

Tobacco *Nicotiana tabacum*, *N. rustica*

Production

Area Under Cultivation	4.2 million ha
Global Production	6.8 million MT
Average Productivity	1,610 kg/ha
Producer Price	\$2,985 per MT
Producer Production Value	\$20,299 million

International Trade

Share of World Production	83%
Exports	5.6 million MT
Average Price	\$4,969 per MT
Value	\$28,017 million

Principal Producing Countries/Blocs (by weight)

China, India, Brazil, United States,
Zimbabwe, Turkey

Principal Exporting Countries/Blocs

Brazil, United States, Zimbabwe,
China, Italy, Turkey

Principal Importing Countries/Blocs

Russia, Germany, United States,
Netherlands, United Kingdom, Japan

Major Environmental Impacts

Habitat conversion
Soil erosion and degradation
Agrochemical use
Deforestation for drying tobacco
Waste

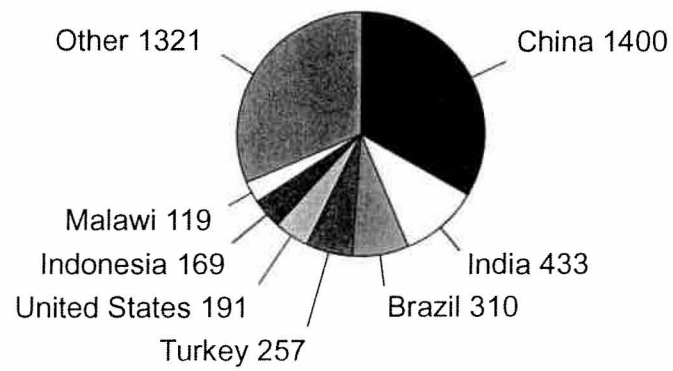
Potential to Improve

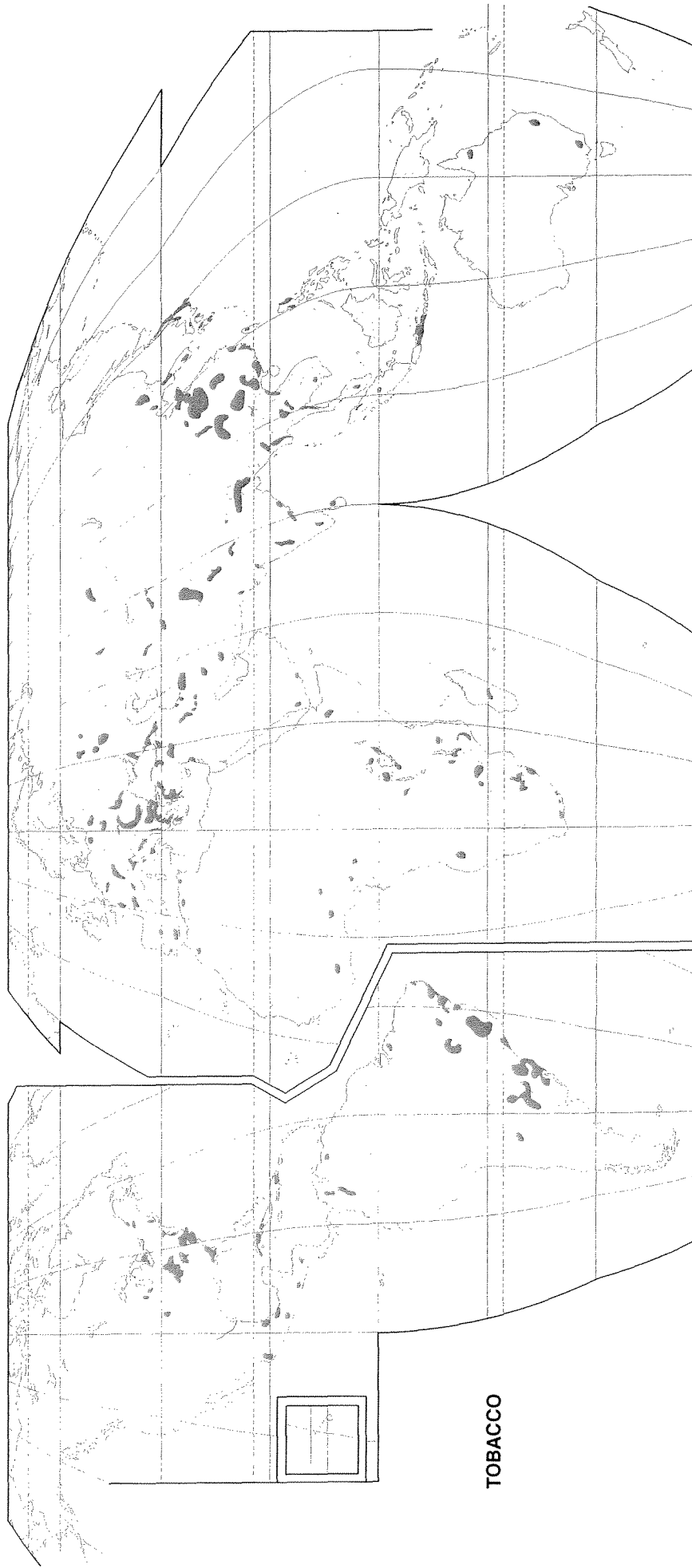
Poor
Most production shifting to developing
countries where there is less ability to
influence production practices
Buyers have little interest in sustainable
production
Few alternatives to wood-based energy and
paper use in many countries
Focus is on stopping smoking, not making
production sustainable

Source: FAO 2002. All data for 2000.

Tobacco

Area in Production (Mha)





TOBACCO

Main areas of production

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Chapter 15

Tobacco

Overview

Tobacco originated in the Americas, where its use is estimated to have begun around 6000 B.C. By the time of Columbus, tobacco was cultivated by Native Americans throughout the Americas and used for both ceremonies and medicine. Sailors on Columbus's first voyage were the first Europeans to use tobacco. By the middle of the sixteenth century, adventurers and diplomats (for example, Jean Nicot de Villemain, France's ambassador to Portugal, after whom nicotine was named) promoted its use (Tobacco Free Kids 2001).

Initially, tobacco was obtained by trading with Native Americans and was used for pipe-smoking, chewing, and snuff. The first crop cultivated by nonnatives was in Virginia in 1612 (Tobacco Free Kids 2001). Within seven years tobacco was Virginia's largest export. New, milder varieties of tobacco were found in Brazil and brought to the United States. Markets expanded and production expanded quickly to match it. Most tobacco was grown and harvested by slave labor.

Initially, tobacco was cured and cut for pipe smoking or ground into powder and used as snuff. Crude cigarettes have been around since the early seventeenth century. They became much more popular after the Civil War, however. At first, cigarettes were hand-rolled at the rate of three per minute. In 1880 the first cigarette-making machine was invented. It produced 200 cigarettes a minute (Tobacco Free Kids 2001). Today the fastest machines can make 160,000 per minute.

Producing Countries

In 2000 global tobacco production was estimated at 6.8 million metric tons. The total area devoted to tobacco cultivation was about 4.2 million hectares. Tobacco is grown in more than 100 countries, including more than 80 developing countries (FAO 2002).

In 2000, China was the main producing country with 1.4 million hectares under cultivation. Other major producers included India (433,400 hectares), Brazil (309,989 hectares), Turkey (257,230 hectares), the United States (191,190 hectares), Indonesia (168,688 hectares), and Malawi (118,752 hectares). China accounted for nearly 34.3 percent of the global area planted to tobacco and 37.9 percent of total production. China, India, and Brazil produce more than half of the world's tobacco. The top seven producers account for more than 71 percent of land planted to tobacco as well as the same percentage of total production (FAO 2002).

Tobacco production increased by 59 percent between 1975 and 1997. For the most part, this increase occurred in developing countries. In those nations, production increased by 128 percent during this time period while falling 31 percent in developed countries (Tobacco Free Kids 2001). More than 80 percent of the global tobacco crop is grown in the developing world.

Average tobacco yields globally are just over 1,610 kilograms per hectare per year. The United Arab Emirates produce yields that are 7.5 times the global average at 12,160 kilograms per hectare per year. Cyprus, Laos, Oman, and Uruguay each produce more than twice the global average per hectare per year.

In 2000, the leading tobacco exporters were Brazil, the United States, Zimbabwe, China, Italy, and Turkey. Exports amounted to about 29 percent of global production. Although the United States is a leading exporter (especially of high-quality, flue-cured tobacco), a number of developing countries have increased tobacco production considerably. For many of these nations tobacco is an indispensable source of foreign exchange, allowing them to import other commodities and consumer goods. For example, in Zimbabwe—the major tobacco producer in South Central Africa—nearly all tobacco (98 percent) is exported. About half of Thailand's tobacco crop is exported. In China, by contrast, tobacco consumption is growing so rapidly that most tobacco is grown to reduce the use of foreign exchange that is required to buy imported tobacco, and meet domestic demand.

Table 15.1 Tobacco's Ranking of Total Exports by Value for Selected Countries, 1990–91

Leading Export	Second Largest Export	Third Largest Export
Malawi	Turkey	Malta
Zimbabwe		Zambia

Source: UNCTAD 1994.

For Malawi and Zimbabwe, tobacco is the leading export as ranked by value, as shown in Table 15.1. In these two countries, tobacco export earnings provide some 56 percent and 47 percent of export earnings, respectively. Indeed, tobacco provides 74 percent of foreign exchange earnings in Malawi and over 30 percent in Zimbabwe. In Brazil, the Dominican Republic, India, and Tanzania, tobacco amounts to about 5 percent of total agricultural exports.

Consuming Countries

China is the largest producer and consumer of tobacco in the world. It imports some 1 percent of its consumption. India is the second largest producer and consumer of tobacco in the world. In both instances, most of the tobacco consumed is grown locally.

Russia is the largest importer of tobacco in the world. It is followed closely by Germany, the United States, the Netherlands, the United Kingdom, and Japan (FAO 2002).

The United States imports some tobacco for special purposes. For example, Asian cigarette leaf tobacco is imported for blending, Puerto Rican tobacco for cigar filler, and leaf tobacco from Sumatra and Java for cigar-wrappers. The United States also produces some of the tobacco it consumes; about two-thirds of the crop is grown in North Carolina and Kentucky (Brown and Williamson 2003).

Several factors have combined to reduce demand for tobacco. The anti-smoking campaigns in the United States appear to have permanently reduced demand in that country. By contrast, the Russian financial crisis has probably only temporarily reduced demand until the economy becomes stronger. The Chinese policy to encourage the use of tobacco land for other crops has caused an overall reduction in the area planted to tobacco. In 2000, Chinese production was down by 39 percent from the prior year, and the area devoted to tobacco was down by 25 percent to 1.5 million hectares (FAO 2002). However, demand in China is still increasing, as it is globally.

Production Systems

The main tobacco species are *Nicotiana tabacum* and *N. rustica*. The latter is grown mainly in Asia. Smaller-leaved aromatic tobaccos tend to be grown for all purposes while larger, broad-leaved tobaccos are produced mostly for the cigar industry.

Tobacco production in the United States and some other developed countries has undergone great changes as technology has been developed so that increased mechanization dominates many aspects of production. Mechanized production in the United States has had other implications. The cost of production, for example, increased nearly 200 percent from 1980 to 1998, while the price of tobacco increased only 19 percent for flue-cured leaf. Put another way, the producer share of the price of a package of cigarettes declined from 7 cents to 2 cents (the tobacco companies' share increased from 37 to 49 cents in the same period) (Tobacco Free Kids 2001). In the meantime, because of the need to increase the scale of operations to survive financially, the number of U.S. tobacco farms declined by 32 percent while total production remained constant (NASS 1999).

Given the price of tobacco, investments in mechanization are not viable in most parts of the world. Thus, for most producers growing tobacco is still a back-breaking, labor-intensive job. Brazilian researchers estimated that some 3,000 person-hours per hectare per year are required to produce tobacco. And, as production shifts to developing countries, the number of child laborers increases. Globally, the industry estimates that 33 million people are engaged in tobacco cultivation, but the full-time equivalent employment levels are probably only a third of that. In addition, tobacco rarely accounts for more than 1 to 2 percent of total rural labor (Tobacco Free Kids 2001).

Labor requirements start with planting the seeds. While adult plants are hardy, seedlings are not. Seedbeds are created (either in greenhouses or glassed-in, enclosed areas in the fields) by carefully tilling the soil, sterilizing it with gas to kill unwanted insects and weeds, and adding ashes to counteract the acidity of soil. Tobacco seeds are planted in the sterilized soil. They are tiny, with some 10,000 weighing only 1 gram. After spreading the seed on the beds, the soil is covered with hay or cloth to protect them. Within three to four months the seedlings have reached a height of 25 to 40 centimeters and can be transplanted into the fields, one at a time. Up to 25,000 seedlings are planted per hectare on ridges that are spaced about a meter apart.

When the plant reaches a specific height, the top is pinched off to improve leaf quality and quantity. For a period of five to six weeks, growers continue to remove new growth on the plant to ensure that the selected leaves grow to full size and mature evenly. The pinching of leaves from the plant causes it to ooze sap, which attracts a variety of insects that must be removed and killed. Some of the insects, like the hornworm, are camouflaged green, making them hard to find. On average, growers must tend between 250,000 and 400,000 individual leaves per hectare (Tobacco Free Kids 2001).

The process of harvesting can be extremely labor-intensive. If high-quality leaves are the goal, a technique called priming is used in which only three to four leaves are removed at a time starting at the bottom of the plant (Tobacco Free Kids 2001). The uppermost leaves, which have the highest levels of nicotine, are harvested last. Priming allows new leaves to form and mature over time. For lower-quality tobacco, all the leaves are harvested together with the stalk.

When grown as a monoculture (as it is in the most productive tobacco-producing regions), tobacco requires large amounts of fertilizers and other agrochemicals. One of the major problems with the crop is its susceptibility to water stress, diseases, insects, and soil chemistry (either deficiency of one or more nutrients or toxicity resulting from an excess of one or more nutrients). As a hardy, sun-loving plant, tobacco can tolerate a wide variation in rainfall patterns, provided they are not extreme, while still yielding a commercially viable crop.

Because of tobacco's susceptibility to stress and diseases, and also to take advantage of field conditions and to maximize yields, several varieties are planted in most fields. Ideally, the varieties that perform best would be chosen based on soil type, available moisture, and local pest problems such as nematodes and insects inside the field in question. However, given the increasing scale of production and the lack of seedling varieties at planting time in many parts of the world, it is impossible for even the most advanced farmers to take advantage of such precision-farming approaches to improve production on their land.

Soil and climatic differences cause significant variations in leaf characteristics. In turn, these differences greatly affect each leaf's suitability for use in the various manufactured forms of tobacco. Each geographic area produces a leaf with special characteristics that is particularly adapted for certain uses—cigarettes, cigars, pipe tobacco, chewing tobacco, or snuff.

In many developing nations, the soil is too poor and offers too few nutrients for many food crops. Most poor farmers cannot afford to use the fertilizers required to grow food crops such as cereals, grains, or beans, which, when sold on local markets, are not valuable enough to cover the cost of such inputs. The high value of tobacco relative to most food crops allows producers to afford the types of fertilizer and chemical inputs that allow the crop to be produced on poorer soils (Tobacco Free Kids 2001). Subsidized inputs (in cash or in kind) from the buyers don't hurt either. In the end, though, it depends on how much profit is left when the crops are sold and all debts have been paid. While tobacco is often a very attractive cropping alternative because of the amount of money it generates, many producers find that at the end of the season they have fewer net profits than expected.

One major trend with tobacco production in developed countries is the use of greenhouses in the production of healthy seedlings for transplant. This allows for lower usage of pesticides in the initial phases of production and for highly controlled application of fertilizers in the initial weeks of growth. The transplanting of healthy and vigorous plants in the primary phases of production is also thought to result in slightly higher resistance to stresses and disease.

Another major trend with tobacco production is contract farming. Under this system of production, tobacco companies act as banks, extending credit to farmers at the beginning of the season in the form of seed, fertilizer, pesticides, and technical support. In return, farmers pledge to sell their crop to the company at harvest. Company inspectors make regular visits to the farms to make sure their guidelines are followed. When the harvest is in and the time comes to pay the farmer, the leaf buyers determine the leaf grade and the price. As a result they often end up paying producers less than the original loans. In Brazil, observers suggest that severe grading has reduced prices by 20 percent. There is some evidence that the companies decide prices among themselves to keep their costs lower (*The New York Times*, as cited in Tobacco Free Kids 2001). This form of "debt bondage" is a way the tobacco companies are increasingly controlling producers (Tobacco Free Kids 2001). In Brazil, Universal and DIMON (two U.S.-based companies) contract with about half of all producers; most of the remainder have contracts with Souza Cruz, a subsidiary of British American Tobacco (Jones 1998b).

Processing

Tobacco leaves are cured, fermented, and aged to develop aroma and reduce the harsh, rank odor and taste of fresh leaves. Fire, air, and more specialized flue-curing are the most common ways to cure tobacco. Curing methods, along with environmental conditions and cultivation techniques, determine the characteristics of many of the grades.

Fire-curing is used on 20 percent of all tobacco, primarily for cigarettes. The process dates from pre-Columbian times. It is undertaken most crudely by drying tobacco leaves over a fire where the smoke can cure them. Alternatively, fire-curing can be undertaken

in a structure that resembles a smokehouse, where the leaves are hung within a smoke-filled enclosure. Flue-cured tobacco, which constitutes just over half of all tobacco, is used to produce pipe tobacco, snuff, and chewing tobacco. Most globally traded production is flue-cured. It requires the leaves to be dried by radiant heat from flues or pipes connected to a furnace (Smith 1999)

Air-curing accounts for 11 percent of all tobacco and is used mainly for cigars. In this process the leaves are hung in well-ventilated structures so that the air can circulate around them and dry them out. Any heat in this system is from the ambient air or from passive solar energy (i.e. heat from sunlight falling on the barn roof). Other tobacco—especially Turkish or other oriental tobaccos—is sun-dried. This process is used on 16 percent of all tobacco, for so-called oriental cigarettes (Smith 1999).

After curing, tobacco is allowed to age for six months to two years. The cured tobacco is graded, bunched, and stacked in piles called bulks or in closed containers for active fermentation and aging. Most commercial tobaccos are blends of several types, and flavorings are often added. These flavorings include maple syrup, chocolate, honey, vanilla, licorice, fruit extracts, and other sugars. Some concern has been expressed that many of these additives are used to help make cigarettes more palatable to children. After curing, tobacco is rolled into cigars, shredded for use in cigarettes and pipes, or processed for chewing or snuff. Because of the toxic chemicals in tobacco, any wastes that cannot be used to make other more valuable tobacco products are used to manufacture insecticides.

Substitutes

Tobacco is addictive. In fact, manufacturers have been accused of adding chemicals to tobacco to make it even more addictive. While many other products are equally addictive, none are true substitutes. Some research shows that alcohol consumption and tobacco consumption are often linked, and when linked it is much harder to stop either one (DeBenedittis 1999; Drobos 2002). However, most people trying to stop using tobacco products do not turn to other more addictive products. Most turn to food as an alternative and usually experience periods of pronounced weight gain, at least in the short term.

Market Chain

In recent decades, tobacco companies have shifted their purchasing to developing countries, where there is cheap labor and easy access to natural resources. Much effort and considerable money is invested to encourage farmers to grow tobacco. Companies have spent billions of dollars to build new factories, enter into joint ventures, and buy formerly state-owned factories. At the same time, these large corporations have been working closely with usually U.S.-based leaf companies (companies that source tobacco around the world, ensure quality control, and then sell to manufacturers) to expand the cultivation of lower-priced tobacco to supply the new factories. Philip Morris, British

American Tobacco (BAT), and Japan Tobacco each own or lease manufacturing facilities in more than fifty countries. They purchase tobacco in dozens more (Tobacco Reporter 2001).

The world leaf market is dominated by three U.S.-based companies: DIMON, Standard Commercial, and Universal. These companies select, purchase, process, and sell tobacco leaf to the major manufacturers of tobacco products (Swoboda and Hamilton 1997). These companies are in charge of purchasing and quality control of tobacco for the main manufacturers. They also work with the major tobacco manufacturers to determine which countries will produce how much tobacco leaf and what kind. Much tobacco production is forward-financed by the manufacturers through the leaf companies that receive down payments from manufacturers to deliver tobacco of predetermined quality and quantity. The leaf companies in turn use that money as cash advances to growers. By helping to finance the farmers through the leaf companies, the manufacturers hope to reduce the risk of not being able to obtain product, the amount of time they are involved in the search for raw materials, and the overall price they will have to pay for product.

In Brazil, DIMON pays about U.S.\$100 million per year to provide tobacco farmers with fertilizer and other inputs. The company “agrees” to purchase the entire crop and in some cases even finances the curing barns as well (Jones 1998a). In Tanzania, DIMON contracts with more than 30,000 tobacco growers by providing similar assistance (Tuinstra 1998a). In Poland, Philip Morris established a growers’ fund for 18,000 tobacco producers to improve the quality of their crop, and BAT has given U.S.\$3 million in no-interest loans to Polish farmers (Tobacco Free Kids 2001). Philip Morris has sent twelve American advisors to provide guidance to local tobacco growers in China. Producers in Argentina, Azerbaijan, India, Malaysia, Turkey, and Vietnam all receive similar loans, technical assistance, and infrastructure investments from leaf buyers (Tobacco Free Kids 2001).

Since a small number of leaf companies or their buyers set the prices, they leave farmers little choice, in any given year, but to accept the prices that are offered. In some cases, the buyers forward-contract to buy the crop through various grow-out schemes before it is even planted. In such cases, they stipulate not only which inputs can be used but also when, how much, and how often. In many instances, such contract farming operates on the notion of prevention of possible problems rather than treating them as they arise. In such circumstances, many producers also buy inputs from a state or private-sector buyer who ends up buying the tobacco at harvest. In the long run, most small-scale farmers never profit greatly from tobacco production. In addition, the inherent value of their land declines due to the terrible toll that tobacco takes on its nutrient and organic matter levels. Most tobacco farms have extremely low nutrient and organic matter levels and are easily farmed until they are no longer productive. Even for larger-scale commercial farmers, especially in the developed countries, most of the profits from growing tobacco come in the form of government subsidies.

In some developing countries, governments intervene in tobacco markets to manipulate the price paid to producers, usually to the detriment of the producers. In 2002 in Zimbabwe, for example, tobacco sold at auction for U.S.\$1.65 per kilogram. This is a

good price, but the farmers were not happy because the government grabbed most of the value by manipulating the exchange rate. The official exchange rate of the Zimbabwean dollar is 55 per U.S. dollar, despite inflation of more than 100 percent per year. On the black market, however, the local currency has only one tenth that value. Farmers are not allowed to hold hard currency and must turn in their sales receipts to the government, at which point they are paid at the official exchange rate. Instead of allowing farmers to reap the real benefit of their crop, the government “gives” them a subsidy equal to some 80 percent of the “official” value of their crop. In the end, the government and certain officials pocket more than 80 percent of the actual value of the crop by holding on to the hard currency (*The Economist* 2002).

Regardless of the tobacco production and curing system employed, the profits from tobacco accrue largely to large multinational companies. As multinational cigarette companies increase their overseas manufacturing capacity, the leaf dealers have followed, setting up leaf procurement and processing facilities near the new factories. Today they operate in dozens of countries on five different continents. In a constant drive to increase profits, these companies regularly shift production from one country to another based on the concession they can negotiate with the local governments, irrespective of the impact this may have on local growers or economies.

Global tobacco companies based in the United States spend \$11 million per day to advertise and promote cigarettes, to enhance their profits, and to protect their markets and market shares. Some promotional tactics that have proven effective in reaching potential young smokers around the world include the use of cartoon images, free cigarette giveaways, sponsorship of events that appeal especially to young people, and the use of cigarette logos on youth-oriented products. Intense tobacco marketing campaigns are increasingly common in developing countries such as Egypt, Indonesia, China, and Brazil. In these countries, population size, low rates of smoking among women, increased disposable incomes available to larger numbers of landless workers, and the lack of legislative controls offer promising new markets to the tobacco industry (DeBenedittis 1999).

Market Trends

The massive increase in global tobacco production fueled by tobacco industry financing has resulted in a worldwide oversupply of tobacco and a decline in prices. From 1960 to 1989 the world price for flue-cured tobacco declined in real terms by 1.1 to 1.7 percent per year. This trend accelerated between 1985 and 2000, when the real price fell 37 percent to U.S.\$1,221 per metric ton (Jacobs 2000, as cited in Tobacco Free Kids 2001).

There are some indications that the lack of competition in the markets hurts prices. Leaf companies have declined in number and are directly linked to the manufacturers. In Zimbabwe some 70 percent of the market is controlled by subsidiaries of DIMON and Universal (Tuinstra 1998b). An article in *Tobacco International*, a pro-business magazine, recently suggested that the small number of leaf buyers in Malawi has reduced

competition to such a point that one company is buying about 50 percent of the local crop (Kille 1998). In 2000 prices declined by 14 percent. In 2001 they declined even further to as little as U.S.\$0.10 per kilogram; the same leaves would have sold for between \$1 and \$2 per kilogram in 1999 (South Africa Broadcasting Corporation 2000, as cited in Tobacco Free Kids 2001).

Another factor that affects prices is currency value. When Brazil devalued its currency in 1999, tobacco prices in Argentina dropped from 15 to 25 percent because Brazilian leaf was suddenly cheaper for the buyers (Bennett 2000).

Companies are also increasing profits and reducing tobacco use per cigarette by figuring out new ways to process tobacco so that it increases in volume. Originally this was done with chlorofluorocarbons (CFCs), but since they were banned it is done with liquid carbon dioxide, nitrogen, or isopentane. In these processes the tobacco is soaked with liquid gas, which solidifies at atmospheric pressure. Hot gasses are then pumped into the mix, causing the dry ice (solidified carbon dioxide) or other solidified gas to vaporize and thus puff the tobacco up by 60 to 100 percent (Tobacco Free Kids 2001). Expanded tobacco costs a little more to produce, but because less is used it pays for itself. In the near future ultralight cigarettes will contain 40 to 50 percent expanded tobacco, but only 20 percent for light cigarettes and 10 percent in full-flavor cigarettes (Tobacco Free Kids 2001).

Another factor that is likely to affect overall tobacco prices and trade globally are the proliferation of international trade agreements (such as the World Trade Organization and a dozen or so regional or hemispheric ones) which liberalize trade in goods and services. Cigarettes are also affected by the removal of trade barriers, which tends to introduce greater competition, lower prices (both to consumers and producers), and increased expenditures on advertising and promotion to stimulate demand. The World Bank (1999) reports that in four Asian countries that opened their markets in response to U.S. trade pressure during the 1980s (Japan, South Korea, Taiwan, and Thailand), consumption of cigarettes per person was almost 10 percent higher in 1991 than it would have been had the markets remained closed.

Similarly, as the United States and the European Union reduce their overall support for tobacco, either through subsidies or market protection, the crop is being grown in a number of developing countries where production costs are cheaper. The response among producers has been so overwhelming that global supply is now greater than demand. If anything, tobacco may be an indication of what will happen if global markets become more open through the reduction or elimination of production subsidies or market protection.

Per capita tobacco consumption in developed countries has stabilized with actual drops in the United States and increases in Europe. Overall use is expected to decline in both over the next century. However, tobacco use is increasing among teenagers and young women in both areas as well as among poorer males and females in both. In the United States, the tobacco industry loses close to 5,000 customers every day—including 3,500 who manage to quit and about 1,200 who die (INFACT 2003).

Globally, demand for tobacco continues to increase steadily. World consumption of tobacco increased by seven per cent from 1992 to 1995 and was expected to increase by an additional seven percent by 2000. By 2025, the total number of smokers is expected to rise from its current 1.1 billion to some 1.6 billion (World Bank 1999). To meet the increases in tobacco consumption, world production of tobacco also increased by seven percent from 1992 to 1995—with the largest increase in developing nations such as Indonesia, China, and Zimbabwe (FAO 2002). More recently, with the decline in tobacco prices due to oversupply, China has discouraged production in favor of other food and fiber crops, leaving the door open for increased imports (UNCTAD 1999).

Developing countries account for the greatest increases in consumption. By the mid-2020s it is predicted that only about 15 percent of the world's smokers will live in developed countries, as there will be a shift in the use of tobacco from developed to developing countries. In the developing world, per-capita cigarette consumption has risen on average by more than 70 percent during the last twenty-five years (INFACT 2003). In Nepal and Haiti, per-capita cigarette consumption in 1990 was over 240 percent higher than in 1970, while in Cameroon and China the relative increase was over 150 percent (Gajalakshmi et al. 2000). In these countries use is expected to increase slightly faster than the population over the next few decades.

Most tobacco companies have pinned their hopes for future profits on expanding markets in developing countries. The industry is targeting Africa, Asia, and Latin America. The tobacco industry has also been expanding into Eastern Europe and the former Soviet Union.

Nowhere is the potential of this strategy clearer than in China. The Chinese cigarette market is already three times the size of the market in the United States. Chinese cigarette consumption accounts for more than 30 percent of the world's 5.4 trillion cigarettes sold each year. Since international sales into the Chinese market amount to less than 1 percent of this market, the tobacco industry feels that there is immense potential for expansion there (Nelson 1993, as cited in O'Sullivan and Chapman 2000). As China discourages local tobacco production, this may well encourage an increase in imported tobacco products.

Tobacco advertising has been predicted to take a different shape in the coming years. Marketing campaigns are likely to target minorities and woman. Women, especially those in developing countries, constitute a major untapped market for the cigarette companies. Companies will continue to target children, but the hooks used are likely to be much more subtle as a way to reduce legal actions. Greater emphasis will also be placed on developing niche markets. For example, special advertising may target groups that identify with fringe cultures. Also, drinkers will become a greater marketing niche.

In the foreseeable future, tobacco farmers are not likely to respond to calls to cease production of a commercially viable crop. They will continue to invest in production as long as consumer demand for tobacco products exists at current or even higher levels, and as long as they can be assured that their crops will sell quickly and profitably. As prudent businessmen, they will also invest in new opportunities as they arise.

Environmental Impacts of Production

Tobacco is mostly known for its damaging social and health impacts. It is one of the largest causes of premature death worldwide and is the most common preventable cause of death in the world. Tobacco kills nearly 10,000 people every day worldwide. In twenty years that figure is expected to climb to some 30,000 deaths per day, or 10 million per year (Tobacco Free Kids 2001).

Tobacco is a known or a probable cause of some twenty-five diseases. These include lung cancer, heart disease, stroke, emphysema, and cancer in other parts of the body. In addition, second-hand smoke, or environmental tobacco smoke, poses a severe health risk to those exposed to it. For this reason, such people are known as “passive smokers.” Second-hand smoke has been found to carry nitrosamines (potent cancer-causing agents) and glycoproteins (proteins that cause allergic reactions). Studies have shown that nonsmokers exposed to second-hand smoke can suffer significant damage to the functioning of their small airways. The International Agency for Research on Cancer of the World Health Organization has concluded that second-hand smoke causes cancer (BBC News 2002).

Smokers and those exposed to tobacco smoke are not the only people at risk. In addition to the health impacts associated with using tobacco products, agricultural workers (especially children) who weed and tend tobacco plantings or pick tobacco have been reported to experience “green tobacco sickness” (GTS). This is a type of nicotine poisoning caused by the absorption of nicotine through the skin. Absorption can be accentuated when those who work with tobacco do not wear gloves or protective clothing, as is common in most developing countries. Green tobacco sickness is considered a serious occupational hazard. It is characterized by symptoms that include nausea, vomiting, weakness, headache, dizziness, abdominal cramps, and difficulty in breathing, as well as fluctuations in blood pressure and heart rates. Research in North Carolina (the largest tobacco-producing state in the United States) suggests that 41 percent of all tobacco workers experience GTS at least one time during the tobacco harvest (Quandt et al. 2000).

The presence of large-scale tobacco production is often followed by tobacco processing plants in the same regions (Tobacco Free Kids 2001). In some areas, this has resulted in the use of child labor (for example, to roll cigars) as well as the introduction of smoking-related problems into the same areas. This particular problem has no easy fix, though it must be remedied to make tobacco an economically sustainable crop for the small farmer in developing countries. It must be addressed on a political level.

Because tobacco is implicated in such a large number of deaths annually, there has been relatively little research undertaken to promote the sustainability of a crop that ultimately kills its consumers. Tobacco as a crop, however, is responsible for damage to ancient forests, and it causes soil depletion through soil erosion and nutrient loss. Pollution also occurs from the extensive use of pesticides and fertilizers. These environmental impacts are discussed below.

Deforestation

A tremendous amount of wood is used to dry or cure tobacco. In southern Africa alone an estimated 200,000 hectares of woodlands are cut annually to support tobacco farming. This accounts for 12 percent of deforestation in the region. Most of the wood is used as fuel (69 percent), but wood is also used as poles for building curing barns and racks (15 percent) for hanging the leaves while they dry. The two most common methods of processing—fire-curing and flue-curing—both require fire or heat, though substitute fuels such as charcoal, coal, or oil can be used. One researcher estimates that 19.9 cubic meters of wood are used to cure every metric ton of tobacco in those areas where the energy comes from wood (Geist 1998). In addition, burning fuel to cure tobacco releases CO₂, which contributes to global warming.

In the United States, China, and Europe, petroleum, coal or natural gas are now common alternatives to wood. However, in most developing countries where increasing amounts of tobacco are harvested, producers still rely on the use of readily available and unregulated wood supplies from forests. Brazil, India, the Philippines and most of Africa use wood for curing tobacco. A wood shortage is looming in Malawi and Western Tanzania as a result of deforestation in the main tobacco-growing regions. Tobacco alone is estimated to account for five percent of Africa's total deforestation, and twenty percent of deforestation in Malawi (Geist 1999). The amount of deforestation attributed to the production and curing of tobacco is shown for several countries in Table 15.2.

Table 15.2 Percentage of Total Annual Deforestation Related to the Production and Curing of Tobacco in Selected Countries, 1990–1995 of Tobacco

Country	Deforestation (%)
South Korea	45.0
Uruguay	40.6
Bangladesh	30.6
Malawi	26.1
Jordan	25.2
Pakistan	19.0
Syria	18.2
China	17.8
Zimbabwe	15.9

Source: Geist 1999.

Additional pressure on forests comes from the use of paper associated with wrapping, packaging, and advertising cigarettes. Modern cigarette manufacturing machines, for example, use more than 6 kilometers of cigarette-width paper per hour to manufacture cigarettes (Tobacco Free Kids 2001). The packaging of cigarettes and other tobacco products may require two to three times as much paper by weight as tobacco. It requires roughly 4 to 5 metric tons of wood from a forest to make 1 metric ton of paper, so every metric ton of tobacco product sold would require some 8 to 15 metric tons of wood for

packaging material. Yet, according to the industry, wrapping and packaging account for only 16 percent of its overall use of forest products (Tobacco Free Kids 2002). If this estimate is correct, the industry uses 50 to 94 metric tons of wood per metric ton of tobacco, for a total of 340 million to 639 million metric tons of wood per year. Given the millions of copies of newspapers, periodicals, etc. sold every week throughout the world, it is quite likely that advertising is the largest single paper use of the tobacco industry.

Cigarettes that have not been extinguished properly also contribute to deforestation, posing a serious fire hazard. It is estimated that one-quarter to one-third of forest fires around the world are caused by careless smokers. If that estimate is accurate, then the amount of wood in forests that is burned by smokers could surpass the sums used by the entire tobacco industry. Apart from the human and property costs, such fires have huge impacts on forests, biodiversity, and watersheds.

When all these different impacts are totaled, it is clear that the tobacco industry is a major contributor to deforestation, which has serious ecological consequences including the loss of ecosystem functions and biodiversity as well as soil erosion and degradation.

Pollution from Pesticides and Herbicides

Tobacco is a delicate plant that is prone to many diseases and pests. Some management guides call for as many as sixteen applications of pesticides during the three-month growing period before the plants even leave the greenhouse (Goodland et al. 1984). The list of chemicals that are recommended includes some with toxicity levels that are quite high. In developing countries, chemicals that are commonly used include aldicarb (Temik), aldrin, butralin, endosulfan, chlorpyrifos, 1,3-dichloropropene (Telone), dieldrin, and DDT (Tobacco Free Kids 2001). A common soil fumigant that is used in tobacco production in developing countries is methyl bromide. It is also used to sterilize greenhouses (Watts 1998). This substance is a significant contributor to ozone depletion.

High doses of herbicides and pesticides can be dangerous to workers and to the environment. These chemicals can cause damage to eyes, skin, and internal organs, and are potentially carcinogenic and mutagenic. Exposure to these chemicals poses a considerably higher risk to children than adults, since exposure in the early years can lead to a greater risk of cancer as well as damage to the development of children's nervous and immune systems. This is particularly worrisome since more and more children are working in tobacco fields as production shifts into developing countries. The tobacco companies and leaf buyers often work with local schools to insure that school schedules allow children to work in the fields (Tobacco Free Kids 2001). Runoff and leaching of these chemicals pollute waterways, affecting people who use those as a water source and harming freshwater biodiversity as well. Aquifers can also become contaminated, which in turn contaminates any wells that tap into these aquifers.

Tobacco fields can provide both food and cover for wildlife. However, that puts the wildlife at risk from pesticides. Insecticides are usually highly toxic to wildlife, while most fungicides and herbicides are only slightly toxic. Birds made sick by insecticides may neglect their young, abandon their nests, and become more susceptible to predators

and disease. Many pesticides and herbicides that are not highly toxic can still be harmful to wildlife by reducing the food and cover that they need to survive or by contaminating water supplies. Runoff can decrease the aquatic foods necessary to the survival of aquatic animals (Barry 1991).

Soil Degradation

Tobacco is a demanding crop that depletes soil nutrients faster than many other crops. This is particularly problematic where soils are already characterized by low nutrient content. When tobacco is cultivated on the same land repeatedly with minimal rotation with other crops, there is a tendency for the soil to become exhausted and for crop pests to become endemic. This is why continuous tobacco cultivation requires ever-increasing inputs of pesticides and chemical fertilizers.

Solid Waste

Perhaps the least obvious way in which smoking impacts the environment is through tobacco-related waste and litter. In the United States, the tobacco industry ranks 18th among all industries in the production of chemical waste. Globally, the tobacco industry produced an estimated 2.26 million metric tons of manufacturing waste and 210 billion metric tons of chemical waste in 1995. Nicotine is an example of the industry's toxic waste. Globally, the industry produces about 300,000 metric tons of nicotine waste per year (Novotny and Zhao 1999).

Litter is another problem. In the 1999 Clean Up Australia activities, the most common type of rubbish collected was cigarette butts, especially filters. Tobacco waste accounted for 9 percent of the ten most common items found (Tobacco Free Kids 2001). In the United Kingdom cigarette butts account for some 40 percent of street litter. UK smokers alone throw away 200 million butts and 20 million cigarette packages every day (Tidy Britain Group 1995). The International Coastal Cleanup Project reported that cigarette butts were twenty percent of all litter items found (Novotny and Zhao 1999). The filters are not readily biodegradable and can take from 18 months to five years to break down. As the tobacco in the butts degrades it releases toxins into the soil. With tens of trillions of cigarettes sold and with considerable tobacco remaining in each when it is discarded, this is a significant source of toxic waste. Cigarette wrapping and packaging also contribute to litter. Even when disposed of properly, a huge amount of cigarette wrapping and packaging enters the waste stream and must be disposed of each year.

Better Management Strategies

Of all the commodities in this book, tobacco is unique in that it is totally unnecessary to human sustenance, clothing, or intellectual development. Given the overall health, environmental, and economic impacts of the product, any attempts to reduce its environmental impacts should be seen as short-term activities with an overall goal of eliminating production, at least for human consumption, altogether. Even so, studies suggest that the number of smokers globally will increase for at least the next generation.

Any shift away from tobacco production must be made with some care. For many farmers—especially small farmers—there are a number of real economic incentives to produce tobacco. While such farmers may eventually stop producing tobacco altogether at some point in the future, in the meantime they need to understand how to produce it with fewer impacts, if for no other reason than to leave as many agricultural production options open for themselves and their children as possible.

At this time, most tobacco is grown by small farmers in developing countries. Most of them grow tobacco as their single, or most important, cash crop. The incentives available from governments and multinationals allow them to make more money growing it than other crops. In developed countries, subsidies and market protection also make tobacco production attractive to producers. These programs will need to be shifted as well.

There are a number of ways to reduce tobacco use and its environmental impacts as well as the environmental problems caused by tobacco production, processing, and marketing. The following approaches can help to accomplish a number of these goals. The first step is to improve monitoring and evaluation of environmental issues associated with tobacco production. Economic alternatives to tobacco production need to be identified and promoted. For example, the existing tobacco contract farming schemes should be used for the production of other products. Tree-planting programs need to be developed and implemented to offset the problems of deforestation associated with the use of wood by the tobacco industry. Health education programs as well as antismoking programs should be promoted globally, especially in areas of production. These should include information about the hazards of second-hand or environmental tobacco smoke, as well as strategies to protect people from exposure to tobacco smoke. Fiscal policies to discourage the use of tobacco, such as taxes that increase faster than the growth in income, should be developed and promoted. These will include eliminating incentives that maintain or promote tobacco use. They should also include elimination of tobacco advertising, promotion, and sponsorship.

Implement Soil Conservation Strategies

In the meantime, however, there are ways to produce tobacco that have fewer environmental impacts. In the United States, for example, no-till production is a workable option for farmers trying to save topsoil and soil moisture and to make tobacco production more sustainable. To replace tillage, herbicides are required to kill the existing vegetation before planting. Periodic pesticide use is also required to minimize pest outbreaks. However, because this technique maintains ground cover at all times, it minimizes pesticide runoff as well as soil erosion. In addition it maintains higher levels of soil organic matter, which significantly improves soil water retention. A disadvantage of the use of the no-till technique is the need for specialized equipment for irrigation and to maintain weed control.

Use Integrated Pest Management (IPM) and other Conservation Strategies

A comprehensive guide to better management practices for flue-cured tobacco can be found through the North Carolina Center for IPM at North Carolina State University. The

center has produced general works on pest management as well as more specific works on insect pest management and even specific manuals on the control of tobacco budworms and stink bugs.

Studies have also shown that many pest problems can be controlled, though not eliminated, by using resistant tobacco varieties. Although no varieties are resistant to all pests and diseases, a farmer can choose a plant with resistance to major local diseases and pests. This will reduce considerably the use of pesticides.

In general, it makes both financial and ecological sense to reduce the use of expensive inputs. The risk of pesticide toxicity to wildlife, for example, can be reduced considerably by judicious use of pesticides and other agro-chemicals, which is a cornerstone of integrated pest management (IPM) practices.

Improve Efficiency of Curing Process

Recent surveys of 23 tobacco-growing countries, including Brazil, found that an average of 5.5 kilograms of wood was used to cure 1 kilogram of green tobacco where flue curing is practiced. The average fuelwood use has fallen steadily over the past decades due to the introduction of more efficient furnaces and improved barn and drying shed designs (ITGA 1997).

Innovations in the United States have also focused on curing and include the use of insulation and circulating fans to increase the heating efficiency of drying barns. Also new regulations have led to the development of drying systems that control the amounts of tobacco specific nitrosamines (or TSNAs). These compounds are a by-product of the drying process and a chemical reaction between nitrogen compounds in combustion and nicotine in the tobacco leaves. The presence of TSNAs is thought to be responsible for many of the damaging effects of tobacco on human health. With the retrofitting of drying barns with heat converters or exchangers it is possible to eliminate most detectable TSNAs (PBS 2001).

Outlook

The most important questions that will affect tobacco production and consumption in the future revolve around liability issues and, related to that, government regulation and taxation of the industry. So long as tobacco can be produced and sold legally, there will be people who will buy it. However, if governments develop regulations regarding advertising, the number of new smokers recruited each year may decline dramatically.

Liability issues will continue to grow in developed countries, with the United States taking the lead but soon followed by the European Union when the health care and associated costs of the industry to society are fully recognized and accounted for. In response to these pressures, tobacco companies are likely to sell off assets. Philip Morris sold Miller Brewing company and 16 percent of Kraft Foods in a move which analysts think will eventually result in the sale of both companies. RJR has been more aggressive

about the sale of its assets. It has sold all of its international business interests as well as its interest in Nabisco and all its holdings (Tobacco.com 2003). While such sales might give the appearance of generating funds to cover liabilities, they allow companies to split off their more promising income-generating centers. In this way, investors could be sheltered from increasing liabilities in developed countries such as the United States while tobacco companies in the United States are allowed to go bankrupt. Some of the money generated by sales has been used to buy back stocks from shareholders.

While the future is uncertain for tobacco, it is not likely that the industry will disappear soon. Projections show the number of smokers, as well as total consumption, to be on the rise. Tobacco companies are looking to China and developing country markets to increase their overall sales and profits. It is not clear that the governments in those countries realize, or at the very least are prepared to address, the long-term social and economic costs of increased domestic tobacco consumption.

Resources

Web Resources

www.tobacco.org
www.tobaccoleaf.org/
www.the-tma.org.uk
www.tobaccoreporter.com/
www.indiantobacco.com/aboutus.htm
www.bat.com/
www.cdc.gov/tobacco/
Anti-smoking organizations:
www.tobaccofreekids.org
www.nietrokers.nl
www.ash.org

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