grade, free from all traces of fermentation, mustiness and other undesirable smells and taints, shall be free from extraneous matter	Min. 90% milled above 17, max. 2% milled below 12	Max. 10%	Max. 12%
Bug-A	Washed arabica coffee beans, heavy, solid and of good appearance for the grade, free from all traces of fermentation, mustiness and other undesirable smells and taints, shall be free from extraneous matter	Max. 10% milled above 17, 2% milled below 12	Max. 10%	Max. 12%
Wugar	Washed arabica coffee beans of good appearance for the grade, free from all traces of fermentation, mustiness and other undesirable smells and taints, shall be free from extraneous matter		Max. 10%	Max. 12%
Drugar	Unwashed arabica coffee beans of good appearance for the grade, free from all traces of fermentation, mustiness and other undesirable smells and taints, shall be free from extraneous matter		Max. 10%	Max. 12%
Triage	Washed/unwashed arabica coffee beans, mainly broken pieces			
Other	Includes organic washed			

Source: ICO, Supremo, UCTF.

Ugandan robusta exports in volume terms are dominated by Scr-15, accounting for around 60% of total robusta shipments; Scr-12 exports account for an average 22% share. Unwashed Drugar shipments on average account for 46% of total arabica exports (Diagrams A2.4 and A2.5).

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Diagram A2.4: Ugandan Robusta Exports by Grade

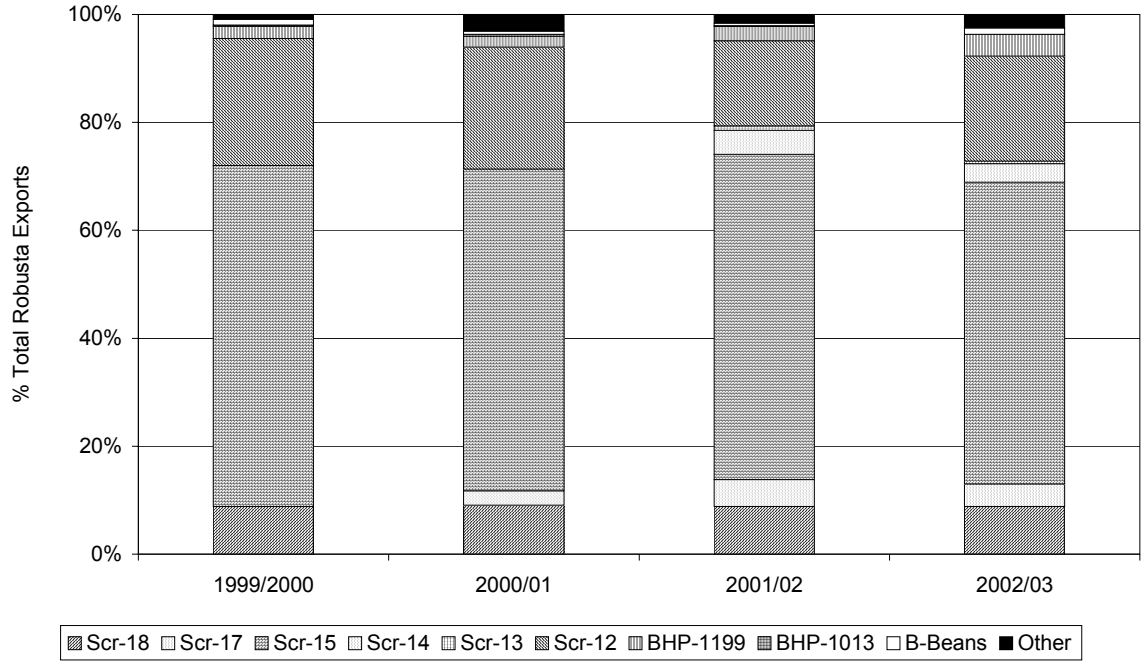
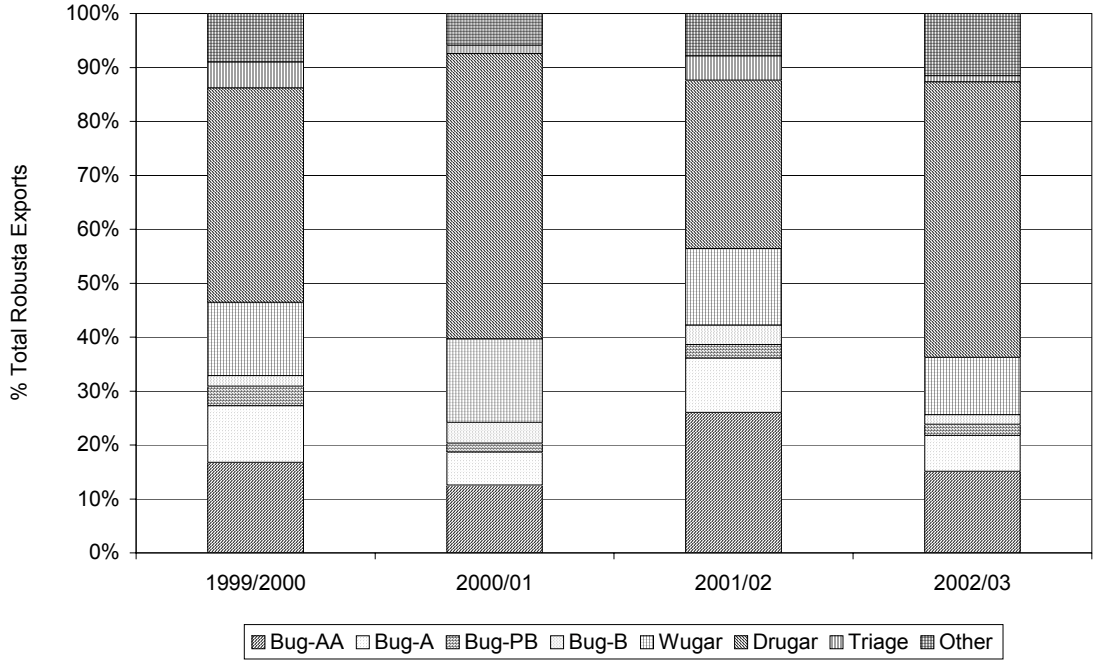


Diagram A2.5: Ugandan Arabica Exports by Grade



KENYA

Production System

Kenya is an arabica producer, producing both washed and unwashed coffees. With the exception of 1999/2000, when good climatic conditions led to a crop of 1.5 million bags,

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Kenyan coffee production has been in decline since 1995/96; in 2002/03, less than 1.0 million bags were produced. Production is split between smallholders and estates. Smallholders comprise two categories: smallholders organised in cooperatives, and small estate farmers, who have left the cooperatives. Traditionally, smallholder production has accounted for 60% of production, with estates accounting for the remaining 40%. However, the fall in production in recent years has been greater among smallholders than estates, and the split of production is now closer to 50:50.

Both smallholder and estate production are dominated by the Central Province around Mt Kenya (Table A2.5).

Table A2.5: Kenya - Production by Region ('000 bags)

	1997/98	1998/99	1999/2000	2000/01	2001/02
Smallholder	**560**	**668**	**1,038**	**416**	**480**
Central	292	431	675	254	255
Eastern	204	181	258	118	173
Rift Valley	6	13	12	10	14
Western	19	22	37	12	20
Nyanza	39	21	56	21	17
Other	0	0	1	0	0
Estates	**366**	**473**	**641**	**447**	**383**
Central Province	323	402	576	419	338
Eastern Province	26	25	26	10	17
Rift Valley	16	46	37	16	27
Western	0	1	1	0	1
Nyanza	1	0	1	1	1
Other	0	0	0	0	0
Total	**926**	**1,141**	**1,679**	**863**	**863**

Source: Coffee Board of Kenya.

Marketing System

Diagram A2.6 presents the major input output relations in the Kenya supply chain.

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Diagram A2.6: Kenya Input-Output Relations

All coffee is required to be marketed through a central auction. There are two distinct marketing channels, one for smallholders and one for estates. Smallholders deliver harvested cherries to a co-operative society's processing factory, where it is pulped, washed and dried. It is mandatory for smallholders to market coffee through the co-operative societies. Estates, including small estates, on the other hand, operate their own processing factories.

Both co-operative societies and estates transport the resulting parchment (or dried cherry) to a miller where is it milled to remove the parchment skin (or hulled in the case of dried cherry), and then graded. The resulting clean coffee is then warehoused and auctioned. Marketing agents are responsible for ensuring presentation of coffee in the auction, the preparation of the auction catalogue, the setting of reserve prices and the selection of an auctioneer. Throughout the marketing chain, ownership of the coffee remains with the grower. The clean coffee is then purchased at auction by dealers and exported.

Growers do not receive payment for coffee until the auction proceeds are returned to them. In some cases, cooperatives are able to borrow money to provide a cherry advance on the delivery of cherry.

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Export Grading System

Kenya coffee is graded by size and density, after which it is classified by quality. Here, quality means the combination of the physical appearance of the green bean and the roasted coffee, together with the cup quality (liquor or taste) with the cup being the most important factor (Tables A2.6 and A2.7).

Table A2.6: The Kenyan Grading System

Grades	Description	Screen number on which beans are retained
E	Elephant; 2 beans joined together. Also very large AA beans	Retained over screen 21 = 8,3 mm round
PB	Peaberry: single bean per cherry	Through screen 17, retained over screen 12 = 4.76 mm slotted
AA	Flat beans	Through 21, retained on 18 = 7,2 mm round
AB	Flat beans	Through 18, retained on 16 = 6,35 mm round
C	Smaller flat beans	Through 16, retained on 10 = 3,96 mm round
TT	Light density beans/shells, from AA, AB and E	by air or fluidisation extraction
T	Smallest size, broken beans and small C	Through 7 = 2,9 mm.

Note: Where screen size is specified, a minimum of 95% of the beans shall fall in that grade category. All other grades, not mentioned here, refer to lower qualities and Mbuni (dried cherry)

Source: CBK.

Table A2.7: The Kenyan Classification System

Class/Grade	AA/PB/E	AB	TT	C	T
One	Fine				
Two	Good	Good			
Three	Fair to Good	Fair to Good	Fair to Good		
Four	F.A.Q. *	F.A.Q.	F.A.Q.	Fair to Good	
Five	Fair	Fair	Fair	Fair	Fair
Six	Poor to Fair	Poor to Fair	Poor to Fair	Poor to Fair	Poor to Fair

Note: * FAQ Fair Average Quality. All other classes (7 onwards) refer to lower qualities and mbuni.

Source: CBK.

Auction sales are dominated by AB, Mbuni (dried cherry) and C grades and by quality class 4-6 (Diagrams A2.7 and A2.8).

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Diagram A2.7: Kenyan Auction Sales by Grade

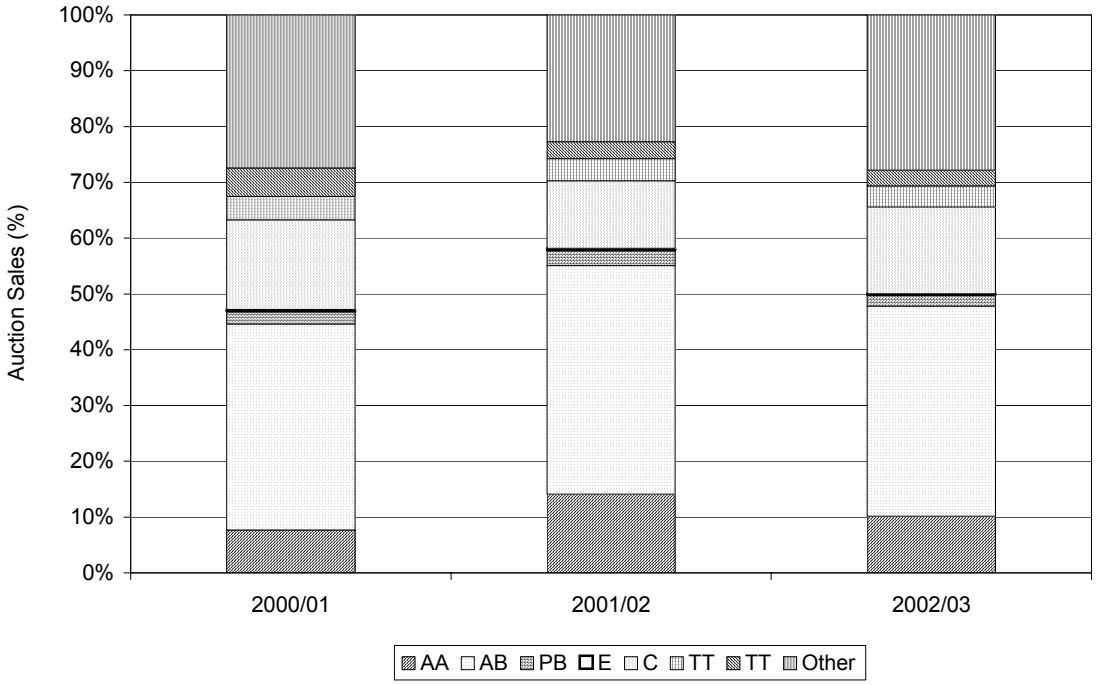
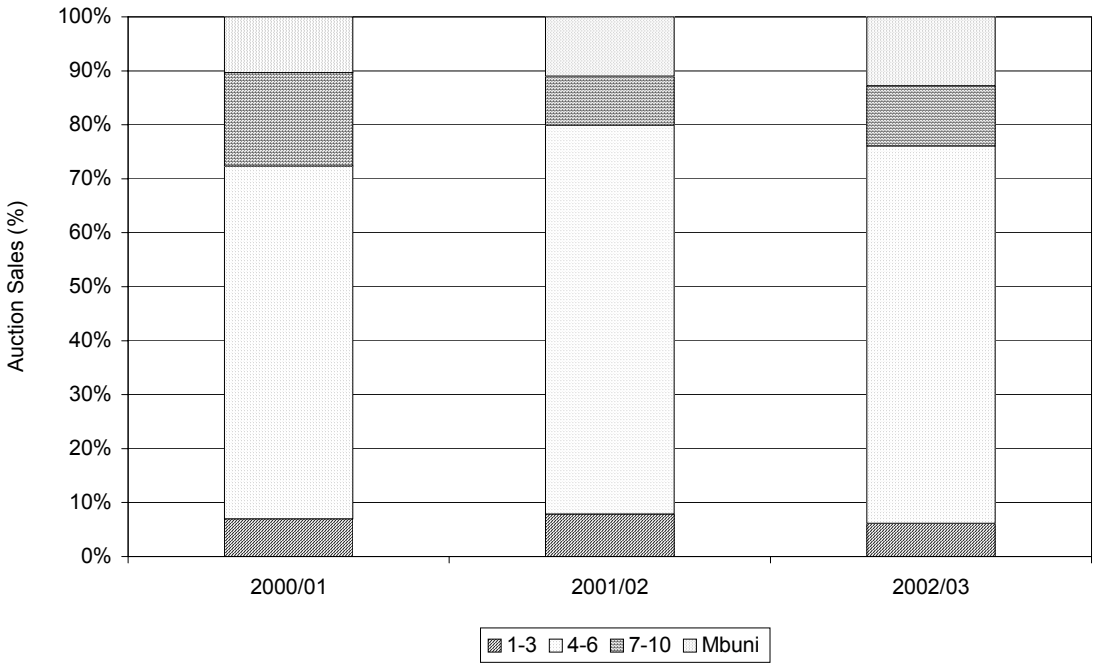


Diagram A2.8: Kenyan Auction Sales by Class



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INDIA

Production System

India produces both robusta and arabica coffee with a roughly 60:40 split between the two types. Around 70% of arabica and 8% of robusta are pulped and washed, while the remainder is dry processed; India is the world's largest producer of washed robusta. Indian coffee production averages around 5 million bags per annum.

Production is split between smallholders and largeholders. Smallholders, each with holdings of less than 10 hectares of coffee, account for over 70% of India's coffee area and 60% of total production; most smallholders have less than 2 hectares of coffee. Largeholders, with more than 10 hectares of coffee, account for the remaining 30% of area and 40% of production.

The Chikmagalur and Coorg Districts in Karnataka State dominate coffee production in India, while Wyanad District in Kerala State is an important robusta producer (Table A2.8).

Table A2.8: Production Share by State and District in 2002/03

State	District	Arabica	Robusta	Total
Karnataka	Chikmagalur	43%	18%	27%
	Coorg	23%	40%	34%
	Hassan	17%	4%	9%
Kerala	Wyanad	0%	31%	20%
	Travancore/Nelliampathies	1%	5%	4%
Tamil Nadu	Pulneys/Nilgiris/Shevroys (Salem)/Anamalais (Coimbatore)	12%	2%	6%
Others	Andra Pradesh & Orissa/North Eastern Region	4%	0%	1%

Source: Coffee Board of India.

Marketing System

The Indian coffee marketing system was liberalised in the 1990s, and most smallholder producers now sell their coffee directly to exporters' agents or domestic manufacturers, while largeholders can also opt to sell through a voluntary auction system. Some largeholders export coffee directly from the plantation, after curing and grading.

The direct marketing system typically involves the producer preparing washed parchment or unwashed, sun dried cherry in 50 kg bags and selling it through an agent, who works on behalf of one or more of the curers and/or exporters. At the curing factory the coffee is tested for moisture and quality. If it meets the minimum standards specified by the exporter, a banker's draft is issued to the agent in the name of the grower. The grower usually receives payment 2-3 days after the collection of the coffee (Diagram A2.9).

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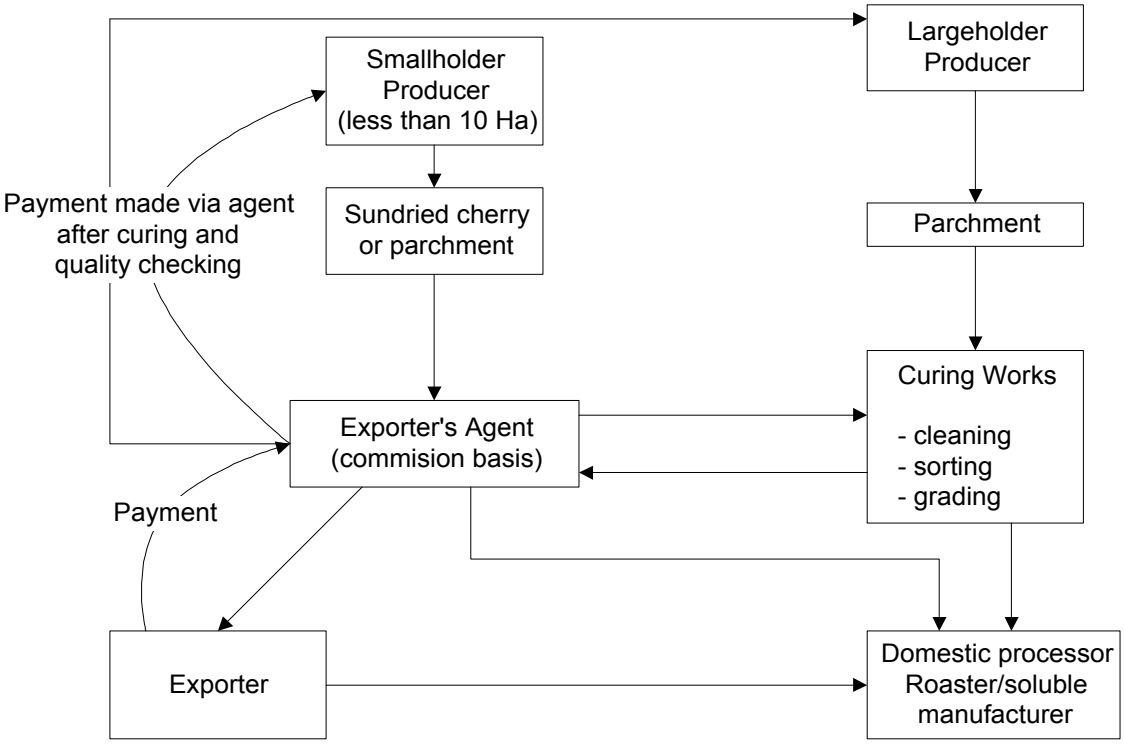
Diagram A2.9: Marketing Chain, Direct Marketing



Larger growers can also sell their coffee through the weekly voluntary auctions, which are conducted by private auctioneers under rules set by the India Coffee Traders' Association (ICTA). However, the proportion of India's production going through the auctions has declined to around 5% (compared to over 10% in the late 1990s) partly because of grower's concerns that they may face a higher tax burden as a result of their participation.

Export Grading System

Indian washed arabicas are known as 'plantation' coffee while washed robustas are classed as 'parchment' coffee; unwashed coffees of both types are called 'cherry'. Robusta cherry accounts for around half of total green exports, followed by plantation coffee with a 30% share (Diagram A2.10).

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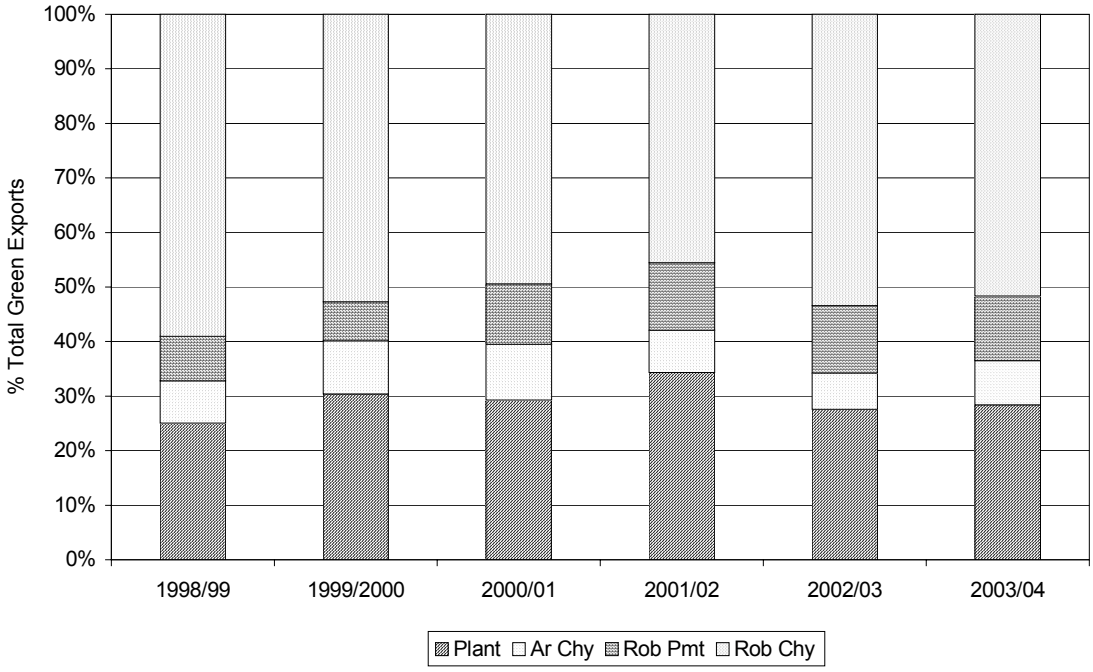
Diagram A2.10: Indian Green Coffee Exports by Type



A number of export grades are set according to bean size and defect levels (Table A2.9).

Table A2.9: Export Classification of Indian Coffees

Type	Processing Method	Classification	Moisture Level	Export Grades
Arabica	Dry (unwashed)	Cherry	10.5%	AA, A, PB Bold, PB, AB, C
	Wet (washed)	Plantation	10.0%	AA, PB Bold, PB, A, B, C
Robusta	Dry (unwashed)	Cherry	11.0%	AA, A, PB Bold, PB, AB, C
	Wet (washed)	Parchment	10.0%	A, PB Bold, PB, AB, C

Note: A tolerance of +/- 0.5% in moisture content is permissible.

Source: Coffee Board of India.

Besides commercial and premium export grades, India offers a selection of specialty coffees such as Mysore Nuggets EB, Robusta Kaapi Royale and Monsooned Coffee. Specialty coffee exports are currently running at around 130,000 bags per year.

CÔTE D'IVOIRE

Production System

Côte d'Ivoire produces around 150-200,000 tonnes of robusta coffee per annum. There are over 400,000 smallholders producing coffee using a low-input low-output system, with average yields of between 250 kg and 350 kg per hectare.

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Marketing System

Prior to liberalisation in 1998, the Caisse de Stabilisation (CAISTAB) guaranteed prices at different stages of the marketing system by absorbing or refunding the difference between a fixed price determined at the start of each season and the actual market price. A stabilisation fund was used to return shortfalls to exporters or retain surpluses. CAISTAB also applied export quotas and performed quality control along the supply chain.

After liberalisation, the system of minimum guaranteed prices was ended, along with export quotas and upcountry quality control. Various institutions now regulate the domestic industry including the Coffee and Cocoa Regulatory Authority (ARCC), the Coffee and Cocoa Bourse (BCC), the Coffee and Cocoa Regulatory and Control Fund (FRC) and the Coffee and Cocoa Producers Promotion Fund (FDPCC), each of which are funded by producer levies.

Farmers usually hull their coffee using small scale artisinal hullers before selling it to private traders or cooperatives, who bulk it together and deliver it to exporters' depots or warehouses situated either upcountry or at the ports. Some cooperatives also export coffee, while some traders act as agents for exporters, who provide pre-financing.

Export Grading System

Ivorian export grading standards are set according to the number of defects and bean size. The main export grades are Grade I, Grade II and Grade III (Tables A2.6 and A2.7).

Table A2.6: Côte d'Ivoire - Export Standards for Main Coffee Grades - Defects

Grade	Requirements (per 300g sample)
0 & I	Total value of defects maximum 60
II	Total value of defects between 61 and 90
III	Total value of defects between 91 and 120
IV	Unspecified

Type of defects	Definition	Value
Large twig	Twig about three centimeters long	2 defects
Average twig	Twig about one centimeter long	1 defect
Small twig	Twig about 0.5 centimeter long	1/3 defect
Dried damaged bean		2 defects
Cherry		1 defect
Black Bean	At least half of the outside of the bean is black	1 defect
Semi-black bean	At the most half of the outside is black	1/2 defect
Parchment bean		1/2 defect
Undesirable bean	Dry, unripe, quakers, sour, spotted, blackened by coffee bean borer bites, ill-shaped, faded beans, etc	1/5 defect
Eaten bean		1/10 defect
Broken bean	Part of a bean that is less than 0.5 size of a normal bean	1/5 defect
Shell		1 defect
Thick cherry skin	Part of the exterior coverings of the fruit	1/5 defect
Thin parchement skin	Part of the covering of the bean	1/3 defect
Stones	Unwashed coffee : max 1.25 gram except peaberries : max 2.5 gram	

Note: If a bean has several defects, it is the most penalising defect that is taken into account.
Source: Supremo

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Table A2.7: Côte d'Ivoire - Export Standards for Main Coffee Grades – Bean Size

Grade 0 (400 gr.)	Milled over screen 18 Max 6 % below screen 18 Max 1 % below screen 16
Grade 1 (360 gr.)	Passing screen 18 Milled over screen 16 Max 20 % above screen 18 Max 6 % above screen 16 Max 1 % below screen 14
Grade 2 (300 gr.)	Passing screen 16 Milled over screen 14 Max 20 % above screen 16 Max 6 % below screen 14 Max 1 % below screen 12
Grade 3 (230 gr.)	Passing screen 14 Milled over screen 12 Max 20 % above screen 14 Max 6 % below screen 12 Max 1 % below screen 10
Grade 4 (180 gr.)	Passing screen 12 Milled over screen 10 Max 20 % above screen 12 Max 6 % below screen 10

Source: Supremo

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