Waking Up from the Coffee Crisis:

Finding the path towards conservation,

sustainability and justice

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EXECUTIVE SUMMARY

The future of biological diversity in the tropics depends in large part on the conservation value of human-dominated landscapes. Coffee (*Coffea* spp.) is one of the world's most valuable export commodities and is grown in some of the highest-diversity regions of the globe, so the manner in which it is produced has the potential to impact conservation goals significantly at both local and regional scales.

Coffee is currently produced in a variety of ways, ranging from rustic conditions under a canopy of native forest to modern monocultures with high levels of chemical inputs and mechanization. Yet over the past five years, the world market for unroasted coffee has been severely depressed. Current green coffee prices have been at record lows, and well below costs of production for many producers. Because of the devastating impacts of these reduced prices on as many as 25 million coffee farmers and their families, this period has been referred to as the "coffee crisis."

The main cause identified for the coffee crisis is the fact that production has been rising at a rate significantly faster than consumption. The International Coffee Agreement, which encouraged participating countries to stockpile surpluses, had helped control overproduction and maintain higher prices starting in 1962. When this agreement collapsed in 1989 and quotas were removed, production slowly began to increase. In particular, new countries such as Vietnam and Indonesia entered the market, and are now out-producing some previous coffee giants (e.g. Colombia). Given the importance of coffee for the developing world, many argue that the coffee crisis has led to an increase in poverty, social unrest, illegal drug cultivation, rural unemployment, and emigration.

In response to the crisis, governments, nongovernmental organizations, and coffee consumers are working to boost the price for producers. One line of action has been the development of certification programs that allow farmers to fetch higher prices for their coffee as long as they meet environmental or social requirements. Consumers in the developed world are beginning to become aware of the environmental advantages of low-intensity production and increasing numbers are prepared to pay a premium for coffee or other crops from such systems. Although some argue that increased prices for certified coffee could in fact lead to coffee expansion at the expense of intact native forest, higher prices may provide stability for farmers making expansion less necessary. Other current endeavors to address the crisis include creating voluntary standards programs for the coffee industry, destroying low quality coffee to decrease the oversupply, and promoting increased coffee consumption in producing countries.

This paper argues that a multi-pronged strategy is needed to combat the crisis and improve the conservation and social impacts of coffee production. This strategy should address global-level supply issues, correct the market failures inherent in the coffee supply chain, and support appropriate local alternatives for coffee where it cannot be grown in a way that is economically and ecologically beneficial. Specific recommendations include the following:

- Think on a "landscape scale" about the conservation impacts of coffee production
- Encourage farmers to polycrop rather than relying solely on their coffee crop, and to find sustainable alternatives to coffee for income where necessary
- Improve and consolidate sustainable coffee certification programs

- Internalize the externalities of coffee production where possible and avoid perverse incentives for farmers to clear nearby forests to expand production

- Decrease the barriers to coffee certification so it is possible for all eligible farmers

- Focus on improving coffee quality
- Shorten the supply chain by creating more direct relationships between producers and buyers

- Continue to improve purchasing practices of the largest corporate coffee buyers

- Strengthen consumer awareness campaigns about sustainable coffees and make sure they are available to more consumers

The unregulated free-market coffee economy has failed to meet the goals of conservation and sustainable development; it has in fact led to a humanitarian and ecological crisis. However, with coordinated effort from governments, NGOs, and coffee drinkers, coffee has the potential to become a positive force for improving both species diversity and human livelihoods.

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***Preface*: The framework of sustainable development and conservation**

> *The core development challenge is to ensure productive work and a much better quality of life for the almost 3 billion poor people today earning less than $2 per day... To achieve this goal, while taking better care of our environmental and social assets, will require a global development process that does better than the one followed in the past...[which] has left a legacy of accumulated environmental and social problems that cannot be repeated.*
>
> -- World Bank's *World Development Report 2003: Sustainable Development in a Dynamic World*, p. ix.

Two of the most pressing problems facing our society today are widespread poverty and the destruction of our ecological life support system. Half the world's population lives on less than $2 a day, and a billion people survive on less than $1 a day (*The Economist* 2002). At the same time, worldwide population is booming and the gap between rich and poor continues to grow. Humans have made more changes to their natural environment in the past century than in all of prior history (Harrison 2000).

The international community has turned to the goal of "sustainable development" to solve the human problems while working to restore healthy environments. According to the World Bank's 2003 *Report on Sustainable Development in a Dynamic World*, the goal is to "eliminate poverty in a way that is environmentally and socially sustainable" (p. ix).

Three main pillars of sustainable development are social, economic, and environmental. An often-quoted definition of sustainable development comes from the Brundtland Report: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987). It is also described as development that respects the limited capacity of an ecosystem to absorb the impact of human activities.

Conservation is often included as part of the environmental pillar of sustainable development. The United Nations estimates that over 12 million hectares of tropical forest are lost every year (cited in Ellison 2004). The goal of conservation is to retain the biological diversity of species and ecosystems on earth.

It is through the lenses of sustainable development and conservation of biological diversity that I will look at the coffee crisis. The goal is to move towards production systems that better preserve both human livelihoods and the natural variety of our planet.

I. INTRODUCTION[1]

1.1 Why is coffee important?

> *There is little doubt that the exodus from rural areas and increased poverty in coffee producing areas caused by the current price crisis poses a very real and wide-ranging threat to sustainable development.* -- Néstor Osorio, Executive Director, International Coffee Organization, 2002

Where is it grown?
Coffee (*Coffea* spp.) is produced in nearly eighty tropical and subtropical countries (Clay 2004). In 2003, 7.8 million metric tons of green (unroasted) coffee was produced worldwide, nearly all (99.95%) of which came from developing countries (FAO 2004). Forty-one countries produced over 10,000 tons of coffee in 2001, and 25 countries produced over 50,000 tons (Donald 2004). More than 60% of world coffee production is exported from Latin America and the Caribbean (FAO 2004).

Currently, the major producers are Brazil, Vietnam, and Colombia, but Costa Rica, Indonesia, and Mexico are also important (see Table 1). It is important to note, however, that coffee can still be a significant land use for some countries even if they are not major exporters. For example Côte d'Ivoire and Puerto Rico have 25-49% of their agricultural land planted in coffee (Clay 2004).

Coffee is one of the developing world's leading exports, and has been second only to oil as a legal source of foreign revenue (Clay 2004). Coffee can account for over three quarters of total export earnings in some developing countries (Dubois 2001). Therefore the coffee market has direct implications for development in these regions.

Table 1: Main Green Coffee Producing Countries, 2003

	Coffee, Green Production	***Coffee, Green Area Harvested***
	(Mt)[2]	***(hectares)***
Brazil	1,970,010	2,405,250
Vietnam	771,200	500,000
Costa Rica	731,126	113,130
Indonesia	702,274	1,001,603
Colombia	695,000	805,000
Mexico	310,861	743,840
India	275,000	323,000
Ethiopia	220,000	260,000
Guatemala	210,000	245,000
Uganda	186,000	264,000

(Source, FAO Stats 2004. All data from 2003)

[1] This section introduces the general topics and themes that will be discussed in greater detail in later sections of the paper.
[2] Mt = million metric tons. 1 metric ton = 2,205 pounds = 16.7 bags of green coffee.

Who grows it?
Over 25 million people (largely smallholders) are involved directly in coffee production, and an additional 75 million people are indirectly dependent on coffee to earn their living (Bigirwa 2004; Clay 2004; Donald 2004; Dubois 2001). Others estimate that over 125 million people worldwide are directly or indirectly dependent on coffee for their livelihoods (Osorio 2002, Santos 2003).

Coffee plantations are important employment generators in many tropical countries. Smallholder coffee cultivation is labor-intensive, requiring approximately 73 person-days/ha/year and the efforts of entire families. For example, nearly 23% of the agricultural labor force in Colombia is involved in coffee production (Donald 2004).

Seventy-five percent of the world's coffee is grown on farms smaller than 10 hectares, mostly in family-run operations (Jeffrey, 2003). In Central America and Mexico, 90% and 98% of coffee enterprises, respectively, are smaller than 10 hectares (Rice and Ward 1996). In Colombia, 96% of coffee is grown on plots of 3 hectares or less (Wilson 2001).

Who consumes it?
On the other end of the equation, the United States is the world's leading coffee consumer. The United States imported $1.8 billion worth of green coffee in 2002 (ITC 2004) (see Table 2). A third of the world's coffee is imported by the United States, where coffee is the third largest import after oil and steel (Donald 2004). Europe consumes another 40% of the coffee traded internationally (Clay 2004).

Table 2: The Main Coffee Importing Countries, 2002

	Value 2002 US$ '000's
United States	1,799,246
Germany	1,115,301
Japan	668,090
France	586,680
Italy	428,822
Canada	382,526
United Kingdom	309,826
Belgium	305,049
Netherlands	281,753
Spain	248,673
Russian Federation	228,680

(Source: ITC Trade statistics for 2002)

Together, the size of the coffee market, the amount of land in coffee production, and the fact that coffee is mainly grown in developing countries by small farmers make coffee an important commodity to analyze in terms of whether it can be grown in a humanly and environmentally sustainable way.

1.2 Coffee and conservation

The rapid rate of tropical forest loss has led scientists to turn their conservation efforts toward maximizing biodiversity on human-managed landscapes and agroecosystems. Coffee, especially coffee grown in the shade, has received substantial attention over recent years for its potential ability to harbor a diverse array of wild species (Perfecto et al. 1996). Approximately 11.5 million hectares worldwide are planted in coffee, typically replacing lower- and middle-elevation tropical forests in some of the world's most biologically diverse regions (Donald 2004; Myers et al. 2000).

There is a significant overlap between regions where coffee is grown and conservation "hotspots," or areas with "exceptional concentrations of endemic species and experiencing exceptional loss of habitat" (Myers et al. 2000). Of the 25 "biodiversity hotspots" identified by Conservation International, 13 overlap with coffee-growing areas. For example, Colombia is not only one of the top coffee producing countries, but also has the world's richest array of bird and amphibian species (Somarriba et al. 2004).

Because protected areas alone are insufficient to maintain biodiversity the land use matrix surrounding forest patches is of increasing importance for the conservation of native species (Miller 1996). Traditional shaded coffee systems can protect against soil erosion, aid in watershed management, act as a carbon sink, and provide habitat for many migrant birds and other animals, many of them rare or endangered (CABI 2004). Smallholder coffee is important since it is grown mostly under shade trees and either inter-cropped or grown in a semi-natural agro-forestry setting.

However, not all coffee production is environmentally friendly. There has been a shift in recent decades to monoculture production in full sun with heavy agrochemical use. Also, in some cases, coffee expansion can correspond with deforestation when there is an incentive for farmers to plant more land with coffee in previously forested areas (see Nestel 1995 for Mexico and O'Brian and Kinnaird 2003 for Indonesia, described in section 3.2 below). Section III of this paper will discuss the conservation implications of coffee production in greater detail.

1.3 The coffee crisis

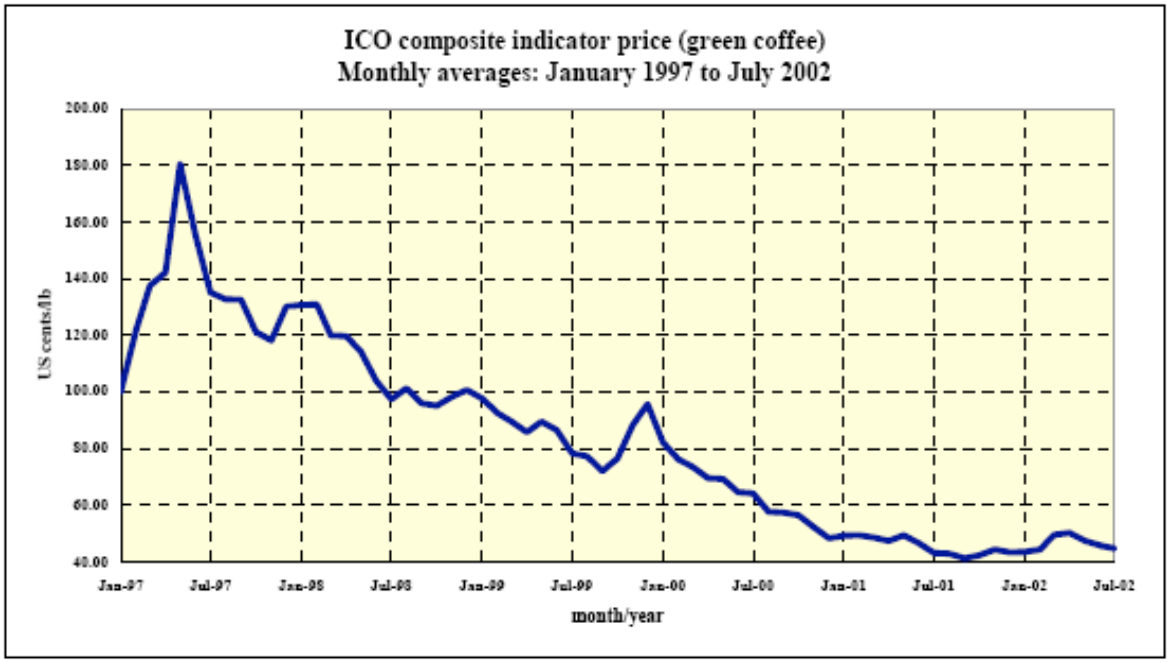
While coffee is of critical importance for the economic health of many poorer countries and small farmers, and potentially important for conservation of significant ecosystems, the market has had a devastating effect in recent years in both economic and conservation terms. Over the past seven years, prices for the ten basic commodities upon which 80 percent of developing countries depend for their livelihoods have fallen between 50 and 86 percent (Robbins 2003). Of these, coffee has been the commodity most affected by this sudden drop in prices (Osorio 2004). Between 1999 and 2002, the price of coffee was cut in half (see Figure 1). In 2002, the ICO[3] composite price for coffee (determined by the commodities market of the New York stock exchange) fell to 42 cents (US) per pound, the lowest price in real terms of the past 100 years (Osorio 2002, FAO 2004). In most cases, this price did not meet farmers' production costs.

During the early 1990s, while coffee producing countries earned annual revenues of US$10-12 billion from coffee exportation, industrialized countries earned $30 billion from coffee retail

[3] International Coffee Organization, the intergovernmental organization created by the United Nations to serve the world coffee community.

sales. As of 2002, however, the value of retail sales ballooned to exceed US$70 billion for industrialized countries, while coffee producing countries received only half of what they had previously earned, a mere $5.1 billion for production of the crop (FAO 2004; Osorio 2002). Small farmers, who generally sell to middlemen, end up capturing as little as 2-4 percent of the retail price of coffee (FLO 2004).

Figure 1: Coffee's price drop



(Source: ICO, www.ico.org)

It has been generally agreed that the main cause of coffee's recent price fall (to be discussed in greater detail in section 2.4) was the rapid increase in production, compared to the relatively stable coffee consumption rates (Clay 2004). Between 1962 and 1989, overproduction was moderated by the International Coffee Agreement, which encouraged participating countries to stockpile coffee surpluses to keep prices high. When this agreement collapsed in 1989 and quotas were removed, prices collapsed (Donald 2004). After a few price spikes in the 1990s due to frosts in Brazil, the price dropped to its lowest real value in 100 years by 1999. In 2003, 112 million to 114 million 60 kg bags of coffee were produced, compared to the 85 million bags currently consumed (Suri 2004). According to Oxfam (2001), more than five billion pounds of coffee go to waste each year. Given that demand for coffee is growing very slowly while global production continues to expand, most analysts predict that coffee's price recovery will be slow (Varangis et al. 2003).

These low prices have "serious repercussions for human livelihoods and biodiversity conservation" (O'Brian and Kinnaird 2003). Some producers are abandoning coffee plantations, while others are destroying them and switching to other crops (Clay 2004; O'Brian and Kinnaird 2003). In Latin America, for example, many small farmers have abandoned their coffee farms and migrated north. Others have intensified production toward sun management, attempting to increase yields, or have converted shade coffee farms to cattle pasture or illegal crops. Section 3.2 will discuss the possible conservation impacts of these landscape-level changes.

1.4 In search of solutions

There has been a move in emphasis by the international community to coordinating economic development with conservation efforts, in order to address both challenges more effectively. Some of these efforts have been aimed at improving the livelihoods of coffee farmers while protecting the habitat quality of their coffee fields. In the last decade, certification of specialty "sustainable coffees," including organic, shade grown or biodiversity-friendly, and fair trade, has begun to address the low prices by paying premiums to farmers for keeping to certain environmental and/or social standards. Other attempts are now being made by government, international aid organizations, NGOs, and corporations to address the crisis through setting standards for coffee quality and sources, and supporting diversification into other crops.

This report first deals with assessing the causes and impacts of the coffee crisis, then evaluates the various strategies for coping with the crisis in a way that aims to maximize biodiversity conservation and the well-being of coffee farmers, sustainably over time. I will look at how the coffee market has the potential either to improve or worsen both development and biodiversity. Some of the questions I will examine are:

- How is the oversupply (or under-consumption) problem being addressed, given that individual actors have incentives to increase production to gain foreign exchange revenue?
- What are the conservation implications of a reduction in coffee prices, or of a reduction in the number of traditional shaded coffee farms in the tropics?
- Can price premiums be designed to allow smallholders to survive and flourish economically without encouraging increased deforestation to plant more coffee?
- How can the playing field be leveled for small farmers? Can the coffee industry be "deconcentrated" out of the hands of just a few large companies? Can more of the major industry players be brought to the table in support of sustainable coffee?

In particular, the report is structured as follows. The next section, II, is a background on world coffee production, the major stakeholders in the coffee supply chain, and the causes of the coffee crisis. Section III explores the main conservation issues surrounding coffee production, and compares the ways coffee is currently grown while also considering the possible implications if farmers begin to switch out of coffee production. Section IV looks at the social impacts of the coffee crisis, and discusses the inequities inherent in the current coffee commodity market structure. Section V introduces some of the efforts that have been initiated by conservation groups, international aid organizations, and governments in response to the crisis. Finally, Section VI offers recommendations of strategies to improve the sustainability (social, environmental, and economic) of coffee production.

II. BACKGROUND ON THE WORLD COFFEE MARKET

2.1 Types of coffee: Arabica vs. robusta

Coffee is a woody shrub or small tree[4] that belongs to the genus *Coffea* in the family Rubiaceae. It is a fairly easy crop to grow in tropical and subtropical environments, yet it can be susceptible to a number of diseases and insect pests (see Box 1, page 22). There are two main types of coffee grown in the world, *Coffea arabica* (known as "arabica") and *Coffea canephora* var. robusta (known as "robusta")[5]. Arabica and robusta differ in numerous ways, including their optimum growing conditions, taste, caffeine content, disease resistance, and commercial markets.

Arabica is of higher quality, is grown at higher elevations (450-1,800 meters compared to 0-1,000 meters for robustas), and fetches almost twice the price of the heartier robusta (Dicum and Luttinger 1999). Robusta coffee has a higher caffeine content, a more bitter taste (unless disguised by blending with arabica or artificial flavor compounds), and is able to grow in more diverse conditions. For example, robusta is resistant to the water-borne coffee leaf rust (*Hemileia vastatrix*), and thus can also be grown in wetter areas.

Arabica originates from the highlands of Ethiopia, and was the first coffee variety produced for sale, starting before 1000 AD. Arabicas can either be sold in the commodity market or in specialty coffee markets**.** Specialty coffee is produced mostly on small-holder farms and can command much higher prices than commercial-grade arabica.

Robusta coffee entered the world commercial market only after World War II (when it was used to make instant coffee for the troops), and is now used in instant coffees and in mass-consumption supermarket coffee brands. Recently, roasters have found ways to sell more of the cheaper and more abundant robustas by steaming to remove the harsh taste or adding flavorings (e.g. hazelnut, French vanilla).

Arabica accounts for about 70 percent of world production (2004). Generally, arabica is grown in Latin America, and robusta in West Africa and Asia, although Brazil grows both types and elsewhere the division is also not absolute[6]. Arabica production involves higher overhead costs (including capital, administration, and management). The composite price is weighted at 65 percent arabica, 35 percent robusta. The world prices for robusta are usually 30-40 percent lower than composite prices.

2.2 Methods of production: Traditional to technified

Coffee production traditionally consisted of the planting of arabica coffee bushes under a selectively thinned canopy of native forest. Later, coffee was integrated as part of a polycropping or agroforestry system in which the coffee plants are grown in the shade of other economically valuable tree species, and often along with a variety of other economically or non-economically important plants. More recently there has been a trend towards "technified" coffee, which entails planting newly developed varieties of coffee in modern plantations

[4] Coffee trees can reach 10 meters in height, but they are usually pruned to under 2.5 meters when cultivated to make harvesting easier.

[5] *C. liberica* and a small number of other species are also cultivated, but they make up a miniscule proportion of total production.

[6] Vietnam has plans to increase arabica production in the near future, largely in forested uplands of rich biodiversity (Donald 2004).

requiring considerable levels of chemical inputs and using either no shade trees or a reduced level of shade from a limited number of genera (e.g. Inga, Eucalyptus) (see Section 3.1 for more details).

2.3 Coffee processing

Coffee begins to bear fruits in its third year after planting, and the ripe "cherries" are harvested and processed to make the beverage we drink. In most coffee-growing regions, there is one major harvest per year, although in some countries, such as Colombia, where there are two flowerings each year, there is a main and secondary crop. A typical coffee shrub produces 2,000 cherries, each of which has two beans, which is equivalent to half a kilo (1 pound) of roasted coffee per year. In most countries, the ripe coffee is picked by hand. Only in certain areas with relatively flat landscapes and large coffee fields, such as certain locations in Brazil, has the process been mechanized. Whether harvested by hand or by machine, all coffee is either "strip picked," in which the entire crop is picked at one time, or "selectively picked," in which only the dark red ripe cherries are picked, and the harvesters rotate between the trees every 8 - 10 days. The latter method is used primarily to harvest the higher-quality arabica beans (NCA 2004).

After being harvested, coffee is processed using either the dry or wet method, depending on local resources. In the dry method, the freshly picked cherries are spread out on large surfaces and dried in the sun. They are turned every 4 hours, and covered at night or if it rains. When the moisture content falls to 11 percent, the dried cherries are hulled to expose the beans and moved to warehouses for storage. The dry method is less expensive, and less polluting, but is usually used for lower-quality beans (Dicum and Luttinger 1999). In the wet method, the cherries are sent through a pulping machine where the skin and pulp is removed. The pulp that was removed is often dried and used as mulch for future coffee crops. As the beans are conveyed by the water, they are generally separated by weight into higher quality for export and lower quality for domestic consumption. After separation, the beans are transported into large fermentation tanks, where they will remain for 12 to 48 hours, depending on climate and altitude, until the mucilage (parenchyma) is removed through naturally occurring enzymes. The beans are then rinsed and then sun dried or machine dried in large tumblers. Once dried, these beans are referred to as "parchment coffee" (NCA 2004).

Before being exported, parchment coffee is machine hulled (to remove the parchment layer) and sometimes "polished" to remove any remaining skin and improve quality. Finally, the coffee will be graded and sorted into size and quality categories, and any defective beans will be removed. These beans are now called "green coffee" and are ready for export. Once exported, they are sent to a roaster where they are transformed into aromatic brown beans. Roasting generally occurs in the importing countries, so the freshly roasted beans can reach the consumer quickly (NCA 2004).

2.4 The Stakeholders

Coffee goes through a chain of go-betweens longer than for any other product in the food industry. After the coffee cherries are picked they must be processed, dried, bagged, shipped, roasted, and sold before they are finally brewed. Coffee can change hands as many as 150 times before it reaches the consumer (Madeley 2004).

Farmers, Harvesters, and Exporters
Most coffee is grown by farmers on small plots of land. For example, the average Colombian farm is only 1.5 hectares (Vigilante 2003). Due to their place at the bottom of the supply chain, small farmers typically receive far below the export price, which means that they usually earn less than ten percent of the final retail price of roasted coffee, or less than 2% of the retail price of brewed coffee from a coffee shop (Osorio 2002). For instance, robusta farmers in Cameroon received ten US cents per pound for their coffee in 2001, which was less than two percent of the retail price of coffee sold in the UK (Gresser and Tickell 2002). Unskilled labor accounts for close to 60% of the production costs of coffee (Ramirez-Vallejo 2002). The labor for harvesting coffee may be extended family members of the farmers, or other seasonal hired hands. The initial drying and processing steps may involve local cooperatives. Dried green coffee is either sold directly to roasters (national or multinational firms) who are in search of beans of a certain quality (in rare cases) or is sold to private or institutional buyers who then export the coffee.

While large coffee farmers can afford their own processing mills (*beneficios*), small farmers have little leverage in selling their harvest to *beneficio* owners, and are often forced to accept coffee prices up to 50 percent below the export value. Exporters commonly purchase unharvested crop of coffee from a small farmer at below market prices in exchange for a cash advance that allows the farmer to make it through the year (Tom Barry, cited in Dicum and Luttinger 1999).

Traders, Roasters and Retailers
Within the consuming countries, coffee trading, roasting and retailing are consolidated in the hands of a small number of big players. Five coffee trading companies dominate 48 percent of the world market, five importers manage 46 percent of the total coffee exports, and five roasters control 55 percent of this volume. In the United States, the market is further concentrated[7]. Two brands, Maxwell House (Kraft Foods) and Folgers (Procter & Gamble) provide coffee to 56 percent of the US market. In Germany, Kraft Jacobs Suchard and Tchibo/Eduscho control 56 percent, and in Japan, Ueshimo Coffee and Key Coffee hold 43 percent of the market (Ramirez-Vallejo 2002). The Swiss multinational, Nescafé, is the world's largest buyer of coffee beans.

The "Big Four" coffee roasters—Sara Lee, Procter & Gamble, Nestlé, and Kraft (owned by Philip-Morris) dominate the global coffee industry; they each hold annual coffee sales in excess of $1 billion, and their profit margins range between an estimated 17 and 26 percent[8]. These four plus Germany's Tchibo buy nearly half of the world's coffee beans each year.

A small but viable segment of the market has emerged that focuses on quality and product differentiation (specialty and gourmet coffees), and this sector is more diverse with more small companies involved (Varangis 2003). However, the vast majority of coffee is still consumed at home or in restaurants, where mostly the mass-consumption supermarket brands owned by the large conglomerates are served. For example, the ubiquitous Starbucks buys less than 1 percent of the world's coffee supply (Ramirez-Vallejo 2002).

Unequal division of profits
Most of the total revenue is captured by the transnational companies that control the international trading and processing of coffee, such as Philip Morris and Nestlé, and by the major coffee retailers such as Tesco and Starbucks (Gresser and Tickell 2002). Ten years ago,

[7] Three coffee roasters control 74% of the US market.
[8] Nestlé's profit margin from instant-coffee is 26% and Sara Lee's is 17% (which is high for the food and drink field) (Pennington 2002).

developing countries captured 30% of the value of the coffee market. As of 2002, they only captured 7%, as mentioned (FLO 2004; Osorio 2002). As shown in Table 3, only 13 cents of each dollar goes to the farmer and his help. Very little, 16 cents, is paid in the producing country (not counting transport).

Table 3: Where $1 spent on Roast Ground Coffee in the United States Went (1990s)

Value added in consuming country	67 cents
Retail store	11 cents
Farm labor	8 cents
Paid to grower	5 cents
Value added in producing country	3 cents
Transport and loss	6 cents

(Source: Ramirez-Vallejo 2002)

Consumers

> *Over the past decade, the global coffee industry has gone through a transition that, at first glance, seems to defy the fundamentals of economics. Since the early 1990s, coffee production, centered in developing Latin American, Asian, and African countries, has soared. Yet at the same time, prices for specialty blends at supermarkets and cafes have risen, and even the price of mainstream coffee brands like Folgers has not dropped that much. Call it Economics 102-a new paradigm in which both producers and consumers lose.* -Kurlantzick, 2003

While coffee began as a luxury item, it is now consumed daily by almost 2 billion people worldwide, and approximately 40% of the world's population drinks at least one cup of coffee per year (Clay 2004). Europe consumes approximately 40% of all coffee traded globally, and the United States consumes another 25% - or 2.3 billion pounds per year (Clay 2004; *The Financial Times* 2002). Sweden has the highest current per capita consumption of coffee; each person drinks an average of 1,100 cups per year (Clay 2004).

Consumers in the developed world are increasingly focusing on higher quality coffee, which they are willing to pay higher prices for, but overall they are consuming less total coffee than they used to (Clay 2004). Some of this coffee has been replaced by soda consumption. In 1970, the average US consumer drank 36 gallons of coffee and 23 gallons of carbonated soft drinks. By 2000, the ratio was 17 gallons coffee to 53 gallons soda (Jeffrey 2003). The majority of coffee consumers still drink the lower-quality instant coffees or mass-market blends made of robusta beans (Clay 2004).

One might expect that consumers stand to benefit from falling coffee prices. However, consumers are actually paying increasing prices for their coffee beverages in developed countries. Also, increasing quantities of robusta are being used in coffee blends, so for the typical consumer (of non-specialty coffees) the quality of their coffee is declining. The highly and increasingly consolidated food and coffee market in the US is likely a good part of the explanation for why coffee defies fundamental economic theory.

International Coffee Organization
The International Coffee Organization (ICO) is an intergovernmental body that was originally established by the United Nations in 1962 to address global issues related to coffee. ICO members include all major producer countries and virtually all major consumer countries. The organization also has all major industry players on its private-sector consultative board.

One of the ICO's main roles has been to implement the International Coffee Agreement. Between 1962 and 1989, the Agreement served to regulate the volume of coffee exported from all major producing countries in order to assure a stable price on the world market. The involvement of the consuming countries (especially the United States) in this agreement was most likely a result of the Cold War climate. The hope was that stable coffee prices would lead to private capital accumulation and investment in producing countries, which would then boost these countries' economies and "minimize the inroads which communist propagandists might otherwise achieve" (Love 1999).

The ICO now has 74 member countries, comprising 45 producing countries and 29 consuming countries. However, since the breakdown of the quota system, the influence of the organization has been reduced, and its main activities are now statistics gathering, economic studies, conferences and awareness events and marketing activities. There is now a strong bias in the organization against "intervening in the market" (Osorio 2004).

2.5 Causes of the coffee crisis

> *I will never tire of saying that the market should be given a free hand. In the case of coffee, however, total liberalization of the market has brought only disaster and penury for producers.... The free market imposed on us after the breakdown of the International Coffee Agreement has favoured only the interests of big business in the developed world. Neither coffee growers nor final consumers have benefited from this new order.*
>
> -- Dr. Juan Manuel Santos, former Finance Minister of Colombia, 19 May 2003

The coffee crisis has generally been blamed on the increasing imbalance between supply and demand. Coffee production has been rising at an average annual rate of 3.6%, but demand has been increasing by only 1.5%. Total production in coffee year 2001/02 (October-September) was estimated at around 113 million 60 kg bags while world consumption is just over 106 million bags. On top of this, world stocks amount to around 40 million bags. The coffee glut can be traced to the breakdown of the International Coffee Agreement and the rapid expansion of production in Vietnam and the expansion of production elsewhere in Asia and in Brazil. As this section will explain, beyond the problem of over-supply, two other principal factors underlie the current crisis: changes in demand and changes in the quality of the coffee supplied by Brazil and Vietnam (Varangis 2003).

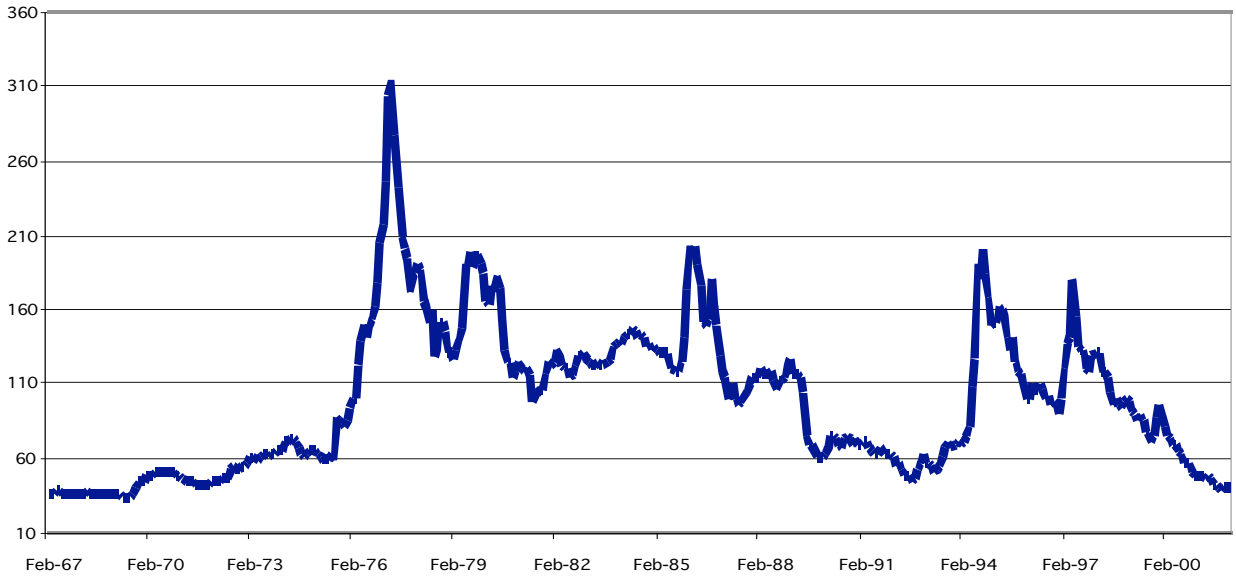
Breakdown of the International Coffee Agreement
As previously mentioned, the ICO regulated coffee production between 1962 and 1989. Between 1975 and 1989, although coffee prices fluctuated, they rarely fell below the agreement's minimum price of $1.20 per pound (see Figure 2). But in 1989, after the Cold War, the United States withdrew its support[9] and the International Coffee Agreement dissolved (it could not be supported without the backing of the world's largest coffee consumer), and prices collapsed (they fell from 124 cents per pound in December 1988 to 62 cents per pound in

[9] Although the US did not completely leave the ICO until a few years later.

December 1989, ICO 2004). Coffee prices remained low for most of the 1990s, with the exception of 2 short-lived spikes due to threats of frost in Brazil[10] (see Figure 2). The term "coffee crisis" officially began to be used to refer to the period starting in 1999; by early 2000 prices averaged under 50 cents per pound - adjusted for inflation, the lowest wholesale price for coffee in 100 years (Jeffrey 2003).

Attempts at establishing new production-setting institutions have been largely ineffective. One such attempt was the Association of Coffee-Producing Countries (ACPC). In 1993 a group of producer countries (including Brazil, Colombia, Costa Rica, El Salvador, Honduras, and Nicaragua) joined to form the ACPC, which unlike the ICA, does not include consumer countries. The ACPC aimed to cut the world supply by as much as 30% in order to improve coffee prices, but has had little success. Nestor Osorio, current Executive Director of the ICO believes a producer cartel such as OPEC for petroleum is not possible for coffee. "In the case of OPEC and petroleum, the tap can be turned off and production can be cut overnight. Coffee trees bear fruit three or four years after planting and since coffee is a crop produced on small-scale family farms, it provides an immediate livelihood for those involved." He also explains that while petroleum is state-owned and its management is in the hands of a few powerful countries, coffee production is spread over more than fifty countries, so coordination is near impossible (Osorio 2004).

Figure 2: Coffee price from 1967 to 2002 (prices in nominal US$ per 100lbs)



(From: Varangis et al. 2002)

Expanding production

Despite low coffee prices, worldwide coffee production increased in the 1990s, with new coffee production coming from Vietnam and Indonesia, where robusta could be produced on relatively poor soils and cheap labor was plentiful. Vietnam's production grew from 2 million bags per year in the early 1990s to 15 million bags by the early 2000s, bumping it up to being the world's

[10] Brazil, which produces both arabica and robusta varieties, accounts for about a fourth of world production, so it can have significant impact on world prices.

second largest supplier. In fact, Vietnam now produces 160 times more than it did in 1961 (see Table 4)[11].

Table 4: Production in 2002 and temporal trends in coffee production for the six major producer countries (listed in decreasing order of overall production in 2002) and globally

	Production in 2002 [a]		*Production changes, 1961-2000 (%)* [b]		
	area	***Production 1000 tons***	***area***	***Yield/ha***	***Total tons***
Brazil	2367.4	2390.1	−46.4	+52.8	−18.1
Vietnam	470.0	688.0	+1055.7	+1292.9	+15997.6
Colombia	805.0	660.0	−9.9	+55.3	+40.0
Indonesia	891.0	376.7	+79.8	−15.3	+319.0
Mexico	752.0	319.0	+146.2	+13.5	+179.6
Côte d'Ivoire	1170.0	198.0	+417.7	−62.0	+96.8
WORLD	10828.5	7364.3	+18.1	+32.0	+55.9

[a] *Area in thousands of hectares and production in thousands of tons and refers to weight of unprocessed green coffee.*
[b] *Expressed as percent increase (+) or decrease (−) in cultivated area, yield per unit area, and total production.*
Adapted from: Donald (2004), data from *FAOSTAT*

Increasing coffee production in Asia was in part due to the pressure of development institutions like the World Bank who pushed producing countries to increase their production in order to earn foreign exchange revenue. Meanwhile, in Latin America, coffee production was maintained by increasing yields due to the conversion of traditional shade-grown coffee systems to more intensive "full sun" monoculture systems (supported by increasing agrochemical inputs). Production was also pushed by price spikes caused by frosts in Brazil, which lasted long enough for farmers to plant more coffee before the price fell again[12]. And because coffee is a perennial crop that takes three years from planting to first harvest, production generally continues to rise for two to three years in the face of failing prices (Dicum and Luttinger 1999; Ramirez-Vallejo 2002). The result has been production levels at an all time high and depressed prices.

During 2000 and 2001, worldwide oversupply caused coffee prices to drop to their lowest levels in 30 years, or to a 100-year low if adjusted for inflation. There are currently 40 million bags of surplus coffee on the world market - the equivalent of eight months' consumption (Osorio 2002; Santos 2003). This excess coffee is held in warehouses worldwide. Coffee stocks have generally decreased in producing countries and increased in coffee consuming countries, since importers buy up large amounts of coffee when prices are lowest (FAO 2003). Looking forward, Vietnam has made no commitment to decrease production rates, and Indonesia has announced plans to increase robusta production, despite low prices, as part of its rural development efforts (O'Brian and Kinnaird 2003).

[11] Jorge Cardenas, head of the National Federation of Colombian coffee growers, even went so far as to say that nations such as Vietnam are "dumping" and that local labor regulations make it impossible for his countrymen to compete (Wilson 2001).
[12] Brazil lost approximately 13 million bags of coffee to frost in the mid-1990s, which increased prices. By the end of the 1990s, however, Brazilian post-frost replanting (now free from government constraints on tree density and planting techniques) caused production to increase and, thus an increase in world supply (Varangis 2003). Brazil accounts for about a fourth of world production and produces both arabica and robusta varieties.

Quality
Currently, low prices tend to lead to lower quality because farmers are left with limited resources to care for their harvest. For example, a "farmer who normally pays harvesters to go through the coffee trees three times during a harvesting season to pick the ripe cherries and now sends them through once only, picking unripe and overripe beans with the ripe ones" (Osorio 2002). Furthermore, the higher quality mild arabica coffees are usually more costly to produce than robustas, so farmers are finding it more difficult to stay in business for production of the mild arabicas (Osorio 2002).

Meanwhile, the "big four" coffee retailers (Nestle, Kraft, Proctor & Gamble, and Sara Lee) also have affected the world market by encouraging the rapid expansion of low-cost robusta coffee production in Asia and Brazil. Advances in roasting and flavoring technologies over the last decade and a half have allowed these companies to increase significantly the amount of robusta coffee in their products, which in turn has led to a lower demand (and thus lower price) for arabica coffee (Kurlantzick 2003). Because *robusta* varieties can be grown in many more places and require less care, profit margins are substantially higher than with *arabica*.

In a study of income along the coffee supply chain, John Talbot (1997) found that since the early 1990s, large corporations have been able to increase markedly their share of the profit, and have used their "oligopsony[13] market positions and control of massive stockpiles of coffee … to hold world market prices at depressed prices." Moreover, the concentration of the industry in so few hands in effect limits coffee producing countries to the export of the raw, unprocessed product, given the difficulty of obtaining sufficient capital to compete with such gigantic market players in processing the product (Love 1999).

Consumption
The amount of coffee bought in the United States and Europe has been decreasing in recent years in both absolute and per capita terms (Clay 2004). There has been almost no growth in total demand among major importing countries except for Japan since 1994, when demand recovered after a small reduction due to a temporary coffee price increase (World Bank 2003).

However, imports have begun to grow in several non-traditional coffee consuming countries, such as Eastern Europe and the Russian Federation, driven by the availability of cheap instant coffees. Also, coffee consumption has increased in some coffee producing countries in Asia and Latin America (FAO 2003). In Brazil, roasters have taken an opposite approach from in Eastern Europe, concentrating on labeling and quality in the domestic market. This has allowed Brazil to increase domestic demand and become the world's second largest consumer[14]. Overall world demand has reached approximately 105 million bags (Varangis 2003).

According to the National Coffee Association's annual National Coffee Drinking Trends survey of consumption in the U.S. (2004), there has been a moderate increase in daily consumption and a significant increase in occasional consumption over the past ten years, with 4 million new daily and over 20 million new occasional coffee drinkers. The leading growth sector in the past five years has been gourmet coffee, increasing its share of the daily market from 3% to 16% of the adult population since 1997, i.e. from 7 million to 27 million daily gourmet coffee drinkers. There has also been a rise in "dual drinkers," who are people who regularly drink both traditional and gourmet coffee beverages. Those who drink exclusively gourmet coffee beverages was off

[13] A market condition in which purchasers are so few that the actions of any one of them can materially affect price and the costs that competitors must pay.
[14] Although part of the increase in domestic consumption in Brazil has been the government's adding of coffee to the menu in the public school lunch program.

slightly, down to 4% from 2003's 5%. Overall coffee consumption remained strong and steady in 2004, totaling 8 in 10 American adults (NCA 2004). On balance, sales of commercial ground and instant coffees have declined while sales of specialty coffees have increased (CEC 2001). There is hope that in the future, the Chinese will begin to increase coffee consumption, thus raising worldwide demand. Currently, the average coffee consumption in China is one cup per person per year, but in Taiwan each person drinks on average 38 cups per year, so there is hope that China will follow this trend (Clay 2004).

III. COFFEE AND CONSERVATION

3.1 From shade to sun coffee production

Coffee can be produced in a broad range of ways, ranging from "rustic" shade coffee grown in conditions that hardly alter forest structure to modern monoculture "full-sun" plantations requiring mechanization and considerable levels of chemical inputs. While much of the discussion surrounding coffee production, especially in regards to conservation, refers to full-sun versus shade-grown coffee, these are in fact two ends of a continuum. Moguel and Toledo (1999) describe five different common coffee production systems in Mexico, ranging from traditional smallholdings shaded by native trees to larger full-sun systems relying on chemical inputs and year-round labor (see Figure 3). The five groupings are:

- *Rustic:* Farmers leave the original forest canopy intact and remove only enough vegetation from the forest floor to plant the coffee bushes.

- *Traditional polyculture*: In these integrated agroforestry systems, producers make use of the original canopy for shade, but also introduce other economically useful plant or tree species along with the coffee bushes.

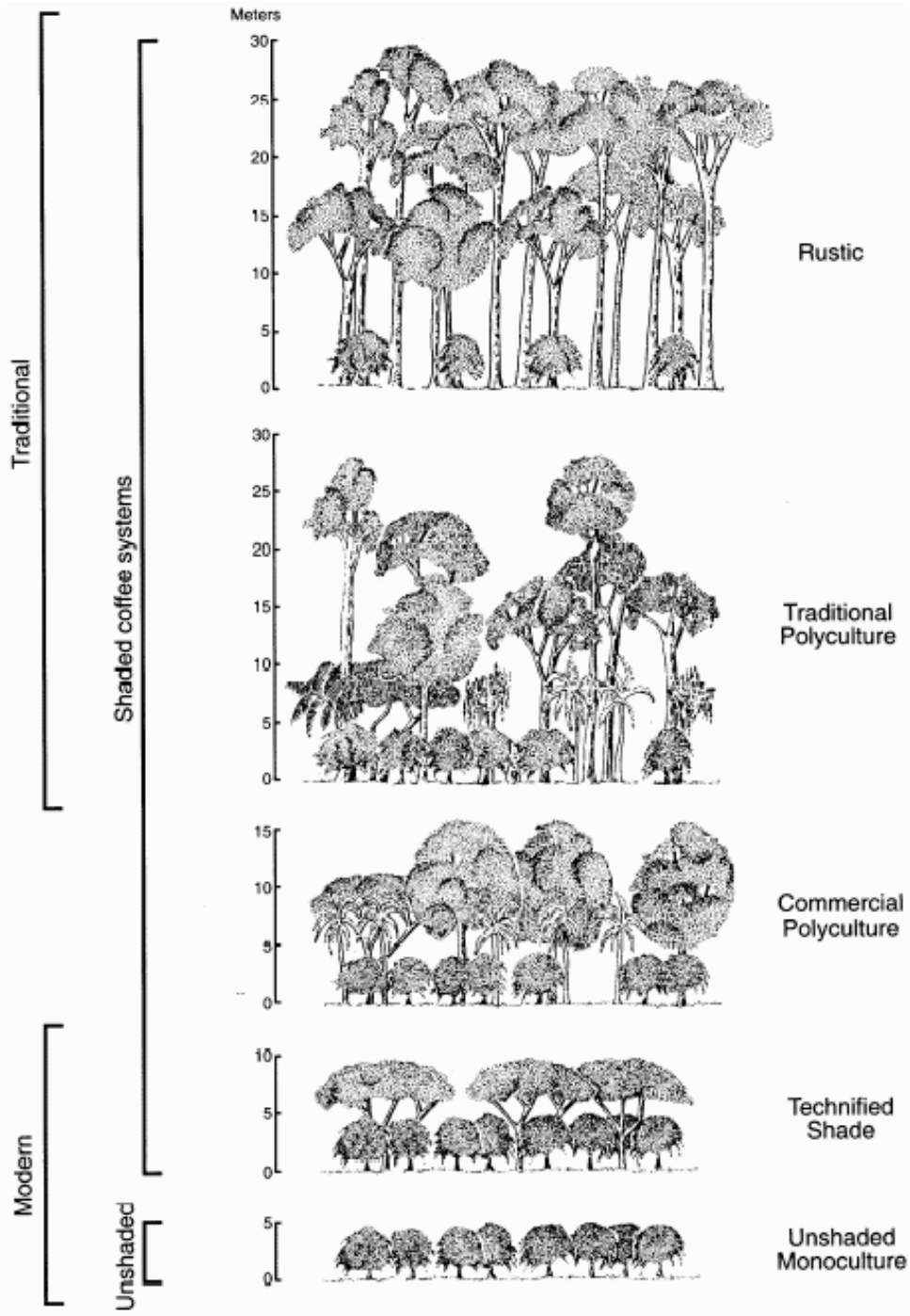
- *Commercial polyculture:* Farmers remove the original forest cover and replace it with coffee and shade trees, as well as other commercially useful species. This system usually requires chemical inputs and has an average canopy height of 15 m (as opposed to 20–30 m for the other systems).

- *Shaded monoculture*: Leguminous trees are used to fix nitrogen in the soil and provide shade for the coffee bushes.

- *Unshaded monoculture:* Coffee bushes are exposed to direct sunlight and are not grown with other plants.

Table 5 compares the typical characteristics of traditional versus modern coffee systems. Rustic or traditional systems use different coffee varieties, which are managed less intensely. Pruning is minimized and labor is greatly reduced for the coffee to free up family labor for other productive activities. Coffee plant density is one third to one fifth lower, planted under a wider range of tree species. Shading is often very heavy (60% to 90%). Productivity is lower and agrochemical use is very low or nonexistent. After World War II, high-yielding coffee varieties were developed that could be grown in dense, full-sun monocultures provided sufficient chemical inputs were available. Full-sun coffee tends to be robusta, however some varieties of arabica can be grown in full sun, such as is done in Brazil.

Figure 3: The five coffee-growing systems common in Mexico, showing vegetational complexity, height of canopy, and variety of components



(from Gobbi 2000, modified from Moguel and Toledo, 1999)

Table 5: A summary of some typical characteristics of traditional and modern coffee systems.

	Traditional **(Rustic & Traditional Polyculture)**	***Modern*** **(Semi-shaded & Unshaded Monoculture)**
Shade cover	60-90%	0-50%
Shade trees	mixed	monoculture
Shade tree size	tall (25 m), natural	short (5-8 m), planted
Coffee plant size	tall (3-5 m)	short (2-3 m)
Coffee plant density	1-2,000/ha	3-10,000/ha
Yield per hectare	low	High
Yield per tree	high	Low
Bean quality	higher	Lower
Time to first harvest	4-6 years	3-4 years
Productive life	>30 years	12-15 years
Production scale	smallholders	larger producers
Chemical use	none/low	high, essential
Fertilizer use	low	High
Pruning	none/light	Heavy
Labor	seasonal	year round
Irrigation	low	High
Soil erosion	low	High
Soil quality	high	Low
Leaf litter production	high	Low
Incidence of disease	low	High
Insect pollination	high	Low
Structural complexity	high	Low
Weed cover	low	High

[Adapted from Donald (2004). Sources: *Rice and Ward (1996), Perfecto et al. (1996), Araroff and Monasterio (1997), Babbar and Zak (1995), Aranguren et al. (1982), Muschler (2001), Roubik (2002), Siebert (2002), & Soto-Pinto et al. (2002)*]

Advantages of shade for coffee growth

Coffee in its wild state is an understory crop, and thus traditional coffee varieties in certain growing zones fare best in shaded conditions. Specifically, shade has been known to:

- Greatly reduce weed growth, reducing the competition for nutrients between weeds and the coffee crop (Nestel 1995).
- Protect the coffee plants from disease or pests (see Box 1, below).
- Buffer coffee plants from extreme weather conditions. The shade tree canopy intercepts solar radiation, wind, and rain, creating a more stable environment for the coffee crop (Nestel 1995).

- Reduce the need for chemical fertilizers, contribute important nutrients to the soil, and reduce erosion through the accumulation of fallen organic material from the shade trees (which serves as natural mulch), all of which support long-term productivity (Swantz 1996; Van der Voort and Greenberg 1997).

- Improve the quality and size of beans, and even the taste of the finished product (Beer 1987; Muschler 2001); and

- Increase the productive life of the coffee plants (Beer 1987).

Box 1: *Pests and disease*

Over the past three decades, coffee pests have become increasingly problematic to coffee growers in Central America. There are now at least 350 diseases that can attack coffee, and over 1,000 pests that can cause problems (Clay 2004). Staver et al. (2001) relate this increase to a) the recent introduction of new pests, b) more favorable conditions for existing pests, diseases, and weeds due to lower shade levels, and c) secondary pest problems caused by pesticide use. Problems with insect pests in shaded coffee are less severe than in unshaded coffee due to the highly diverse and abundant, populations of beneficial insects found in shaded systems. This beneficial fauna may regulate the population levels of pests below economic thresholds (Nestel 1995).

Another advantage of shaded coffee systems is that they possess intrinsic mechanisms for the recycling of nutrients, such as through litter accumulation and decomposition from shade tree leaves, reducing the dependency of the system on and external supply of nutrients (Nestel 1995). The extensive root system of shade trees stabilizes soil particles, reducing soil erosion during strong rains. The humus layer is also enhanced in shaded systems, resulting in greater diversity and abundance of the detritivorous fauna (Nestel 1995). Shade trees create more habitats for birds and soil insects, increasing the species and trophic diversity in the ecosystem (Nestel 1995).

In many high-production areas, however, where coffee covers large areas, shade plantations are heavily managed, with the canopy being made up of short, planted, usually leguminous nitrogen-fixing trees (e.g., *Inga*, *Gliricidia,* and *Erythrina*), which are heavily pruned to manage shade levels (Greenberg et al. 1997). Some of these planted shade trees lose their leaves during the dry season, making them similar during this period to full-sun systems.

There has also been a recent trend in Costa Rica and other coffee producing countries towards the use of *Eucalyptus deglupta*, which is fast-growing and maintains the proper level of shade for coffee plants so less pruning by the farmer is required. Although this is a fairly aggressive species, there is no evidence that competition between the Eucalyptus and coffee root systems caused any decrease in coffee yield (Schaller et al. 2003).

Non-coffee benefits of shade

Farmers have traditionally managed their coffee shade canopies “to diversify production, cope with unexpected family needs and pest outbreaks, buffer themselves against persistent low coffee prices, and reduce both weed competition and the need for expensive inorganic fertilizers” (Somarriba et al. 2004). Inventories of plant species in shaded coffee systems have shown a wealth of plants of commercial or domestic value to the farmer, beyond the value of the shade the canopy species provided. According to Swantz (1996), shade trees fall into two

categories, “commodity” and “service” trees. The former are those trees that yield a product and direct income, such as timber or fruit. The second category is trees which perform agroecological services such as nitrogen fixation (such as Poro, *Erythrina poeppigiana*, and *Inga* species) and thus provide indirect economic benefits. Food and fuel are by far the most common secondary uses of shade trees (Nestel 1995; Soto-Pinto 2000). For example, *Inga* species not only are good shade providers and fix nitrogen in the soil, but also provide excellent firewood, and some species produce edible fruit.

Several theses (Gonzales 1980, Barker 1991, Hernandez Guerra 1995 - cited in Swantz 1996) from the Center for Tropical Agricultural Research and Instruction (CATIE) in Turrialba, Costa Rica show that 1) laurel (*Cordia alliodora*) timber can contribute significantly to farm income in years of low coffee prices, 2) total farm income for coffee was best when laurel and Poro (*Erythrina* spp.) were mixed in the overstory, and 3) even though coffee yields are lower under shade, the net present value is highest when coffee is mixed with laurel. In Central America, typical commercial timber production from shade tree species, such as *Cordia alliodora*, is in the range of 4-6 cubic meters per hectare per year (Beer et al. 1998). In Peru and Guatemala, products from the shade canopy can account for 28 and 19 percent (respectively) of the total value of the coffee farm (R. Rice, unpublished data, 2002, cited in Somarriba et al. 2004). In Puriscal, Costa Rica, the sale of oranges and other fruit from the shade canopy accounted for 5-11 percent of total sales from the coffee plot (Lagemann and Heuveldop 1983, cited in Somarriba et al. 2004). These commercially valuable products can act as a hedge against coffee crop failure or a drop in coffee prices.

Trend toward full-sun production

Despite the benefits of using shade trees in coffee plantations, there has been a trend over the past three decades towards the development of new varieties (e.g., caturra) that are tolerant of direct sunlight. These new varieties can be grown in the absence of a forest canopy, and are therefore more amenable to mechanized agricultural practices. More sun coffee bushes can be cultivated per hectare than shade. In favorable climates where there are good soils, this method produces higher yields per unit area, if not necessarily per plant. This trend was encouraged by government, trade, and international aid organizations[15] as a reaction to the arrival of coffee leaf rust (*Hemileia vastatrix*) to the Americas and to raise production. Researchers believed that the disease was controllable with chemicals in low-humidity sun coffee plantations (Donald 2004).

Besides, some have argued that there are certain disadvantages to the use of shade trees in coffee production. They are summarized here from Beer (1987):

- Falling trees and branches from the shade cover could damage the understory crop.
- Sudden defoliation in the shade trees could cause severe shock to understory crops adapted to the shade.
- Additional manual labor may be necessary to prune the shade trees.
- Mechanization of the underlying crop is rarely possible.
- Terracing and other erosion control structures can be hampered by shade trees.
- Heavy shading can reduce yields.

[15] Support has mainly been through subsidies, especially the U.S. Agency for International Development (Donald 2004).

In his review, Beer (1987) concludes that farmers can balance the positive and negative factors of shade, and carefully manage their coffee farms to maximum advantage based on selection of shade tree species. However, it is also true that shade trees themselves usually obviate the need for terracing and erosion control in many situations.

At present, vast areas of the tropics are planted with sun coffee. By the beginning of the 1990s, 1.1 million hectares of coffee land in Mexico, Colombia, Central America and the Caribbean had been converted into modern, technified coffee farms out of a total of 2.8 million hectares planted in coffee. Sun coffee now makes up about 40% of coffee production in Colombia, Central America, and the Caribbean (Gobbi 2000). In Mexico specifically, rustic and traditional polyculture systems account for 40% of the coffee area, and shaded monoculture (typically - but not always - with just one species of shade tree) accounts for 42% of total area (Moguel and Toledo 1999).

How farmers choose

The system chosen in any location is the result of sociocultural as well as economic conditions and the ecological constraints of local natural resources (Fuentes-Flores 1982, cited in Donald 2004). Clay (2004) agrees that growers select their specific production technique based on the economic situation, microclimate, personal finances, family tradition, and coffee diseases found in the area, as well as other considerations (Clay 2004). Fluctuations in world coffee prices tend to lead to increases or decreases in the area under each production system (Donald 2004) (though, not to the point of balancing production and price at the international level).

The optimal levels of shade for increased yield and pest control vary with climate, elevation, and soils (Staver et al. 2001). Shade is most needed in hot, dry, and windy places, while it is less necessary in cool, humid and cloudy highland areas[16]. For example: Staver et al. (2001) found that in a low-elevation dry coffee zone, 35 to 65% shade promotes leaf retention in the dry season and reduces problems of berry blotch (*Cercospora coffeicola)*, weeds, and citrus mealybug (*Planococcus citri)*; at the same time, it increases the effectiveness of beneficial microbial and parasitic organisms without contributing to increased problematic coffee leaf rust (*Hemileia vastatrix*) levels or reducing yields. Shading is also most used where soils are nutrient-poor (and thus it is necessary to keep yields low to keep production sustainable); where shade-loving varieties are grown, and where shade trees have significant economic value (Donald 2004).

Economics of sun vs. shade

The amount and method of coffee production is determined by the relative costs of land and labor at a given time (at least at times when decisions are made about whether to put in new coffee plantings). Sun coffee generally has a productive life of six to eight years, and shade-grown coffee stays productive for eighteen to twenty-four years, so during this time land and labor values can change. Historically, coffee was grown on large plantations of 500 ha or more, yet now it is typically grown on small farms. This is in large part due to the fact that hired labor has become more expensive, and small farms are better able to supply cheap labor from extended families, and this increased labor can also reduce the need for expensive chemical fertilizers or pesticides (Clay 2004).

Considering the longer lifespan of coffee bushes that have grown in the shade, there is also less capital required for frequent replanting (as is the case in sun plantations), not to mention the

[16] For example, little shade is used above 1,200 meters in where there is greater than 2,5000 mm of rain per year, as is the case in certain parts of Central America (Somarriba et al. 2004).

cost of having to wait the 2-4 years for new coffee plants to begin to produce fruits (Somarriba 2004). Swantz (1996) concluded that "under certain soil and climatic conditions, and when dealing with economies of scale, full-sun cultivation can be the most profitable option." However, The Atlantic Monthly in 1999 (after the crisis began) reported that "the economic advantages of sun coffee are no longer so obvious. Although sun producers…earn more than shade farmers when coffee prices are high, their reliance on chemicals and the techniques of intensive agriculture means that their costs are higher, leaving them more vulnerable than traditional growers to low prices" (Hull 1999).

Swantz argued that "the easiest way to encourage shaded cultivation is to attach an economic value to the shade overstory… an overstory blend of commodity and service trees appears to provide an efficient, profitable option at proper planting densities." More diverse agroforestry systems can offer extra income and can be a safer investment in a volatile world market. A study from Costa Rica found that just 1 hectare of diverse shade coffee plantation could supply all of the timber, firewood, and fruits needed by a 7-person family (Peeters et al. 2003).

Environmental impacts

Coffee production, especially intensive "technified" production can lead to severe environmental externalities. High-input coffee is the second most chemically intensive crop (after cotton); in some areas, farmers use up to a pound of chemicals for every pound of coffee they produce (McLean 1997; Wexler 2003). The effects of agrochemical use and soil erosion also impact the area outside of the given farm, given that soil and chemicals are washed downstream from intensive coffee plantations (Clay 2004). Thus far, these off-farm impacts have not been systematically documented in the literature (ICRAF 2001). Furthermore, over-intensive production can result in soil erosion or degradation (Clay 2004). As summed up by Rappole et al. (2003), "Sun coffee is not a diverse ecosystem, and its byproducts - forest reduction, increased erosion, chemical run-off (from requisite high levels of pesticide treatments), and consolidation of plantations under large landowners - are not positive environmental developments."

Studies have found that over time intensive technified production has actually led to increased pest problems and other secondary problems resulting from the use of pesticides (Staver et al. 2001). Staver et al. (2001) claim that "The strategy of maximizing coffee production with pest control dominated by synthetic pesticides has not only increased yields substantially, but also production costs, pesticide resistance, and both human health and environmental risks."

The alternative is for farmers to stick with the coffee systems that use no or few chemicals (the rustic, the traditional polyculture, or the commercial polyculture system), and to adopt sustainable integrated pest management techniques[17,18]. These are usually defined as limited strategic use of least harmful pesticides only when the benefit outweighs the risk both in the long and short term as well as using non-pesticide control measures as opposed to routine application of pesticides to control any pests that may become problematic. Several species of Hymenoptera, Diptera, and Fungi are natural enemies of coffee pests. Shade tree selection and management are important tools for integrated pest management because increased shade may increase the incidence of certain pests and diseases and decrease the incidence of others (Beer et al. 1998).

[17] Integrated pest management is promoted in coffee plantations to control pests and disease in a manner less harmful to the environment than the use of pesticides alone.

[18] In general, with diverse traditional coffee systems, pest problems are fewer than with less diverse modern systems.

Biodiversity impacts
Shaded coffee farms, especially rustic coffee systems, can support a broad range of native species. Traditional coffee farms are important repositories of diversity for groups such as trees and epiphytes, mammals, birds, reptiles, amphibians, and arthropods (Moguel and Toledo 1999). Studies have been done documenting that bird, mammal, and arthropod diversity declines with coffee intensification (Perfecto et al. 1996, Greenberg et al. 1997, Somarriba 2004, etc.) but little is known about the effects of coffee management on reptiles, amphibians and microbes.

Flora:
Plant species diversity in coffee fields varies with location and with coffee production system. High plant diversity in shaded coffee systems, particularly in traditional polyculture systems, compared to other crop systems is well documented (Moguel and Toledo 1999). Research has been done on composition and structure of shade and companion species, including inventories of the different plant species in the shaded coffee systems. The ground cover in coffee plantations typically includes 20-90 plant species.

Biodiversity of canopy species tends to be very high in rustic and traditional polyculture shade coffee systems (Faminow and Ariza Rodriguez 2001). For example, in parts of Nicaragua, traditional coffee systems incorporate over 25 species of fruit and timber trees (many native). In Costa Rica, plant species richness on coffee farms varied between 19 and 49 species, and one study in El Salvador recorded 18 exotic and 119 native tree species in shaded coffee plantations (O. Komar, cited in Donald 2004; Somarriba et al. 2004). In Sumatra, Indonesia, coffee is generally grown with 10-15 additional crops (Godoy and Bennett 1989, cited in Somarriba et al. 2004).

Not all shaded coffee farms have such a diverse canopy. For instance, the majority of farms in Costa Rica and El Salvador have shade canopies with only 2 or 3 species, and in Nicaragua, farms typically have 7 to 10 species. The most commonly used shade species depends on the region. Bananas are more common in Nicaraguan coffee farms than in other Central American countries, where any of 25 *Inga* species tend to dominate (Somarriba et al. 2004).

Insects*:*
Arthropod species richness is greater in shaded systems compared to unshaded systems (Faminow and Ariza Rodriguez 2001). Research indicates that arthropods benefit from plant species richness within the coffee system. Perfecto et al. (1996) collected arthropods in different coffee systems in Costa Rica and found that traditional coffee systems supported 198-259 species of beetles, ants, and non-ant hymenoptera, while non-shaded technified coffee farms contained only 67-69 species from these categories. Perfecto et al. (1996) also reported 34% more spiders in coffee bushes in a traditional coffee system than in a monoculture. Another study (Ibarra-Nunez 1990, cited in Somarriba et al. 2004) found a total of 609 species of arthropods in a shaded coffee farm in Mexico.

In 2002, Perfecto and Vandermeer studied ground-foraging ants in isolated forest fragments in a matrix of coffee agroecosystems of southwestern Chiapas, Mexico. They found the species richness of ants was not significantly different between a forest fragment and a shaded organic coffee farm, but it was significantly lower in a conventional coffee farm with only spotty shade than in the forest. Species richness decreased with distance from the forest fragment in both matrix types, suggesting that the quality of the agricultural landscape is important for the conservation of ant diversity (Perfecto and Vandermeer 2002).

Higher insect variety in diverse coffee systems provides a food platform to support additional avian diversity. Roberts et al. (2000) found evidence that shade coffee plantations can provide additional habitat for *Eciton burchelli* and *Labidus praedator*, army ants that are top predators of the leaf litter arthropod community, and that act as critical links between swarm-attendant bird species and leaf-litter arthropods, providing an easily exploited food resource that would otherwise be unavailable for many birds. In addition, the leaves of *Inga* (a common shade tree on coffee plantations) act as hosts for a variety of invertebrates, such as grasshoppers, lepidopteran larvae, spiders, beetles, skipper larvae, and microlepidoptera. These invertebrates are attracted away from coffee shrubs and other productive crops by the *Inga* leaves and themselves attract birds that prey upon them. However, if pesticides are used, insect numbers are reduced and the tree canopy hosts lower numbers of birds (Moguel and Toledo 1999)[19].

Birds:
Numerous studies have been conducted to determine compare species richness of birds in shaded and unshaded coffee systems, and in nearby native forests. As a whole, the research indicates that a greater abundance and diversity of birds are found in shaded coffee systems than in unshaded systems (Greenberg et al. 1997, see Moguel and Toledo 1999). Traditional coffee systems are associated with the greatest diversity of birds, and bird species richness in traditional shaded coffee systems in Mexico has been found to be even higher than in some natural forests[20]. Greenberg et al. (1997b) found 104 to 107 bird species in a commercial polyculture coffee system in Chiapas – more than any other agricultural landscape and exceeded only by undisturbed tropical forest.

Bird species' richness falls sharply in less shaded, less diverse coffee systems, because food sources like fruit, seeds and insects are less diverse and less abundant (Moguel and Toledo 1999). This follows from studies showing that more than 2/3 of the birds are found in the canopy of shade plantations and less than 10% are found foraging in coffee plants (Van der Voort and Greenberg 1997). Martínez and Peters (1996) found 50 bird species in a shaded monoculture environment and only 6 to 12 species in unshaded monoculture environments (cited in Moguel and Toledo 1999). The *Inga* shade trees were a very popular foraging platform, and were used by 95% of the birds observed. Shaded coffee farms play a key role as habitat for migratory birds, and thus can have impacts on conservation on a multi-region scale (Somarriba et al. 2004).

However, it is important to steer away from the simplified sun versus shade argument. Calvo and Blake (1998) point out that "all shade coffee plantations are not equivalent, nor are they likely to be equally beneficial as habitats for birds." The type of habitat best suited to migratory or native species of a certain area is locally specific. Besides the difference in density and diversity of shade trees on a farm, Perfecto et al. (2003) found that bird species richness on coffee farms was correlated with distance from the nearest forest fragment[21]. Therefore, to maximize on-farm bird diversity, it is necessary to have intact forest fragments nearby.

Mammals:
Traditional coffee agroecosystems are one of the few agricultural systems that can sustain a diverse wild mammal population. Studies show that mammals favor shade systems and also

[19] There are many other studies of invertebrates in coffee plantaions not included here. For more information, see papers by I. Armbrecht, G. Ibarra-Nuñez, A. Mas and T. Dietsch, and S. Philpott.
[20] By compiling information from several sources, Moguel and Toledo (1999) found that avian diversity in traditional shaded coffee systems was actually greater than in natural cloud forests, humid oak-pine forests, oak forests, or pine forests.
[21] In their study, bird diversity was actually more correlated with distance from the nearest forest patch than with the on-farm habitat quality.

benefit from the greater diversity of vegetation found within them (Faminow and Ariza Rodriguez 2001). Gallina et al. (1996) argue that a diverse coffee agroecosystem is an important habitat alternative for mammals. The shade tree canopy provides good sources of food, shelter, nests, and protection for mammals. They also note that it is not only the on-farm vegetation structure that is important, but also the "patchiness of the habitat" – the variations in vegetation and topography on a landscape scale. The more variety the habitat offers, the greater animal species diversity it can support.

Sun vs. shade coffee and biodiversity:
As seen above, shaded coffee plantations can support high levels of biodiversity. Monoculture or commercial polyculture coffee systems can offer higher (although less stable) economic returns than traditional coffee production systems, but with significantly lower levels of biodiversity. Management options are available to improve the attractiveness of coffee systems for fauna, while simultaneously maintaining coffee output at consistent and productive levels. Selection of canopy density, shade-tree species, and amount of shade-tree diversity are important factors in creating an agroecosystem that is attractive to fauna (ICRAF 2001).

3.2 The conservation question: coffee and biodiversity

The amount and type of coffee produced can have profound effects on worldwide biodiversity levels, and the conservation implications of coffee production have been gaining the attention of conservation organizations worldwide[22]. As of 2003, coffee was grown on 11 million hectares worldwide, mostly in the tropical areas also known for harboring high levels of species diversity (FAO 2004, Moguel and Toledo 1999). Coffee can have both positive and negative impacts on conservation efforts depending on numerous factors, including the type of production system, the scale of analysis (farm-level or landscape), and the economic factors at play (e.g., coffee prices, government or private incentives, and the alternative land use options available).

Not all shade is created equal
Much of the discussion about the conservation impacts of coffee has centered on whether or not it is "shade grown." As discussed in the previous section, not all shade coffee provides suitable habitat for a wide range of native species. As Russell Greenberg, Director of the Smithsonian Migratory Bird Center, states, "I no longer draw the line between shade and sun in terms of the benefits to biodiversity. Much of the coffee in northern Latin America is called shade, but it's marginal in terms of biodiversity" (quoted in Hull 1999).

The extent that biodiversity is supported depends on the type of shaded coffee system and other local factors (e.g. canopy species used, management techniques used, and the surrounding landscape). Rustic and traditional shaded polyculture systems that incorporate coffee (and other crops) into the natural ecosystem produce the greatest biodiversity benefits. By contrast, the biodiversity benefits from shaded monocultures and other simplified coffee systems are less promising (ICAFE 2001).

Intensive vs. extensive agriculture
While it is clear that the more complex and less "technified" coffee systems can support more biodiversity, there is another important level of analysis: the overall landscape scale. For starters, there are two prevailing views on the potential impacts of agricultural intensification on tropical forests. One states that farming through intensive systems (provided a given total level

[22] The conservation community has learned that traditional strategies for protecting biodiversity (through the creation of protected areas, or the use of regulations to protect specific species) have not been sufficient to adequately protect biodiversity (CEC 2001).

of production) removes pressure from forested areas. The other holds that the increased profits associated with technological progress in frontier agriculture will serve as incentives for further deforestation. While the result is dependant on local circumstances, the evidence points to the latter being true.

Coffee and deforestation

The spread of coffee production can sometimes cause the conversion of native forest land. According to Conservation International (2004), to date, some 10 million hectares of rain forest have been converted to coffee plantations. In Indonesia, O'Brian and Kinnaird (2003) found a strong positive correlation between coffee prices and rates of deforestation[23]. In Mexico, Nestel (1995) also found that rising coffee prices during the 1970s and 1980s corresponded with increases in both the area under cultivation and the yield per unit area[24].

In the future, production is likely to expand in areas where input costs, such as land and labor, are low compared to the price that can be obtained for the coffee. This is most likely in Asian robusta-producing countries such as India, Vietnam, and perhaps Laos, Cambodia, and Myanmar (Clay 2004). Plans are already in place in Vietnam to increase arabica production rapidly in forested uplands, which are currently rich in biodiversity (Donald 2004).

Most commonly, however, intact native forest is only threatened when government policies encourage rapid expansion by the provision of subsidies or the lack of enforcement of protected areas. Clearly, if the conservation community hopes to protect biodiversity in these areas, strategies must be developed in the near-term to improve policies and counteract the economic pressures to expand the area planted in low-diversity technified coffee farms.

Landscape changes: Are alternatives to coffee better or worse?

On the other hand, in many of the traditionally arabica-producing areas such as Latin America (where more diverse coffee systems predominate), low coffee prices will most likely lead to a decrease in the area planted in coffee, with possible negative impacts on diversity at a landscape level (Clay 2004; O'Brian and Kinnaird 2003; also see Box 2, page 30). Already, in places where farmers depend largely on coffee for income and they have been unable to recuperate their production costs due to the price drop, many farmers have been forced to abandon their farms, to switch to alternative crops, or to incur substantial debt (Osorio 2002).

According to a report by Oxfam International, Mexico's coffee exports fell by 40 percent in 2002 because many coffee farmers decided not to harvest their beans, given that prices had fallen below their production costs (Gresser and Tickell 2002). In Colombia, the area under coffee decreased by 35 percent in less than a decade (Santos 2003). In fact, according to Clay (2004), "in Costa Rica and Colombia it is unlikely that coffee will hold its own unless a way can be found to certify and market more of it at higher prices so that producers can receive an increasing amount of every dollar paid in consuming countries" (also see Box 2). Blackman et al. (2003) also found that low coffee prices would most likely lead to increased deforestation.

In those areas of the world where producers cannot afford to wait for coffee prices to rise again (with no real expectation that they will in the near future), farmers will begin to look for alternative means to support their families. So far in Latin America, lands that were recently

[23] However, O'Brian and Kinnaird (2003) do not necessarily show causation between coffee expansion and deforestation. In Sumatra, for example, coffee expansion is supported by the government, even within National Parks. Thus it is not only coffee prices, but government subsidies, support, and permission that contribute to this expansion.

[24] Nestel's (1995) study coincided, however, with the era in which the Mexican government via INMECAFE was strongly promoting coffee technification.

under coffee have been converted to other crops, pasture, or illegal drugs. Reportedly, in Colombia an estimated 1,000 of 560,000 coffee farms had been converted to coca and poppy production by mid-2001 (Wilson 2001).

Box 2: *The changing landscape of Pérez Zeledón, Costa Rica*

Changing world commodity prices can impact farmers' land use decisions, leading to shifts in landscape composition. Since crop types differ widely in the levels of biodiversity they can support (e.g., complex coffee agroforestry systems vs. monocrops of sugar cane), these landscape-level shifts are likely to affect the capacity of agricultural areas to support native species. Taylor Ricketts of World Wildlife Fund with the assistance of Jaime Florez and the author (M. MacDowell) conducted a survey of 49 small-scale coffee farmers in Pérez Zeledón, Costa Rica to determine how the current market crisis has affected them, how they are changing their land use practices in response to the price drop, who they are turning to for advice, and how these changes are likely to impact future landscape composition. We found that, while coffee prices were sufficient to produce a small profit for farmers in 1997 through 1999, prices since then have dropped to roughly half this amount. Consequently, as of 2002, farmers had reduced almost all chemical inputs and most labor-intensive coffee management practices compared to 1997. If prices continue at low levels, 50% of farmers said they would decrease the area planted in coffee. Using these data, we forecast that area in coffee production would decrease from 44% to between 34% and 39% of the landscape in the survey area. Farmers appeared to base their land use decisions mainly on their own judgment or on advice from family. Understanding likely farmer behavior and predicting landscape compositional change will help to prepare for and prevent changes that hinder both human livelihoods and the ability of an area to support native biodiversity.

(source: unpublished data from 2003, M. MacDowell, T. Ricketts, and J. Florez)

Several studies have looked at the differences in species richness between shaded coffee and other non-coffee agricultural land uses. These studies record lower species richness in the more intensive land uses such as corn, pasture or sugarcane (Borrero 1986; Terborgh 1989; Greenberg 1994; Petit et al. 1999, cited in Philpott and Dietsch 2003). Areas where land is cleared for grazing cattle or growing monocrops show significantly lower levels of diversity of flora, birds, and arthropods than in typical shade coffee farms (CEC 2001). Shade coffee has been shown to be better than most land uses for maintaining natural diversity, for conserving water sources and for other ecosystem services.

Given the alternatives, the loss of diverse coffee agroecosystems (which characterize a large portion of the small farms in Latin America[25]) due to low prices will be to the detriment of biodiversity conservation (O'Brian and Kinnaird 2003). When the coffee's shade canopy is lost, oftentimes so are the organisms that depend on that habitat. According to Somarriba et al. (2004), in most areas where coffee is grown, the landscape has been so severely deforested and transformed that "the only remaining tree cover is that in the coffee plantations." For example, in El Salvador, most of what is considered to be "forest cover" is actually shade-grown coffee (Somarriba et al. 2004). Once these forest-like areas are lost, it becomes difficult or impossible to recover the species diversity. Moreover, even if coffee prices were to rise over time, it would take 4-6 years before new coffee bushes were ready to produce, and much longer to reestablish a tree canopy on deforested slopes (Jeffrey 2003).

[25] Moguel and Toledo (1999) found that 60% and 70% of coffee areas in Mexico are under traditional management.

Determining the proper scale for conservation planning

From a conservation perspective, the habitat complexity or diversity levels on specific farms are not the only issue. Most species (especially birds and mammals) do not limit themselves to a particular farmer's property. Therefore, it is important to consider the landscape scale as well as the on-farm scale. For certain mammal species, their survival does not only depend on the proper on-farm vegetation structure, but also on the "patchiness of the habitat" – the variations in vegetation and topography on a landscape scale (Gallina et al. 1996). A study of the distribution of non-flying mammals in five habitats of southern Costa Rica by Daily et al. (2003) reported that small forest patches (<35 hectares) that are contiguous with coffee plantations did not significantly differ from more extensive forest patches in species richness and were richer than other agricultural habitat types. For birds, Perfecto et al. (2003) found that the quality of the farm canopy was not as relevant as the distance from a forest fragment (note: also see Ricketts et al. 2004, described in Box 3 for the dependency of native pollinator species on forest fragments around coffee farms).

Box 3: *What if farmers had to pay for their pollinators?*

Natural ecosystems clearly offer significant benefits to society, though it has been difficult to quantify these benefits rigorously, except for in a few specific cases[26] (e.g. carbon sequestration, water flow, etc.). Yet in one recent study, Ricketts, et al. (2004) found that a diversity of forest-based pollinators was actually a significant "free" asset for a coffee farm. Arabica coffee is able to self-pollinate, but yields can increase by 15-50% through bee visitation compared to treatments where bees are excluded. In one farm in Costa Rica, they found that pollination services increased coffee yields by more than 20% for areas within one kilometer of a forest patch. Besides improved yields, pollination also improved coffee quality in areas nearest the forest because increased pollination was associated with less small, misshapen "peaberries." They calculated that the services provided by the presence of the two forest fragments (of 46 and 111 hectares) adjacent to the farm led to an increase of US$62,000 per year in profits for this one farm. This amount is comparable to the revenue that could be derived from other local land uses (cattle pasture or sugar cane), and yet the intact forest could provide habitat and other services (e.g. water purification and carbon storage) as well as agricultural benefits.

Ecosystem services suffer when functional groups such as pollinators or predators are impacted by land use. The lesson here for coffee farmers is that their bottom line benefits from maintaining native forest intact around the farms. The lesson for policymakers is that finding a way to allow landowners to capture the monetary value of the "pollination services" (or other ecosystem services) could serve as a powerful incentive for forest conservation.

Although a larger-than-farm scale is necessary for conservation thinking, it is also important not to generalize conservation lessons on a scale that is too large for proper analysis (beyond individual countries or regions). For example, the species of coffee, the most economically and ecologically beneficial shade tree species, and the local pest issues all differ on a local level, so solutions must come from local or regional research. In terms of policy interventions, country-level laws, institutions, or incentives can also significantly affect farmers' decisions, with resulting impacts on biodiversity.

[26] In one of the first efforts to calculate the global value of ecosystem services, a team of researchers found that they were worth a total of US$33 trillion per year (nearly twice the value of the US GNP at the time), yet are largely taken for granted because they are free. Some specific examples: water regulation and supply was worth 2.3 trillion, climate regulation was worth 1.8 trillion, and genetic resources were worth 0.8 trillion (Costanza et al. 1997).

Another important scale to consider is temporal. Although farmers might be making sufficient profits from coffee agroecosystems to not switch to a "less biodiverse" land use, are there incentives to make sure they do not choose to convert neighboring pristine forest into more coffee fields (no matter how many shade tree species they have, they are necessarily less diverse than "untouched" forest)?

As can be seen from the information compiled above, the rustic and traditional polyculture methods of coffee production can contribute greatly to preserving biodiversity, especially when compared to other common agricultural methods (yet not necessarily if compared to native forest). However, the surrounding landscape matrix is also a critical factor in determining which species can be found on a coffee farm. There could be some risk that significant increases in coffee prices could push farmers to reduce natural forest to grow new coffee fields, but appropriate policies can be developed to decrease this problem. Finally, the technified coffee systems, though profitable to their investors, have negative environmental consequences both on farm and off, including erosion, water pollution and pesticide resistant pest increases. Overall, there is the concern that falling coffee prices could be an incentive for farmers to switch away from biodiversity-friendly land uses to the detriment of numerous neotropical species.

IV. SOCIAL IMPACTS OF THE COFFEE CRISIS

> *If we do not work together to adopt effective measures to permit a recovery in international prices and improve producer incomes, we will be racking our brains to think of ways of finding resources to help to rescue millions of people worldwide from even greater social decline.*
>
> -- Dr. Juan Manuel Santos, Former Finance Minister of Colombia, 2003

4.1 Impacts of the crisis on the developing world

The coffee crisis has deeply affected farmers, their families, and the societies in the countries where they live. Many coffee-producing countries already have been suffering from high levels of rural poverty, rural migration to crowded cities, growing trade imbalances, and an inability to repay debts. The drop in coffee prices has only made each of these problems worse (Gresser and Tickell 2002).

Impacts on developing country economies

According to Global Development Finance 2002, the World Bank's annual report on developing countries' external finance, "even successful poor countries are being hurt by lower global growth, adverse trends in commodity prices, and declining aid." The report states that countries dependent on coffee have been hit especially hard. Coffee can account for up to 80% of total export earnings for some producer countries (Gresser and Tickell 2002). Ethiopia has lost almost US$167 million in export revenues due to the coffee price slump, equivalent to nearly half of the country's total export earnings (Gresser and Tickell 2002). Beyond losing revenue from the drop in coffee prices, coffee's price swings can lower the value of heavily coffee-dependent countries' currencies. This in turn raises the costs of imports such as agricultural inputs, fuel, and consumer goods[27] (Love 1999). A study by Peter Robbins (2003) indicates that if the prices of ten commodities[28] that are exported from the tropics had kept pace with inflation,

[27] Therefore, not only is the amount of money that coffee growers receive falling, but also the purchasing power of that money.

[28] Copra, palm oil, sugar, coffee, cocoa, tea, groundnuts, jute, cotton, and natural rubber (Robbins 2003).

in 2002 these countries would have earned the equivalent of almost five times the annual aid budget for the world as a whole.

Impacts on coffee farmers and harvesters
In northern Latin America alone, there were an estimated 700,000 small coffee producers as of 1999 (Dicum and Luttinger 1999). Small coffee farmers visited by Oxfam in January 2001 reported that prices offered by coyotes (local intermediaries) were between 20-30 US cents per pound, while average production costs were estimated at 76 cents per pound. Income from coffee sales are used to buy food that cannot be produced on the farm, to pay for school and health care, and to meet other cash expenses, such as the purchase of agricultural inputs (Gresser and Tickell 2002).

Coffee harvesters have also been hit hard. In Guatemala, during the 2001/02 season, the harvest labor force was reduced from 500,000 to 250,000 (Osorio 2002). Salaries have also been cut in half because plantation owners cannot afford to pay more, given low coffee prices. In Veracruz, a harvester reported that he was only paid 10 cents (US) per kilo of coffee cherries picked, which is equivalent to a daily salary of US$1-2 (depending on productivity) (Gresser and Tickell 2002).

The first comprehensive report indicating the magnitude of the coffee crisis' impact on coffee farmers and harvesters was put out by Oxfam International in 2002 (Gresser and Tickell 2002). This report gave some horrifying glimpses at what a rapid price change in coffee could bring. The report told that farmers in Tanzania are being forced to take their children out of school; that wages of seasonal coffee harvesters in Chiapas, Mexico have been dramatically cut, "prompting 500 families each week to migrate and raising the spectre of malnutrition;" and that in the Kafe region of Ethiopia, coffee's birthplace, dropping prices threaten food shortages in coffee farmer households.

In a more recent statement from Oxfam, Phil Bloomer (2003) reported that the Guatemalan government has declared a State of Emergency and started food distribution to coffee families because of widespread hunger, and that UNICEF has reported 85% child malnutrition in coffee-growing areas of El Salvador. In Colombia, in certain coffee producing areas, the coffee crisis has led to a severe fracturing of public order. In the Departments of Caldas, Tolima, Risaralda, Quindío and Valle, robberies rose by 90% from 1998-2001, kidnappings increased, and highways became more dangerous (*El Tiempo* 2001).

As coffee farmers have been pushed into deeper poverty, they in some cases turn to quick-cash alternatives, such as illegal drugs[29], or they emigrate to cities or industrialized countries (Osorio 2002). Many argue that the coffee crisis has accelerated illegal immigration to the United States from Mexico and Central America. For example, several Mexican coffee farmers were among those who have died attempting to cross the U.S. border (Madeley 2004). It is estimated that millions of coffee farmers have been displaced globally due to the crisis.
Steady coffee prices contribute to social stability (Jeffrey 2003). However, as Néstor Osorio, Executive Director of the ICO said, "There is little doubt that the exodus from rural areas and increased poverty in coffee producing areas caused by the current price crisis poses a very real and wide-ranging threat to sustainable development." (Osorio 2002)

[29] Such as coca in Colombia or chat (an illegal amphetamine) in Ethiopia (Madeley 2004).

4.2 Globalization and free trade

> *Liberalization and Globalization bring both benefits and demerits to an integrated community. However, it has been over simplified to mean equal opportunity for all without putting into consideration the different origins' capacities and levels of development. Therefore, Commodity trade liberalization and globalization which were perceived to provide a fair play environment has not provided a level playing field for us all along the commodity chain*
>
> – Jack Bigirwa, International Federation of Agricultural Producers, 2004

While recent price trends have led to a crisis for developing countries and small coffee farmers, they have generated significant gains for major corporations in the developed world. In February 2001 Nestlé reported a 20 percent increase in profits, and Starbucks recorded a 41 per cent increase in profits[30] (Gresser and Tickell 2002). The current coffee over-supply has clearly benefited the major retailers, who have failed to pass on the reduced prices to consumers. These trends have enabled them to be selective about suppliers and exercise market power against the producers.

Over the last several decades, the number of major players in the coffee market has fallen and the power of each of the remaining corporations has grown. Likewise, the move towards more technified coffee has meant the consolidation of plantations under large landowners (given the economies of scale), much the way agriculture has gone in the United States.

Market failure

> *"The coffee market is not only an imperfect market, but a market that has failed in recent years – both in human and economic terms."* – Phil Bloomer – Head of Advocacy, OXFAM GB

The playing field is not level, so free trade does not have the benefits it would have under perfect competition. For example, there is a difference in access to affordable credit for small versus large actors, and for those from the developing vs. developed world. Coffee importers (often multinationals from developed countries) are able to borrow money at a 3% interest rate, while local traders in Uganda are only able to borrow money at a 27% interest rate. Over time, the large actors out-compete the small actors due to these inequalities (Bigirwa 2004).

Beyond the problem of unequal power, the coffee market has failed because "its price signals do not draw the right responses on either the supply or the demand side to restore it to equilibrium" (Bloomer 2003). Supply cannot adjust quickly because of the 3-4 year wait between making the investment to plant a coffee bush and the time when ripe coffee cherries can be harvested (by which time the market could have collapsed), and also because of the lack of alternatives for many farmers in rural areas without adequate access to other markets. Demand also does not adjust properly because the retail prices of coffee do not truly reflect supply, given that most of the retail value is captured by roasters, traders and retailers, not the farmers[31]. Furthermore, there are significant asymmetries in access to information between exporters and coffee farmers, causing the price volatility to more severely affect the farmers.

[30] Starbucks has been able to continue to profit in its niche because the price of coffee is such a small component of the product's final price. Even if Starbucks were to adjust its final price with changing coffee prices, these changes are so small they would not affect demand (Ramirez-Vallejo 2002).

[31] According to Oxfam, since 1999, the export price of coffee as a proportion of the retail price has fallen by half, to less than seven per cent.

For example, a study from Ethiopia found that between1992 and 1996 the price paid to farmers changed an average of 17.7% per month compared to 7.9% for the regional auction price and 4.4% for domestic retail prices (Kurlantzick 2003; Love 1999). Additionally, as explained in the previous section, the market price does not account for the costs of ecosystem services or environmental externalities in production.

In neoclassical economic terms, one could look at the global coffee crisis as just the market reacting to being released from a non-efficient situation under the ICO's quota system. Uncompetitive firms (shade-coffee producers in Latin America and Africa) are forced out of business by more competitive firms (Asian robusta farmers)[32]. However, as Bloomer (2003) of Oxfam explained when comparing today's current free market system with the previous system of market intervention, "There can be little doubt that, in human terms, the current free market model has failed far more catastrophically than the previous one."

V. STRATEGIES TO ADDRESS THE CRISIS

5.1 Ecolabeling and certification programs

Ecolabeling
Ecolabeling is a market-based approach that can be used to deal with certain environmental issues. Ecolabeling can help consumers make purchasing decisions by providing them with information about the environmental (or social) attributes of a product. According to the market research journal *Lifestyles of Health and Sustainability* (2003), 63 million American adults now base their purchasing decisions on how the products they consume affect the world.

According to surveys conducted for the Center for a New American Dream (2000), consumer awareness of the environmental consequences of their purchases is increasing. They found that 66 percent of Americans say they try to buy products that are less damaging to the environment. Furthermore, a 1997 Roper Starch Worldwide 'Green Gauge' survey found that the number of consumers reading labels to "see if contents are environmentally safe" increased to 25 percent in 1997 from 19 percent in 1996.

The level of success of an ecolabeling program, however, depends on consumer awareness and acceptance of the label. Acceptance is determined by "(1) the credibility of the agency providing the label or certification, (2) consumers' understanding and perception of the link(s) between product choice and environmental impact, (3) an accurate and clearly understood meaning of the certification" (CEC 2001). US ecolabeling success stories include wood certified by the Forest Stewardship Council (46 million hectares of forest in 60 countries certified as of December 2004), organic food certification by USDA, Energy star, dolphin-safe tuna, and now coffee (see below).

Willingness to pay
One method of considering consumer interest in environmentally-friendly goods is through estimating their willingness to pay for these goods. The "Green Gauge" survey (mentioned above) found that a full 50% of U.S. consumers are willing to pay more for ecologically-friendly

[32]Although, unlike the market dictate, the fall in prices did not stop some countries in Asia from expanding their production.

products[33,34]. Blend and Van Ravenswaay (1999) studied the tendency of consumers to buy ecolabeled versus non-ecolabeled food. They conducted a study with apples, which found that 72 percent of the respondents believed they would buy ecolabled apples the first time they see them. More than 40 percent of the respondents would still buy the ecolabled apples even with a 40 cent price premium. Females and higher income families are more likely to buy the ecolabled product. Another survey by the Commission for Environmental Cooperation (2001) found that 22 percent of Americans, 42 percent of Canadians and 36 percent of Mexicans would be willing to pay US$1 more per pound for shade-grown coffee.

5.2 Market trends for "sustainable" coffees

Today there are very few eco-labeled products that are more ubiquitous or have a longer history of eco-labeling than coffee (Giovannucci 2003). The main categories of coffee commonly referred to as "sustainable coffees[35]" are organic, eco-friendly (also known as shade-grown), and fair trade. While other types of coffee may also contribute to sustainable development, these three general types have intrinsic qualities that most closely fulfill the balanced social, environmental, and economic requirements necessary for sustainability. They are also among the few that currently exist that permit reasonable verification of their claims.

The sustainable coffee supply chain has grown substantially in the last few years. According to Giovannucci (2003), there are currently 32 countries that supply sustainable coffees through hundreds of producer organizations. The majority come from Latin America, and Mexico and Peru stand out as the dominant sustainable coffee producers. Central American producers are increasing their participation as are Colombia and Brazil (Brazil began exporting organics in the 1990s and will likely soon be one of the top producers in this category). There are also now dozens of specialized traders of sustainable coffees, over 20 consuming countries, hundreds of roasters, hundreds of brand-owners, and thousands of retailers. In some countries, 10 to 20 percent of households regularly buy sustainable coffees (Giovannucci 2003).

While sustainable coffees have been on the market since the 1970s they were generally available only in small quantities in a few countries. In the past, these coffees were inconsistent in both their quality and availability. Sales occurred almost exclusively to a small core market of specialty retailers, social organizations, and cause-conscious consumers. Over the last several years, this has begun to change dramatically and these coffees are now entering into new, high-volume distribution channels (Giovannucci 2003). Also, around 5 percent of coffee growers now sell at least some of their beans in the sustainable coffee market (Madeley 2004).

As conventional coffee growers are experiencing some of the lowest prices in the past one hundred years, sustainable coffees are receiving higher prices and showing significant growth (ICO, 2004). Total global sales for 2002 were in excess of 1.1 million bags of coffee (Giovannucci 2003). Specialty coffees (including sustainable coffees or other gourmet coffees) made up $1.7 billion of the $5 billion coffee industry in 2003, or about 35% (Specialty Coffee

[33] Roper's "Green Gauge" Report tracked Americans' environmental views from 1990 through 1996 and showed that the most environmentally-proactive group in the U.S. makes up 10% of the total population. The report states that this group is willing to pay a 7% premium on average for environmentally-friendly products. Another third of U.S. consumers say that they are willing to pay a 4% premium.

[34] It is important to keep in mind that willingness to pay studies can be used as indicators of consumer interest in goods, but not for actual quantification of successful price premiums. There are many reasons, including sampling bias, that reported willingness to pay for products can overestimate actual purchases (CEC 2001).

[35] The US National Coffee Association defines "sustainable coffee" as coffee that is grown and traded in a way that ensures that future generations can be sustained economically, environmentally, and socially through its production.

Association of America 2003). Globally, the market for sustainable coffees is worth US$455 million (Giovannucci 2001).

Besides being a boon to the coffee industry, sustainable coffees provide benefits to farmers and the environment. In terms of price premiums, Giovannucci (2001) found that "sustainable" coffees command between US$0.53 and US$0.62 cents per pound more than regular coffee. Also, whether organic, fair trade or eco-friendly (or even just "gourmet"), most specialty coffees are grown under at least some shade and with less agrochemicals than are used in conventional coffee production.

Looking forward, industry specialists estimate that specialty coffee sales will grow by 20 to 25 percent per year, given that they are still in the early, rapid-growth stage of their product life cycle. In this stage, competition is not based on price but on product differentiation such as: country of origin, flavors, darkness of roast, type of packaging, organic, estate-grown, Fair Trade, shade-grown, etc. (Rice 1997). Excellent quality and taste is now the standard in "sustainable coffees," rather than the exception (those that did not meet quality standards already lost out) (Giovannucci 2003).

5.3 Organic certification

Organic certified coffee is more widely recognized and available than either Fair Trade or Shade Grown coffees, and is more frequently sold (Giovannucci 2001). Certified organic coffee is produced without synthetic chemicals in a way that preserves the soil and protects local environmental quality. The specific criteria vary from one country to another, but most organic-certification bodies operate under the umbrella of IFOAM (International Federation of Organic Agriculture Movement) based in Germany. In the United States, accreditation is organized through the International Organic Accreditation Service (IOAS). The Codex Alimentarius Commission of the Food and Agriculture Organization (FAO) also recently published guidelines for organic production and labeling.

The costs of certification are usually covered by the coffee farmer. The transition to organic production can be difficult unless the farmer has access to capital reserves or loans, because most certification standards require a waiting period of three years during which the farmer cannot use chemicals (and thus, generally yields decrease at first), and yet their coffee is not yet eligible for the price premium.

In retail outlets, organic coffee can cost the consumer an additional $0.20 to $2.00 per pound above other specialty coffees (CEC 2001). Interestingly, organic coffee is not really about the health impacts to the coffee drinker. Most experts agree that the chemicals used in technified coffee burn off during the roasting process and that little if any traces are left behind. Either consumers who consider health impacts try to buy organic products in general (so they expand this rule to coffee without knowing that it is not as relevant), or they are concerned about the health impacts of the chemicals on the farmer's and harvesters' health and on the environment.

Organic coffee has also helped small farmers earn enough to continue in coffee production despite the coffee crisis. A report from the Consumer's Choice Council (Bartra 2003) showed that in Oaxaca Mexico, a certified organic producer makes almost 17 times more net income and almost 9 times more gross income than a conventional producer. The study found that non-organic producers most likely only stayed in the business because they failed to calculate

the labor costs in their coffee production given that when labor costs are considered, only certified organic producers turn a profit.

5.4 Fair Trade certification

The Fair Trade certification system focuses more directly on improving the share of coffee profits that go to farmers (usually in cooperatives), and the environmental benefits are secondary, not central to the certification. The purpose of Fair Trade Certified coffee is to correct the market distortion in which the market power of large corporate coffee buyers is balanced against the millions of disaggregated small growers. While the mainstream coffee price is related to supply and demand pressures, fair trade prices are based on production costs and what farmers need to meet their basic needs.

Fair trade labeling programs now exist for a wide range of major agricultural commodities, including tea, cocoa, fresh fruits, juices, rice, and sugar; although coffee is still the most important item in the fair trade market, accounting for 24% of fair trade products by volume (Bretman 2004). In Europe, some organizations have been buying coffee directly from small farmers since 1973 (McLean 1997). The first "fair trade" certification system was developed in the Netherlands in 1988 in reaction to a sharp fall in coffee prices. The brand was called "Max Havelaar," for a fictional Dutch character that opposed the exploitation of coffee harvesters in Dutch colonies, and offered mainstream coffee industry players the opportunity to adopt a standardized system of Fair Trade criteria.

By linking directly with markets, farmers in Fair Trade cooperatives can earn 3 to 5 times higher prices for their coffee than they would by selling their coffee through conventional routes. Licensed Fair Trade importers pay $1.26 per pound, or $1.41 per pound if the coffee is also organic (85% of the fair trade coffee sold in the United State is organic). If the market price is already higher than $1.26, fair trade farmers earn a minimum of 5 cents per pound above the market price. Importers of Fair Trade Certified products must additionally make pre-financing available for up to 60% of the value of the contract, if growers request it (TransFair 2004) (for a list of the principles behind fair trade, see Box 4).

Fair trade and the environment
Of the Fair Trade Certified coffee sold in the United States, 85 percent is also certified organic, although on a worldwide scale, only 51% was also organic (as of 2002, in Simmons 2004). Producers whose coffee is double-certified (fair trade and organic) receive $1.41 per pound. Even if it is not also certified organic, Fair Trade certification forbids the use of ISO-designated "dirty dozen" pesticides (TransFair 2004).

Fair trade labeling programs exist in 18 markets across Europe, North America, Japan, and most recently in Mexico. Australia and New Zealand are currently developing labeling programs as well. The biggest markets for fair trade coffee are the US and the Netherlands. Great Britain is also experiencing rapid growth and is now the third largest market for fair trade coffee. Producers are located in Central and South America (76%), in Africa (14%), and just less than 10% in Asia. Each national fair trade organization works under an umbrella organization, FLO International (Fairtrade Labelling Organizations International, www.fairtrade.net), based in Bonn, which sets fair trade standards and conducts international auditing of certification programs. In the United States, Fair trade coffee is certified by TransFair USA.

BOX 4: THE PRINCIPLES OF FAIR TRADE

Creating opportunities for economically disadvantaged producers: Fair Trade is a strategy for poverty alleviation and sustainable development. Its purpose is to create opportunities for producers who have been economically disadvantaged or marginalized in the conventional trading system.

Gender Equity: Emphasis is often placed on ensuring that women's work is properly valued and rewarded. Women are always paid for their contribution to the production process and are empowered in their organizations.

Transparency and accountability: Fair Trade involves transparent management and commercial relations in order to deal fairly and respectfully with trading partners and customers.

Capacity building: Fair Trade assists in developing producer independence through sustained relationships with trading partners that provide continuity, and often include management skills development, improved access to markets, and financial and technical assistance.

Payment of a fair price: A fair price in the regional or local context is one that has been agreed through dialogue and participation. It covers not only the costs of production but enables production that is socially just and environmentally sound. It provides fair pay to the producers and takes into account the principle of equal pay for equal work by women and men. Fair Traders ensure prompt payment to their partners and, whenever possible, help producers with access to pre-harvest or pre-production financing.

Working conditions: Fair Trade means a safe and healthy working environment for producers. The participation of children (if any) does not adversely affect their well-being, security, educational requirements and need for recreation, and conforms to the UN Convention on the Rights of the Child as well as the law and norms in the local context.

Environmental Sustainability: Fair Trade encourages producers to engage in production practices that manage and use local resources sustainably. Fair traders often work directly with producers in regions of high biodiversity in order to develop products based on sustainable use of their natural resources, giving communities incentive to preserve their natural environments for future generations.

Promoting Fairer Trade: Fair Trade organizations educate the public about the importance of purchasing fairly traded products, highlight the need for change in the practices of conventional trade, and publicly demonstrate how fair trade is a successful model that emphasizes social justice and environmental sustainability, over the endless drive for increased profits. By providing information about producers' history, culture and living conditions, Fair Trade enhances cross-cultural understanding and respect between consumers and communities in the developing world.

(Source: Fair Trade Federation, 2003)

In 2002 the net retail value of coffee sold in the US under the TransFair label in the U.S. increased by 53% from $85.6 million to $131million (FTF 2003). In 2003, 19,900 metric tons of coffee was traded as Fair Trade Certified, an increase of 26% from the previous year (Bretman 2004). This coffee came from 800,000 producers, workers and their dependants, from 221 Fair Trade cooperatives in more than 45 countries (FLO 2004; TransFair 2004). Part of Fair Trade's success comes from the quality; a recent blind taste test comparing fair trade and non-fair trade

coffees found that overall, fair trade coffees scored above the non-fair trade alternatives (Davids 2004).
Despite the success and recent growth, Fair Trade Certified coffee still only represents about 2% of the global coffee market (Jeffrey 2003). Fair Trade coffee faces the same oversupply problem as the larger market. Fair Trade farmer co-ops sell only a small percent of their crop at Fair Trade prices (20% for coffee and 3% for cocoa) (Global Exchange 2004). The farmers certified by TransFair produced 170 million pounds of coffee in 2001, yet only 40 million pounds of it could be sold under fair trade terms. The rest was sold at normal market prices, often below production costs, due to insufficient demand for the certified product (Jeffrey 2003).

5.5 Biodiversity-focused certification programs: Rainforest Alliance and Bird-Friendly

Certified shade-grown coffee (i.e. bird-friendly, biodiversity friendly, Rainforest Alliance certified) is a much more recent development than either the Fair Trade or organic certification. For many years, coffee retailers have marketed certain lines of coffee as "shade grown" to appeal to conservation-conscious shoppers. However, because these claims were not verified by a third party, the conservation value of the type of shade used was not certain.

The move to create certifying bodies for shade coffee has primarily been backed by conservation groups (Conservation International, National Audubon Society, Rainforest Alliance, and others) and North American bird watchers concerned about disappearing migratory bird habitat in Latin America. The first certification system including criteria for shade cover was the Rainforest Alliance's Eco-OK "conservation coffee," that came out in the mid 1990s. In 1996, the Smithsonian Migratory Bird Center (SMBC) offered its own label for shade coffee with different criteria. Since that time, other smaller labels have begun to appear on the market.

Rainforest Alliance's certification
Rainforest Alliance developed standards for environmental and social sustainability for coffee farms in collaboration with the Sustainable Agriculture Network (SAN), a coalition of nine leading Latin American conservation groups[36] that the Rainforest Alliance coordinates. The Rainforest Alliance certification (formerly Eco-OK) standard calls for biodiversity and wildlife conservation, fair treatment of workers, and the use of integrated pest management among other requirements[37]. The SAN partners can slightly adjust the standards to the situation in each country to reflect better the reality in the region. As of 2003, the Rainforest Alliance certification covered 31 producers.

Smithsonian Migratory Bird Center's "Bird Friendly" certification
The Smithsonian Migratory Bird Center's (SMBC) certification program was specifically designed to ensure the conservation value of habitat (in this case for migratory birds) on coffee farms. For a farm or cooperative to earn the SMBC's "Bird Friendly" seal they must be organic and[38]:

[36] The SAN partners are Interamerican Foundation of Tropical Research in Guatemala; the Institute for Agricultural and Forestry Management and Certification in Brazil; the Institute for Cooperation and Self-Development in Honduras; the Nature Foundation in Colombia; the ProNatura Chiapas A.C., in Mexico; SalvaNATURA in El Salvador; the Toledo Institute for Development and Environment in Belize; and Conservation and Development in Ecuador.
[37] The categories of criteria that must be met for certification are "ecosystem conservation, wildlife conservation, fair treatment and good conditions for workers, community relations, integrated crop management, complete integrated management of wastes, conservation of water resources, soil conservation, and planning and monitoring" (full criteria are available at http://www.rainforest-alliance.org/programs/agriculture/pdfs/coffee.pdf).
[38] For complete requirements, see "Shade Management Criteria for 'Bird Friendly' Coffee," Smithsonian Migratory Bird Center.

- Maintain a shade cover of at least 40 percent year-round, preferably with several strata,
- Have at least ten tree species (preferably native and evergreen) in the canopy layer,
- Allow the canopy to grow to at least ten meters in height,
- Allow epiphytes and parasitic plants to grow on the canopy trees,
- Retain dead limbs and snags on the plantation as additional habitat for birds,
- Border coffee fields with a "living fence" or border strip of trees and shrubs or natural second growth vegetation, and
- Not be on land that has legal protected status.

Generally, only diverse commercial polyculture, traditional polyculture or rustic systems can gain the certification (rather than shaded monocultures)[39]. Bird Friendly coffee currently only certifies farms in Latin America, because their focus is on the conservation of neotropical migratory birds. The certification is conducted by an independent third-party inspector. There are currently 26 certified "Bird Friendly" coffee farms. An interesting aspect of this certification is that it is also a fund-raising device for conservation; companies that sell "Bird Friendly" coffees contribute 25 cents per pound to support SMBC's research and conservation programs.

Economics of shade coffee certification
Gobbi (2000) studied the financial viability of investing in biodiversity-friendly certification (using the criteria proposed by the government of El Salvador – very similar to the SMBC criteria) in farms under five different production systems in western El Salvador: traditional polyculture, commercial polyculture, and shaded monoculture at an elevation of less than 1200 meters; shaded monoculture at an elevation of more than 1200 meters, and unshaded monoculture. He found that the criteria were financially viable in all cases. Of the five, the returns for the traditional polyculture systems require the smallest initial investment and this was the only "risk-free" case.

5.6 Other specialty coffees

Beyond the certified "sustainable coffees," high quality gourmet or specialty coffees also fetch higher prices than the base commodity level, and can be less environmentally harmful (despite their not being certified). To obtain top quality[40], coffee is generally grown in the shade with minimal chemical inputs). The US specialty coffee industry began as a niche market that could provide the sophisticated consumer with taste sensations not found in the supermarket brands. Specialty coffees generally come from individual farms or from cooperatives where there is greater accountability for keeping standards high. Just a few "bad" (underripe or overfermented) beans can ruin the taste of a coffee shipment, so it is important to keep standards uniform.

[39] Some farmers have complained that the SMBC certification is too "stringent or difficult to obtain," thus limiting the number of farmers who can participate in the program. However, this certification is one of the few that is actually tied to biodiversity research (the criteria were developed based on more than 5 years of field data in coffee farms and selected to specifically preserve migratory birds) -- S. Philpott, personal communication January 10, 2005.
[40] See Muchler (2001), "Shade improves coffee quality in a sub-optimal coffee-zone of Costa Rica."

Some countries, such as Costa Rica, have implemented national quality standards in hopes of ensuring an improved brand image for their country's beans (and thus a higher-than-commodity price). In Nicaragua, PRODECOOP pays workers to hand sort beans after they have been machine sorted, to ensure the top quality that kept them successful despite the coffee crisis. The Colombian Coffee Federation's famous (and long lasting) "Juan Valdez" campaign has been quite successful in creating a specialty brand image for Colombian coffee. "Colombian milds" is even its own category in the commodity market, and it fetches a consistently higher price than the composite (as of December 1, 2004, the difference was 30 cents per pound, ICO 2004).

Consumers only started to pay attention to coffee quality around the time of Juan Valdez' appearance (late 1960s), but now the gourmet coffee industry is starting to gain broader attention, and the number of connoisseurs (not unlike for wine) has grown dramatically over the last several decades. Specialty coffee is still a small fraction of the entire coffee industry, but it is growing quickly and enjoys a significantly higher percentage of industry-wide profits. Specialty coffees now make up almost 20% of the world market, and in the U.S.; specialty coffee retained revenues have risen from $7.5 billion in 1999 to $8.96 billion in 2003 (Ellison 2004). According to the National Coffee Association Annual Drinking Trends Study (2004), the percentage of adults who consumed "specialty" coffees on a daily basis rose from 9 percent in 2000 to 16 percent in 2004.

Quality coffee can pay off. The Panamanian coffee, "Esmeralda Special" from Hacienda La Esmeralda, set an online coffee auction record when it sold for $21 dollars a pound in June 2004. Esmeralda Special had placed first in the "Best of Panama" cupping competition with a score of 95.6 out of 100 (SCAA 2004). The potential of increased prices through quality is not as formalized or risk-free for farmers as certification, but it does have potential as another incentive for farmers to preserve the forest and free themselves from the mass commodity market (Ellison 2004).

5.7 Discussion – certification

Sustainable coffees have been among the fastest-growing market segments in the coffee industry mainly because they appear to be attuned with emerging consumer demands for quality and increasing consumer and corporate responsibility (Giovannucci 2003). Sustainable coffees not only benefit farmers by awarding them a premium price, but can also provide other benefits that help producers improve their sustainability. At 2003 prices, a producer that could sell double certified (organic and fair trade) coffee would double his income above the benchmark market price. However, there is still some discussion among analysts about the best way (or if) to go about certification.

Is shade the answer?
Shade-grown coffee in particular has suffered from industry division over standards and criteria for certification. The problem partially stems from the fact that differing ecosystems make it a challenge to develop universal standards, and there is constant debate over what shade-grown really means. Moreover, in a recent issue of *Conservation Biology*, Rappole et al. (2003) warned that scientists should be cautious about "blindly" promoting shade-grown coffee as a biodiversity-friendly product. They argued that even shade coffee threatens some forest ecosystems (such as Mesoamerican highland pine-oak forests) and discussed reasons why the shade coffee movement is misleading in terms of biodiversity conservation. A particular concern is that promoting shade coffee will boost sales of non-certified coffees that claim that

they are “shade grown” on their packaging (whether or not they use native trees or have biodiversity benefits).

They do agree that if the only result of the promotion of shade coffee were to encourage coffee farmers either to stay in shade coffee instead of converting to sun production, or to switch from sun to shade production, then there are few problems from the conservation perspective. However, they worry that since the goal of the shade-coffee movement is to encourage consumers to pay premiums for shade coffee as an economic incentive to growers, that there might be a resulting incentive to convert native forest to shade coffee in areas that are ill suited to conventional types of agriculture or sun coffee (due to steep slope, remoteness, etc.). Also, they believe that the premiums paid might not be sufficient for sun coffee producers to switch back to shade cultivation, because the financial returns per hectare are still usually greater for sun than shade coffee (although Gobbi’s 2000 paper refuted this point in the case of El Salvador). Furthermore, they argue that there will always be a market for sun coffee for those consumers who want to pay less regardless of the consequences for conservation.

Rappole et al. also highlight the problem that coffee advertised as “shade-grown” does not necessarily come from a diverse agroecosystem. They contend that: “Economic forces tend to push growers away from plantations that mimic forest and toward those that mimic a citrus grove… Both extremes qualify as "shade coffee," but their contributions to biodiversity are significantly different.” However, the main shade coffee certification systems have requirements about the percentage shade cover and the diversity of shade trees that are necessary. This problem would therefore only apply to fringe certification programs or uncertified coffees that simply write “shade grown” on the packaging.

Overall, Rappole and colleagues believe that “widespread endorsement of shade coffee represents a dramatic ‘lowering of the bar’ in terms of conservation goals,” because not even traditional coffee farms can provide all of the same ecosystem services of undisturbed native forests. While this is true, it ignores the reality of the local human inhabitants of these areas and their need for income.

In a response to the article described above, Philpott and Dietsch (2003) argue that “in the larger global agricultural context, and if promoted correctly, shade coffee does not present a significant threat to forest conservation but instead may advance conservation goals.” They assert that the loss of species richness in well-shaded coffee farms is minimal compared to impacts caused by other types of agriculture. Those studies that have looked at the differences in species richness between shade coffee and other agricultural types have shown much lower species numbers in more intense systems (e.g. cattle pasture, sugarcane)[41]. Moreover, in a global context, these other agricultural types have a much greater overall impact. For example, in northern Latin America, permanent pasture covers almost 2.2 billion hectares, or 37% of total land area, while coffee only covers 3.6 million hectares, or 0.6% of total land area (FAO 2002, cited in Philpott and Dietsch 2003). Thus, given that the current economic alternatives in many locations include sugarcane monocrops or pasture[42], modern shaded coffee systems are the “lesser evils” in the eyes of conservation, but could have net positive impacts when considering the health and well-being of farm owners and workers.

[41] See Borrero 1986; Terborgh 1989; Greenberg 1994; and Petit et al. 1999.

[42] Of course, there are other possible income earning activities that cause less harm to the landscape, such as ecotourism, sustainable forestry, or the collection of non-timber forest products, but these are not realistic options in all areas without outside assistance.

Furthermore, Philpott and Dietsch (2003) advocate that conservationists reduce any potential threats from shade-grown coffee by linking rigorous shade certification with fair-trade certification programs. As is, though, only the more structurally and biologically diverse agroforestry systems qualify for the two existing certification programs, Bird Friendly Coffee from the Smithsonian Migratory Bird Center and Rainforest Alliance Certified coffee. However, the entry into these systems can be prohibitively expensive for most farmers (who have to pay fees to the certifying agents).

Because (at least until recently[43]) fair trade certifiers like TransFair USA have covered much of the certification costs for farmers and provide loans and advance payment options, Philpott and Dietsch (2003) argue that there may be benefits of creating a combined certification option. Currently, fair-trade certifiers do not require shade or organic certification, although they do promote environmentally friendly methods (and it happens that most of the smallholder cooperatives that get the Fair Trade Certification are shaded and organic, at least more than the average). They suggest that linking organic, shade, and fair trade certification programs will make them more attractive to farmers (based on higher premiums and reduction of barriers to certification) and may also alleviate some consumer confusion between different types of sustainable coffees.

In answer to the assertion by Rappole et al. (2003) that price premiums for shade coffee might serve as an incentive for farmers to convert forest to new coffee production, Philpott and Dietsch (2003) argue that this consequence can be avoided through careful policy formulation. They suggest that certification systems prohibit certification of farms that were recently converted (such as within the past 10 years). Also, agricultural extension agents should be well-versed in the criteria for certified shade coffee, so they can spread the word to farmers in time to prevent them from clearing understory due to lack of knowledge of potential premiums of working with a more structurally diverse system. They also argue that shade-certification programs should incorporate methods of crediting farmers for the preservation of adjacent forest fragments. Most importantly, they believe that shade certification systems must provide an adequate price premium for farmers if they are to have the desired conservation outcomes.

Both sides agree that something must be done to address the problem of "renegade" shade-coffee retailers who put birds or other animals on their packages and promote themselves as eco-friendly and yet are not certified, and are not actually tied to conservation organizations at all (Philpott 2005). Because there are national or international regulators for organic and Fair Trade certification, there is less of a problem with these designations being misused. Creating an overseeing organization for certified shade grown or biodiversity-friendly coffee may help to address this problem.

Pros and cons of one super-certification scheme

Fair trade, organic, and biodiversity-friendly coffees are neither a panacea nor the full answer (see Recommendations, section VI). They do, however, hold the key to some of the few positive trends in an otherwise difficult coffee economy and provide considerable direct benefits to nearly a million coffee producing families and are considerably better than most other competing land uses. But because each system has its own limitations, and there is concern over the effects of competing certification programs, an increasing number of authors (including Philpott and Dietsch 2003 as described above) have advocated the merging of the various sustainable coffee criteria into one "super-certification" scheme.

[43] Over the past year, the Fairtrade Labelling Organisation began to charge farmers a fee for initial and renewal certification (FLO 2005).

In a survey of 9,000 North American coffee industry firms, Giovannucci (2001) found that about two-thirds were in favor of a simpler way of communicating sustainability in the marketplace, such as "standardized terminology and consumer-friendly certification." For example, failure to define clearly or certify concepts such as "shade coffee" will likely cause the erosion of consumer understanding or "faith" in such claims. Clear definitions and standardized certification criteria will make it more likely that only truly sustainable growers are rewarded in the marketplace by higher prices. Of the existing certifications the Rainforest Alliance's certification program is the most inclusive, covering environmental, ecological and social criteria, yet allowing the flexibility for adaptation to local conditions.

On the other hand, there are also good reasons to keep different certification systems separate. First of all, each of the certification systems is clearly better than the increasingly common non-certified alternative - technified monoculture. Buying shade coffee also means supporting small, independent farmers or farmer collectives, most Fair Trade farmers do grow coffee under a shade tree canopy, and organic farmers usually intercrop, control erosion with hedgerows, use some tree cover, and provide a premium price to farmers (McLean 1997). Second of all, not all farmers are going to be able to fit all criteria, and perhaps it is better to bring more on board and support the move in the direction of improvements rather than allow other powerful economic factors to decide how their land is used. For example, large farms cannot apply for Fair Trade certification, but improvements in labor standards would be a positive move. Also, in some moist highlands, coffee cannot grow well under the shade, yet farmers could certainly improve the vegetational complexity in other ways or reduce chemical inputs if given proper incentives. In the short term, it is important to raise consumer awareness about certification, but over the long term criteria can be merged for a more comprehensive system

5.8 Other initiatives to address the crisis

While coffee certification is clearly an important part of the solution to the coffee crisis (in both human and ecological terms), there are a number of other strategies that different actors have taken to address the coffee crisis in a way that promotes conservation or social equity. Below is an introduction to how business and the ICO are addressing the crisis[44].

The role of business

The concept of socially responsible business has gained a high profile in the corporate sector in recent years. Several coffee industry firms have engaged in endeavors to improve their level of sustainability and their image in the face of public pressures[45]. They range in size from small importers and roasters to large corporate conglomerates. The following are a few examples:

- Massachusetts-based Equal Exchange is the largest US company that sells exclusively fair-trade coffee. Equal Exchange buys directly from cooperatives of farmers in 13 countries, mostly in Latin America. They recorded sales of $10.4 million last year, a 34 percent increase over the previous year (www.equalexchange.com).
- In the UK, Cafédirect (www.cafedirect.co.uk), a fair trade coffee company established in 1991 by Oxfam, Traidcraft, Equal Exchange and Twin Trading, has grown to be the sixth largest coffee brand in the UK and one of the country's fastest growing coffee brands.

[44] There are also numerous excellent programs through other NGOs, but these are not discussed here.

[45] According to Giovannucci (2003), many "corporate-driven endeavors define sustainability somewhere between conventional practices and an improved level of sustainability companies feel they can reasonably achieve and pay for. The better of these initiatives incorporate independent third party verification and are very useful to producers while some others are little more than public relations gambits."

- Co-operative Retail, a British chain, became the first British retailer to switch its house-label coffee exclusively to fair trade sourced. The company anticipates its bold move will boost the U.K fair-trade market by 15%, or 4 million pounds a year (NCA 2004).
- In 2003, the world's two largest coffee trading companies, Neumann Kaffee Gruppe and Volcafe Group[46] announced they would work with the Rainforest Alliance to meet rigorous standards for environmentally and socially sustainable coffee production. Neumann and Volcafe are currently involved in sustainable coffee projects in Costa Rica, the Dominican Republic, Ethiopia, Guatemala, Honduras, Mexico, Nicaragua, Peru and Uganda, with many more under development (Rainforest Alliance 2003).
- In 2003, Procter & Gamble, the largest coffee retailer in the United States, agreed to carry one fair trade coffee as part of its Millstone line, available for purchase online.
- Kraft Foods International recently committed to buy 4.5 million pounds of Rainforest Alliance-certified coffee and mix it into their blends and existing brands (Vigilante 2003).

Box 5: *The Case of Starbucks*

Starbucks began selling fair trade coffee in 2000, although, as of 2002, only 1 percent of the total 100 million pounds of coffee they purchased was Fair Trade Certified. The Fair Trade coffee is sold along with shade-grown and organic coffees in one-pound bags available at their stores, although they are rarely served as the coffee of the day.

However, even without buying a large percentage of certified coffees, in fiscal year 2003, Starbucks paid an average price of $1.20 per pound, significantly above the world commodity market prices for coffee. Also, Starbucks generally enters into long-term contracts with farmers, and assists farmers in obtaining affordable loans, which gives farmers more economic security (Customer Service Department 9/29/04).

In partnership with Conservation International (CI) and other nonprofits, Starbucks has been working on developing Coffee Sourcing Guidelines, which contain quality, economic, environmental, and social criteria that farmers are asked to adopt. Farmers can earn up to 100 “points” for meeting specific criteria. Farmers with the most points have higher status as Starbucks Preferred Suppliers. They then buy from preferred suppliers first, paying them higher prices and offering better contract terms.

The Preferred Suppliers criteria involve coffee quality, economic accountability (for suppliers be clear about how much ultimately gets paid to farmers), environmental impacts (farmers are rewarded for coffee growing and processing practices that have a minimal impact on the environment or positively affect biodiversity), and social condition (workers’ wages should meet minimum requirements under local and national laws, and measures should be taken to ensure workers’ health, safety and adequate living conditions). An independent environmental and food safety evaluation and certification firm (Scientific Certification Systems) audits growers participating in the program and assigns the points. Currently, about 10 percent of Starbucks' coffee is bought from suppliers following this system, but by 2007, Starbucks expects 60 percent of its coffee will come from farmers following these rules (Groom 2004).

Starbucks hopes this change will improve its corporate image. In 1999, a Starbucks store in Seattle was targeted by protesters at the World Trade Organization. Starbucks also recently lost business in the U.K. as a result of the Oxfam campaign surrounding the global coffee crisis. The company has since started a partnership with Oxfam to work on a rural development project in a coffee-growing region of Ethiopia.

(Source: www.starbucks.com, unless otherwise noted)

[46] Volcafe, based in Switzerland, is one of the world's two leading coffee trading companies, operating 68 coffee mills, and buying coffee from nearly every producing country.

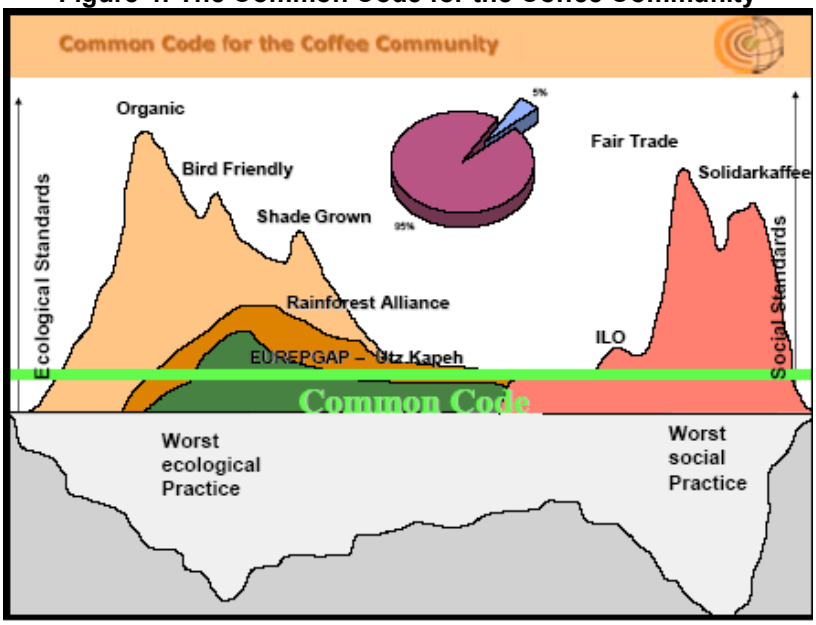
The role of the International Coffee Organization

So far, the ICO's main reaction to the crisis has been to support quality-improvement programs for small farmers, to push for increased consumption (especially in producing countries[47]) and to boost prices by legislating quality standards for exportable coffee (i.e. limiting the number of unripe coffee beans and setting a moisture content cap). Their goal is to remove 5 to 8 percent of the lowest-quality coffee from the export market and thus boost the composite price. Also, in September 2004, the US announced its intention to rejoin the ICO after an 11-year absence, citing the "more market- and development-based approach" and "the difficulties plaguing many coffee producers as a result of falling prices" as the motivations. The US also hopes joining the ICO will help counter the influence of the cocaine industry in producing countries where coffee production has become difficult (NCA 2004). However, the US is clear that it wants to maintain a free-market approach to the crisis and does not want to return to the days of quotas.

The 4-C Code

Also in September of 2004, a coalition[48] of European public, private and governmental bodies released a draft "Common Code for the Coffee Community" (also known as the "4C Code"), a model regulatory structure with baseline standards to promote sustainable coffee production, processing and marketing. The Code sets minimum economic, environmental and social requirements[49] applicable to eligible sellers and buyers who choose to sign onto the Code (see Figure 4). The objective of creating the 4C Code is to foster sustainability in the 'mainstream' green coffee chain (beyond certified coffees) and to increase the quantities of coffee meeting basic sustainability criteria (Common Code for the Coffee Community 2004). Pilot programs will test its practical application in coffee-producing areas of Africa, Asia and Latin America.

Figure 4: The Common Code for the Coffee Community



(Reprinted from http://www.ico.org/event/equitable/schmidt.pdf)

[47] For example, the ICO was very supportive of Brazil's initiatives to increase consumption – including the introduction of "coffee breaks" in the country's public schools in hopes of helping students acquire a tast for the product.

[48] The coalition includes the German Ministry for Economic Co-operation and Development (BMZ), the German Coffee Association (DKV), the ICO, World Bank, International Institute for Sustainable Development (IISD) and Foundation Utz Kapeh.

[49] The economic dimension includes "reasonable earnings over time for all in the coffee value chain, market access, and sustainable livelihoods," the ecological dimension includes " protecting the environment and conserving natural resources," and the social dimension includes " human rights and social standards, decent standard of living and decent income and working conditions" (Common Code for the Coffee Community 2004).

Figure 4, reprinted from Schmitz-Hoffman (2004), shows how the 4C Code would compare to current certified versus non-certified coffee production systems. The baseline in this figure is the average production practice (in terms of social and ecological criteria) for green coffee production. Above the line are programs that improve either ecological standards of production (towards the left of the figure), or social standards (towards the right), with the name of each program above its peak (the higher the "peak," the better the practice). Likewise, there are many cases where coffee production is significantly worse than average, represented by the curve in the gray area below the baseline (these are non-certified coffees, and thus are not labeled). The goal of the 4C Code is to raise create a new voluntary baseline (the wider green line in the figure) for mass-market coffee that has higher social and ecological standards than average production, without having requirements as stringent as those for certified coffees. The pie chart in the figure shows that 95% of coffee worldwide is sold in the mass-consumption market, whereas only 5% of coffees sold are certified. The theory behind 4C is that increasing the sustainability standards of non-certified coffee (if even by a small margin) could lead to substantial improvements overall in the ecological and social impacts of coffee production.

VI. RECOMMENDATIONS

The coffee crisis is a complex and multifaceted issue, and the goal of sustainable development requires that social, environmental and economic problems (which commonly have contradictory solutions) be solved simultaneously. A solution to the crisis must address the root of the problem (market failure), but also take shorter-term steps to prevent further devastation of human lives or ecological habitats. Unfortunately, the coffee commodity market is driven almost exclusively by economic factors and, like all commodity markets, does not recognize, much less internalize into its prices, the very real environmental and social costs of production. Certified "sustainable coffee markets" are beginning to do this. Below I have listed the main actions I see as positive steps in both the near and long term, and at both global and local levels. These strategies are not the complete answer to sustainability in the coffee sector, but they are wise options for a policy maker's toolkit.

Think on a landscape scale: It is important to focus on the appropriate scale for thinking about conservation. There are the environmental impacts on the individual farm scale – such as amount of chemical fertilizers or pesticides entering the soil or water, and the diversity and quality of habitat types – based on the canopy cover. Then there is the landscape or regional scale in static time – such as the connectivity between forest cover on adjacent farms, or whether there are forest patches large enough to sustain populations of native mammal, bird, or pollinator species, and whether sensitive species are able to travel through the coffee farms as a corridor. But when one thinks on the dynamic landscape scale (i.e. over time), one must consider whether coffee production is expanding to the detriment of protected areas or other intact forest areas. There must be a careful balance between providing sufficient economic incentives for farmers to produce shade coffee and improve their quality of life, but without providing the perverse incentive to destroy more forest to expand coffee production.

Diversify coffee farms: Given coffee's frequent price shifts, in the short term the best option for farmers is to polycrop (adding fruit trees, timber species, etc. to their coffee agroecosystem) – creating both a diverse habitat for birds and other species and providing alternative sources of income, or a better "investment portfolio." Producing multiple crops is a way of hedging risk. The information regarding the best tree species to use for these purposes should be obtained at the local or regional level for best results; national-level coffee institutes or local universities are the most appropriate bodies for researching and disseminating this type of information. For

certified farms, one other strategy for diversification is to combine coffee farming with ecotourism. For example, in Costa Rica Café Britt and Café Monteverde make significant business out of charging tourists for tours of their coffee farms and processing facilities.

Find alternatives to coffee where necessary: The reliance on a single export commodity by farmers in many countries often results in overproduction. With oversupply being part of the problem, having farmers diversify to other crops in marginal areas where quality or certified coffee cannot be grown is part of the solution. Governments and aid organizations should help local institutions focus on developing sustainable income producing alternatives for farmers, and coffee production should be phased out (i.e. new plants should not be planted after old plants exceed their useful life) where it is not well-suited to local conditions. Part of the solution might require the developed world (especially the US and Europe) to get rid of massive farm subsidies in order to make it worthwhile for poor farmers to switch to other crops (Pennington 2002).

Improve and consolidate certification programs: While each major certification program currently has its own audience (birders, social justice advocates, conservationists, or consumers concerned primarily with health), there are advantages to creating more comprehensive options. The Rainforest Alliance certification is a good model of a comprehensive seal, although it could be strengthened by the addition of an organic production requirement. Another strategy is to follow the example of Starbuck's "Coffee Sourcing Guidelines" and create a point system with higher premiums offered for more points. That way, even areas where coffee is currently produced in a chemical intensive manner, farm owners could be rewarded for moving towards a more sustainable system.

Internalize the Externalities: Part of the problem of the market price for coffee is that it does not internalize some free inputs (pollinator services from nearby forest fragments, for example Ricketts 2004). At the same time, technified coffee production might not be so profitable if the environmental costs of contamination of waterways or ecological costs of loss of native species are subtracted from the profit a farmer earns. Policy makers should continue to explore ways that ecosystem services can be given monetary value and incorporated into the "implicit" economic formulas farmers use to make land use decisions by such routes as tax credits, conservation easements, or zoning policies.

Watch out for perverse incentives: Conservationists walk a fine line; we want to increase the prices paid to farmers to encourage them to continue to grow coffee (especially traditional shaded coffee, which is better for biodiversity than most alternative land uses other than protected areas), but we do not want to encourage the expansion of production into native forest. Certification programs should therefore be modified to remove the incentive to expand production. For example, as Philpott and Dietsch (2003) suggest, there could be a waiting period built in before newly established farms can gain certification. Also, certifiers should make sure that they do not certify farms that are located within the boundaries of protected areas. Overall, incentives must be provided to induce existing farms to convert to (or stay in) shaded coffee while at the same time providing disincentives to expanding production into native forest.

Make certification possible for all eligible farmers: At present, lack of information, know-how, and funds for certification or transition costs have prevented many farmers who might otherwise be eligible to seek sustainable coffee certification[50]. The Fair Trade certification programs have been the most successful thus far in assisting farmers with these costs, and providing affordable credit opportunities, but recently have begun to charge farmers.

[50] A survey of Costa Rican coffee farmers found this to be the case – unpublished data, M. MacDowell, T. Ricketts and J. Florez.

Certification programs should find ways to help more farmers become certified, such as reducing initial costs, supporting the formation of farmers' cooperatives to spread risk and gain increased bargaining power, and providing affordable credit.

Focus on quality not quantity: Improved prices for quality coffee can provide farmers with better livelihoods (the alternative to extensification of coffee production where there are no viable crop alternatives). Farmers and farmer assistance programs can focus on raising quality standards in order to gain access to specialty coffee markets. Growers of high quality beans benefit from conducting business with small roasters who pay them higher prices for their coffee, instead of selling to large roasters or government programs who will mix their coffee with lower quality beans in order to reach the volume demanded (McLean 1997).

Shorten the supply chain: Farmers and farm cooperatives should be given the training and access to form more direct relationships with buyers and roasters (thus increasing their fraction of the final retail price of coffee). One trend is to carry out more roasting within the producing countries[51]. Another strategy is for farmers groups to diversify into the retail side of the business. For example, some farmers sell roasted coffee via the Internet (and ship directly to consumers). The Colombian Coffee Federation has also recently made the bold move to open a chain of "Juan Valdez" coffee shops (á la Starbucks) in major US cities as a way to capture more of the value of the coffee their farmers produce.

Continue to improve purchasing practices of the "big five": Conservation and humanitarian groups should continue to work with major industry players to create standards. Oxfam, Conservation International, and Rainforest Alliance have all made major progress in their campaigns (both push and pull) to influence the buying practices of the main coffee buyers, but continued pressure is necessary. The recent creation of the voluntary "Common Code for the Coffee Community" is also a step in the right direction.

Strengthen consumer awareness campaigns: Perhaps the most important area for action is to create a strong demand for sustainable coffees. Certification programs will not achieve their goals if there are not sufficient numbers of coffee consumers that ask for certified coffees. As is, supply of certified coffees outstrips demand in some cases (e.g. Fair Trade). Conservation organizations can use the mass media to educate consumers about sustainable coffee options, and the importance of certification (for example, the difference between a package that says "shade grown" and a package that is certified biodiversity friendly). Also, if consumers become more discerning about coffee quality, there is a possibility that arabica will regain more of its market share (Kurlantzick 2003).

Make sustainable coffees available to more consumers: Along with education of consumers, supermarket chains should be encouraged to carry certified coffees (they are currently mostly found in specialty or health food stores on the West Coast or in urban areas). Progress has begun on this front; so far Fred Meyer department stores (on the West Coast) have upgraded their organic coffee line to Bird-Friendly *and* organic, and Procter and Gamble have added a certified coffee option to their Millstone line (found in many supermarkets), but they are currently only offering it for sale from the Millstone Web site. However, these certified coffee options still need to be made available in the large supermarkets across the country where most shoppers

[51] The usual concern has been that quality decreases with time since roasting (delivery 48 hours after roasting is considered optimum, 7 days maximum), so it is best to roast coffee in the consuming countries. However, specialty coffees can be shipped quickly from Latin America to the US, and increasing gourmet coffee companies are selling roasted coffee over the internet (for example, Costa Rica's Café Britt or Café Monteverde).

purchase coffee for in-home consumption. If consumers face initial obstacles in finding sustainable coffees, they may lose interest.

Change institutional purchasing policies: A powerful way to reach out to the public about the importance of sustainable coffees is to have institutions lead by example by purchasing these coffees. Already, more than 300 US college campuses now serve Fair Trade coffee – including Yale, Harvard, Georgetown, University of Texas, Oklahoma State, and UCLA. Students should continue to pressure their campuses to follow these leads. Corporations can also make similar decisions. Citigroup, Java City, and Aramark recently announced their commitment to serving Rainforest Alliance Certified coffee in 25 Citibank corporate headquarters around the nation (Vigilante 2003). Finally, the United States government could set the example of only purchasing certified coffees for its offices and cafeterias. This could serve as encouragement for the adoption of more socially responsible policies.

Coordinate Internationally: It seems that the experiment with an entirely hands-off approach to the world coffee supply has been disastrous. Even if the market is just adjusting to "shake out" uncompetitive farmers, the potential social consequences of the more "efficient" system are grim (e.g. the increasing accumulation of wealth in fewer large corporations at the expense of the livelihoods of rural farmers in the developing world). A better level of prices for coffee growers will depend on progress towards a balance between supply and demand. Now that the United States has rejoined the ICO, talks should begin about ways to "correct" the market failures in a way that keeps prices above production costs and contributes to long-term sustainability.

Conclusion

> *Sustainable development involves a process of deep and profound change in the political, social, economic, institutional, and technological order, including redefinition of relations between developing and more developed countries.*
> --Maurice Strong, Secretary-General, 1992 Rio Earth Summit, UN.

For every daily coffee drinker in the US, there is one worker elsewhere in the world who depends on coffee for his or her livelihood. Given that more than half of American adults drink coffee every day (NCA 2004), and that in one year, a two-cup-a-day drinker of coffee will consume the annual harvest of 18 coffee trees (Conservation International 2004), we have the responsibility to examine the social and environmental impacts of our actions. The free-market economy for coffee has failed to ensure that the goals of conservation and sustainable development are met; it has in fact ended in a humanitarian and ecological crisis. Therefore, governments, NGOs, the international community, and most importantly, coffee drinkers, must band together to demand what's right.

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