Section 5
Policy and Other Influences on the Supply of Tobacco Products

Chapter 10
Tobacco Growing and Tobacco Product Manufacturing

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Tobacco-growing practices and policies influence the supply of tobacco and can have important implications for tobacco use and tobacco control. In many countries, tobacco is a part of the farm and/or manufacturing sector. This chapter examines current issues related to tobacco growing and manufacturing, including the following topics:

- Economic and policy aspects of tobacco growing
- Crop substitution and diversification programs, particularly in low- and middle-income countries
- Tobacco product manufacturing
- The potential for tobacco product regulation to reduce tobacco use.

Policies encouraging crop diversification or substitution may be useful as part of a comprehensive strategy to reduce tobacco use. Research has demonstrated that alternative crops can be at least as profitable as tobacco, but many of these alternatives require investments in infrastructure, and tend to be highly specific to a country or region. The design and manufacturing of tobacco products have changed substantially over time, both as a result of efforts to allay consumers' concerns about health harms, and to reduce costs to manufacturers. However, these changes generally occurred in the absence of regulation and were sometimes harmful to public health. An important goal of tobacco product regulation is to ensure that future changes to tobacco products benefit public health. The evidence base for regulating tobacco products in the context of a rapidly evolving marketplace continues to grow, and tobacco product regulation is now recognized as an important component of a comprehensive approach to tobacco control.

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Introduction

Practices and policies affecting the production of raw tobacco and the manufacture of cigarettes and other tobacco products can have an important effect on the characteristics and patterns of tobacco product use. Trends in the economics and market structure of tobacco growing and tobacco product manufacturing can also impact tobacco control efforts. However, tobacco control policies targeting the supply side of the market are less widely used than those targeting the demand side. Thus, less is known about the impact of these policies on tobacco use. In addition, the increasing role of low- and middle-income countries (LMICs) in global tobacco growing and tobacco product manufacturing has raised new challenges for tobacco control policy.

One of the main obstacles to the adoption of measures to reduce tobacco use has been government concern that these measures could cause agricultural and manufacturing job losses as well as decreased tax revenues and export earnings. These concerns have been fueled by claims from tobacco industry–affiliated organizations such as the International Tobacco Growers' Association that tobacco control policies threaten the livelihoods of tobacco farmers, that tobacco-farming practices are sustainable and not harmful to the environment, and that tobacco is the only cash crop able to provide sufficient income, especially to small-scale farmers in key regions.[1–6] In contrast, a growing body of scientific evidence shows that concerns about the detrimental macroeconomic effects of tobacco control policies on tobacco-producing countries are largely unfounded when data and evidence on the actual economics of tobacco and tobacco control are examined (chapter 15).

The first part of this two-part chapter discusses the role of tobacco farming, and the second part covers the related subject of tobacco product regulation. The tobacco farming portion of this chapter addresses the main arguments and the most commonly held concerns about the impact of tobacco control measures on tobacco-growing activities and farmers' livelihoods. Drawing on the practical lessons emerging from selected country case studies, this section offers guidance for evaluating current opportunities to assist tobacco farmers in LMICs in shifting to other crops through crop diversification and crop substitution programs. The related subjects of exporting and importing both leaf tobacco and manufactured tobacco are discussed in detail in chapter 13, and tobacco-related employment in chapter 15.

The second part of this chapter describes tobacco product regulation. An example of these regulatory policies is a ban on one or more tobacco products; several countries have banned sales of some types of smokeless tobacco products, and one country (Bhutan) has banned the sale of all tobacco products.[7] Most existing tobacco product regulation has focused on policies that change the design of tobacco products in an effort to limit toxicity or other harmful aspects of the products. Countries around the world are in the very early stages of product regulation.

The section on tobacco product regulation briefly describes the variety of conventional and emerging tobacco products and their key design features and discusses the evolution of these products and their economic implications. Several approaches to tobacco product regulation are described, along with the limited evidence on the impact of these approaches. Some dimensions of policies targeting tobacco product manufacturing and distribution are covered elsewhere in this monograph, including tobacco product marketing (chapter 7), cigarette packaging/labeling (chapter 8), and youth access to tobacco products (chapter 11).

The Global Context of Tobacco Growing

Tobacco farming takes place on approximately 4.2 million hectares (10.5 million acres) of land in 124 countries around the world, with LMICs accounting for about 92% of world production.[8] More than 80% of the world's tobacco is produced in only 10 countries (Table 10.1), with upper middle- and lower middle-income countries responsible for most production, whether measured by volume or share of area. The People's Republic of China, India, and Brazil account for almost two-thirds of total tobacco production. China is the world's largest producer, growing more than 40% of the world's tobacco. The United States was the second-largest producer until 1998, but its share has dropped from 10.2% in 1998 to 4.7% in 2013. Brazil became the world's second-largest producer in 2000.[8] India is the third-largest producer, with an 11.2% share of world production. The other top producing countries each contribute between 1.2% and 3.5% of world production. The European Union (EU), if treated as a single entity, would be the sixth-largest tobacco producer.[8] Of the World Health Organization (WHO) Regions, the Western Pacific Region has the largest share (45.4%) of the total world volume of tobacco production, largely accounted for by China (Table 10.2). (Note that data about the quantities of tobacco leaf are expressed in tonnes, a unit of mass equal to 1,000 kg or 2,204.6 pounds.)

Table 10.1 World's Top Tobacco-Growing Countries, 2013

Country	Production 2013 (tonnes)	Share of total world volume (%)	Area harvested (hectares)	Share of total world area (%)
China	3,148,547	42.4	1,526,910	36.0
Brazil	850,673	11.4	405,253	9.6
India	830,000	11.2	490,000	11.6
United States	345,837	4.7	136,068	3.2
Indonesia	260,200	3.5	270,200	6.4
Zimbabwe	150,000	2.0	115,000	2.7
Malawi	132,849	1.8	120,172	2.8
Argentina	115,334	1.6	59,238	1.4
Pakistan	108,307	1.5	49,775	1.2
Turkey	90,000	1.2	136,233	3.2
Other tobacco-growing countries	1,401,488	18.9	928,394	21.9

Source: FAOSTAT 2013.[8]

Table 10.2 Tobacco Leaf Production, by WHO Region and Country Income Group, 2013

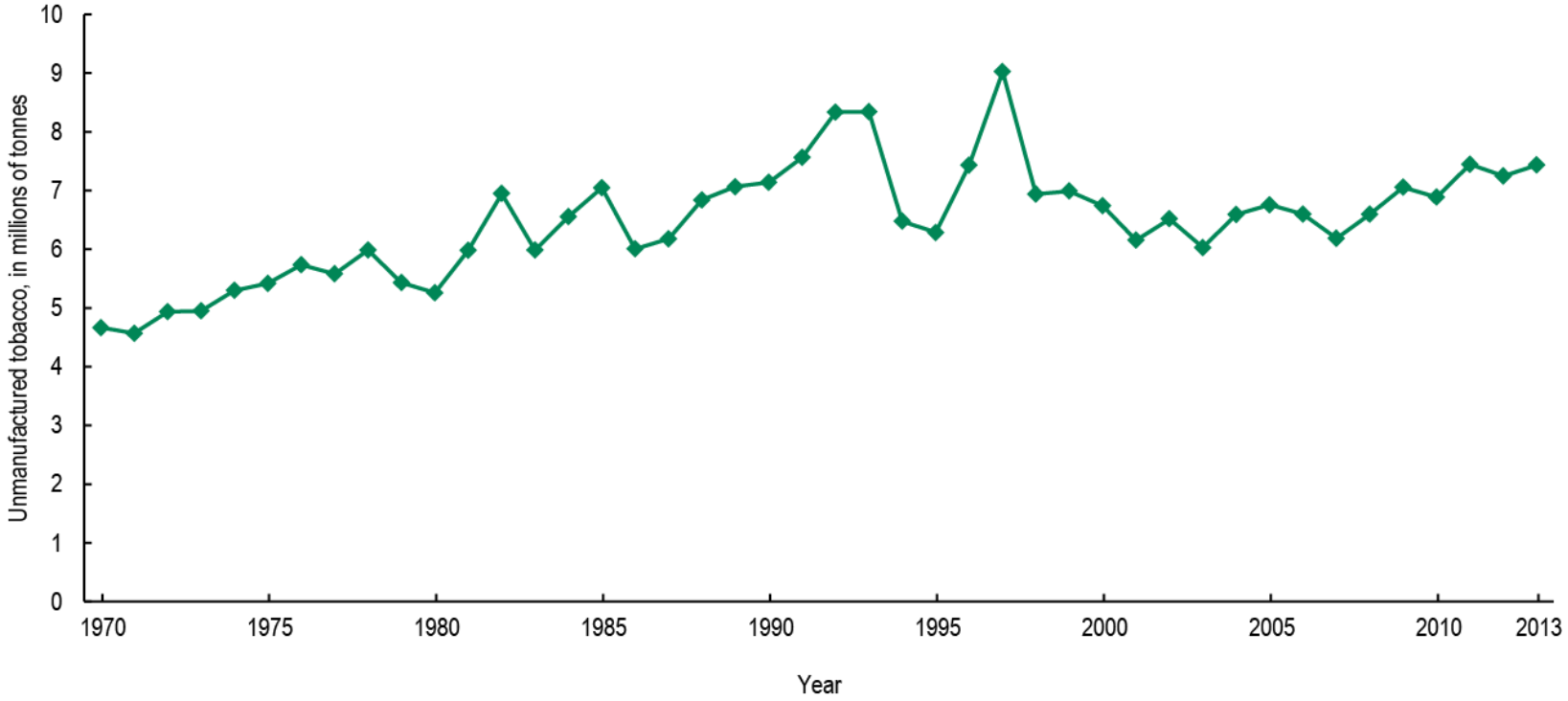
Region/country income group	Production 2013 (tonnes)	Share of total world volume (%)	2013 area harvested (hectares)	Share of total world area (%)
Western Pacific	3,372,466	45.4	1,635,336	38.6
Americas	1,502,865	20.2	689,639	16.3
South-East Asia	1,364,470	18.4	914,918	21.6
African	628,506	8.5	619,117	14.6
European	375,554	5.1	277,712	6.6
Eastern Mediterranean	189,373	2.5	100,521	2.4
High-income	617,678	8.3	249,959	5.9
Upper middle-income	4,542,903	61.1	2,310,342	54.5
Lower middle-income	1,560,776	21.0	1,044,121	24.6
Low-income	711,878	9.6	632,821	14.9

Notes: WHO = World Health Organization. Country income group classification based on World Bank Analytical Classifications for 2013.
Source: FAOSTAT 2013.[8]

The two major features of tobacco leaf production in recent decades are the halt in the upward trend in tobacco growing of the 1970s through the 1990s, and the shift of tobacco farming from high-income countries (HICs) to LMICs. Global production of tobacco leaf increased from 4.6 million tonnes in 1970 to a peak of over 9 million tonnes in 1996-1997[8] (Figure 10.1). After that, leaf production declined steadily until it reached 6 million tonnes in 2003, and then stabilized around 6.5 million tonnes between 2004 and 2008 before increasing slightly in more recent years. No single factor explains this pattern, and some variation over time may be expected based on a variety of factors, such as weather, tobacco product demand, manufacturing technology, and changes in production locations.

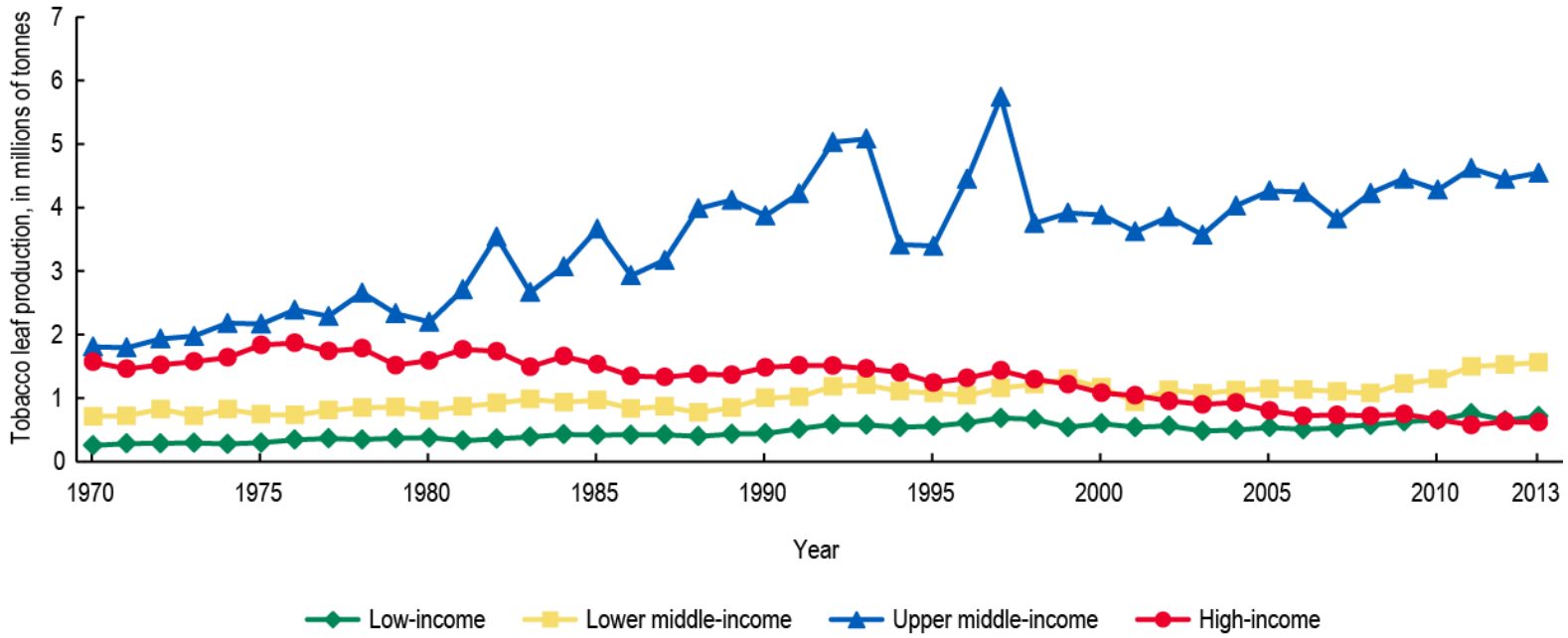
The growth in tobacco leaf production took place entirely in LMICs, with the largest growth seen in upper middle-income countries (Figure 10.2). From 1970 to 2013, tobacco leaf production in LMICs increased from 2.8 million tonnes to 6.8 million tonnes. In contrast, in HICs, production of tobacco leaf fell during the same period from about 1.5 million tonnes to 0.6 million tonnes.[8] Over the first decade of the 21st century, the greatest percentage increases in tobacco leaf production were seen in Mozambique, Zambia, Mali, Ghana, and Cambodia—all LMICs without a large pre-existing tobacco-growing sector.[8,9] As shown in Figure 10.3, overall growth in tobacco leaf production was greatest in the Western Pacific Region, primarily driven by China.[8]

Figure 10.1 Global Tobacco Leaf Production, 1970–2013



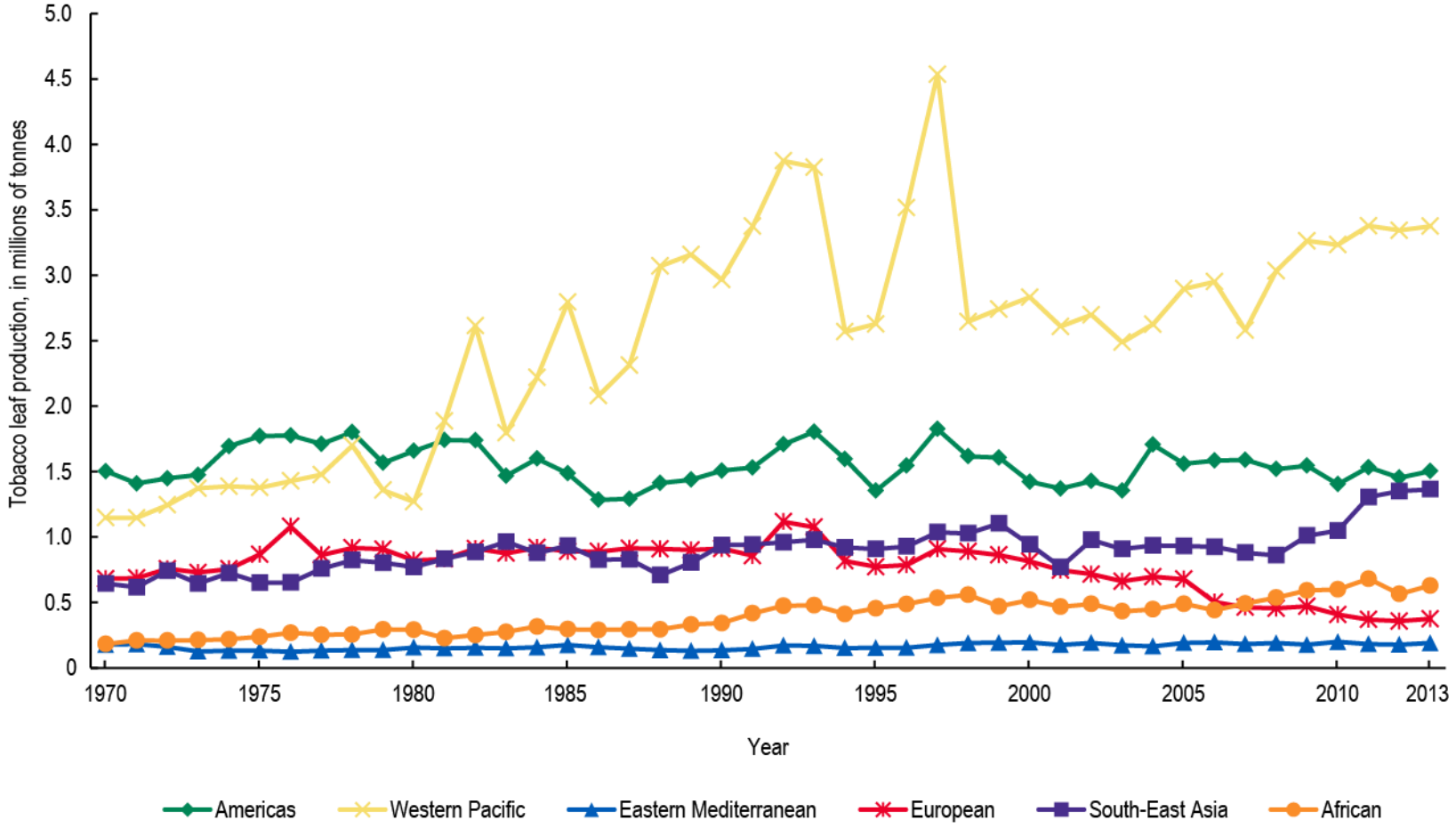
Source: FAOSTAT 1970–2013.[8]

Figure 10.2 Global Tobacco Leaf Production, by Country Income Group, 1970–2013



Note: Country income group classification based on World Bank Analytical Classifications for 2013.
Source: FAOSTAT 1970–2013.[8]

Figure 10.3 Global Tobacco Leaf Production, by WHO Region, 1970–2013



Source: FAOSTAT 1970–2013.[8]

Several factors help explain the increasing participation of LMICs in world tobacco production. First, production costs in LMICs are lower than in HICs, in part because of the generally less stringent regulatory environments in LMICs. Agricultural policies supporting tobacco production in many HICs have been weakened or ended, resulting in a considerable decline in the farm-level profitability of tobacco crops in these countries. For example, recent policies have resulted in a reduction in the number of tobacco farmers in the United States. Second, tobacco use in HICs has declined, while in LMICs demand for both cigarette manufacturing and exports has increased, catalyzing increased tobacco production. Third, since the late 1980s, as part of a broader trend toward globalization, multinational tobacco companies (MTCs) have established a growing presence in LMICs, and have encouraged the expansion of tobacco growing in order to supply new processing plants.[10] Fourth, in many LMICs tobacco may be perceived as a relatively profitable cash crop, particularly when compared with traditional food crops.[11] For example, tobacco growing may be perceived as associated with indirect benefits, including loans, technical support, or other forms of support from governments or the tobacco industry, along with well-developed marketing systems, which help make tobacco an attractive crop for small farmers in LMICs, and hamper efforts to encourage farmers to switch from tobacco to alternative crops.[12,13]

Tobacco Farming

Tobacco is a labor-intensive crop that provides work and income to millions of people in the major tobacco-producing countries. However, estimating the number of people working in tobacco growing and the extent of their dependence on this employment is challenging, and data to support such estimates are limited. The differing interests and goals of the organizations estimating employment figures may influence how they select and interpret data. Tobacco industry–sponsored analyses, for example, may tend to overestimate the number of tobacco-related jobs—for example, by not distinguishing between part-time, seasonal workers, and full-time workers.[14] Tobacco-related employment is further addressed in chapter 15.

Most tobacco-growing operations are small family farms, averaging less than 1 hectare in many LMICs, where family members are an integral part of the labor force.[12] Although tobacco farmers often grow other crops either for their own consumption or for sale, the livelihood of many tobacco farmers depends on tobacco crops. In Malawi, tobacco is the main source of cash income for many rural households; in the major tobacco-producing regions, previous estimates have shown that sales of tobacco provided the bulk of rural household cash income, ranging from 65% in Lilongwe to 89% in Kasungu and 95% in Dowa. In these regions, cash income from other crops was minimal.[15] Prior to 2000, Zimbabwe's tobacco production was dominated by large-scale (greater than 1,000 hectares) commercial farms[16]; since the land reform program was undertaken in 2000, this is no longer the case[17] (see also chapter 13).

Tobacco farming is associated with detrimental effects on the environment and on the health of farm workers. Substantial evidence points to the harmful effects of tobacco farming as practiced, including a range of occupational health risks resulting from green tobacco sickness and exposure to pesticides[18–21] as well as the use of child labor associated with the intensive family involvement in tobacco growing.[22] Tobacco farming also entails farmer indebtedness.[23] Environmental harms include soil depletion and deforestation.[24]

Farm Gate Prices

The price of tobacco leaf is a key factor in global trends driving tobacco farming and the leaf market. Producer prices—also called farm gate prices, or the price, in local currency, at which the farmer sells tobacco leaf—are determined by two major factors: international market conditions and regional and local market-related systems such as the power relationship between growers and leaf traders. Differences in farm systems and governmental price support policies, and power asymmetries between farmers and the tobacco industry all powerfully influence farm gate prices.[12] In addition, farm gate prices vary significantly over time and between countries, making country-to-country comparisons a difficult task.

Prices paid to tobacco producers in the top five major producing countries decreased between the beginning of the 1990s and the beginning of the 2000s, with the notable exceptions of China and India. Since 2002, however, farm gate prices have been rising in the top producing countries except the United States. The average price paid to growers in the United States, however, has been significantly higher than prices paid to producers in Brazil, India, and China. In India, for example, tobacco growers received 6.4 times less income per tonne than those in the United States, on average, between 1991 and 2006.[8] Despite the difficulty of comparing such data for different countries, the prices received by tobacco growers in LMICs are generally much lower than those received by tobacco growers in HICs.[8]

The low prices received by tobacco growers in LMICs has been one of the major factors inducing MTCs to invest in these countries, which has boosted tobacco growing in countries like Brazil and Malawi.[25] In HICs where the average payment to growers is higher, including Italy and the United States, production has declined.[8] Cured tobacco leaf can be stored over time under appropriate conditions,[26] allowing multinational tobacco product manufacturers to choose where and when to purchase tobacco leaf to obtain a desired price and quality. This flexibility drives the market to seek out lower tobacco leaf prices.

The Global Tobacco Leaf Marketing Chain

There are important differences in how tobacco-farming activities and the sale of tobacco leaf are organized around the world. In most LMICs, tobacco is grown on small family farms that are linked to tobacco companies through contracts.[24] In other countries, including the United States, tobacco is grown on large commercial farms and sold at auctions. The nature of the linkages between growers and tobacco companies and the characteristics of tobacco-farming systems across countries have important implications for the role of government policies in protecting farmers' livelihoods and supporting a transition to alternative crops and livelihoods.

Box 10.1: Integrated Production Systems: A Framework for Controlling Farmers

In countries where tobacco is sold through private contracts rather than at auction, small farmers usually participate in an integrated production system, which involves contractual obligations between the small farmers and tobacco-processing or retailing firms. In agreeing to these contracts, small farmers commit to provide all the tobacco leaf they produce to the contracting firm and to follow the technical guidance and price classification scheme set by the firm.[29]

Under such agreements, the firm is responsible for providing the farmers with seeds, selling them the main agricultural inputs like fertilizers and authorized pesticides and insecticides, giving technical advice through the firm's supervisory and instructional teams, controlling loans and mediating between tobacco growers and approved banks, providing transport from the fields to the tobacco warehouses and processing plants, and buying the entire crop from the farmers. The contracting farmers are then bound to volume, quality, and production costs defined by the firm.

Through establishing these agreements, and in order to reach the competitive standards required by the international markets, the tobacco firms control both the tobacco varieties produced at the local level and the quality and costs of production. The tobacco companies also determine which technologies the tobacco growers will adopt, and the companies are assured of exclusive rights in supplying them.

While farmers may receive seeds and materials, technical assistance, and a contracted price for their product, the arrangement restricts farmers' ability to grow other crops or sell their tobacco to other buyers, even if the farmer owns the land. The tobacco industry has defended integrated production systems by claiming they improve the quality of the product and provide better and more predictable incomes for farmers.[134,135] However, the integrated system offered to farmers by the tobacco companies has become a strong mechanism to increase farmers' dependence on tobacco, especially considering the lack of structured markets for alternative food crops. For example, studies in Bangladesh and Brazil found that tobacco companies aggressively promoted farming contracts, offering cash credit and fertilizer to farmers at the start of the season; if the tobacco harvest did not meet expectations, farmers were encouraged to take on additional debt with further cash advances, keeping them tied to ongoing tobacco production.[136,137]

Thus, the leading tobacco companies usually operate like a monopsony (a market where there is only one purchaser), promoting the same system of farming and paying the same prices for the crop. In the long run, this system gives leaf buyers and tobacco product manufacturers much greater control over the leaf market and, importantly, the ability to control prices.[138,139]

The tobacco industry's global expansion has dramatically increased the participation of LMICs in tobacco-growing activities. However, the geographical reach of these economic activities does not correspond to the distribution of the gains from participating in the global tobacco industry. Although tobacco growing and manufacturing are increasingly concentrated in LMICs and encompass thousands of small farmers, the higher value phases of the tobacco value chain—associated with research and development, marketing, or international trade—are increasingly concentrated in a few highly profitable tobacco companies largely based in HICs.[25] This gap between the global scale of tobacco companies and the local scale of farmers has resulted in an asymmetrical governance structure, in which the competition conditions faced by large corporations in the international market set the conditions for the roles carried out by farmers in LMICs.

Because many LMICs are involved in tobacco growing but the number of manufacturers is limited (five tobacco companies account for almost 90% of the cigarette market),[27] it is difficult for the tobacco-growing countries to compete in the global market unless they keep production costs low and quality high and have good trade networks. Most tobacco-exporting countries depend heavily on a small number of external customers associated with MTCs, including the two major leaf dealers and five major cigarette manufacturers.[25] For LMICs that are major tobacco growers, access to global tobacco production networks is increasingly based on both their lower costs of production and their functional integration with the leading MTCs. In this sense, these local producers remain tied to specific activities within particular links of the tobacco value chain—for example, tobacco growing—that are characterized by low barriers to entry and declining incomes.

For the leading MTCs, the ability to govern the global tobacco value chain rests on intangible competences like research and development, branding, and marketing that are characterized by high barriers to entry and high financial returns.[25] Thus, although global tobacco farming occupies an essential place in the tobacco value chain, the approximately 19.1 billion U.S. dollars (US$) accounted for by farming in 2013[8] represents only a small share of the global tobacco market. In comparison, the 2013 global tobacco product market was valued at US$ 783 billion.[28]

The large multinational leaf-buying companies and their subsidiaries are another important component in the global leaf market. The leaf market is dominated by two corporations—Universal Corporation and Alliance One.[25] The leaf-trading companies select tobacco to purchase and then process, store, and ship tobacco leaf to buyers (tobacco product manufacturers) around the world. While large cigarette manufacturers may purchase tobacco directly from farmers, they also rely heavily on the leaf-trading companies to obtain raw tobacco.[25] In some countries leaf buyers are making increased use of contract farming (or integrated production systems; see Box 10.1), allowing them to gain more control over labor arrangements, yields, prices, and quality. For example, in Malawi in the 2012-2013 growing season, contract farming accounted for 80% of the total volume of trade in tobacco leaf.[29] Another study found that the global leaf companies have significant political influence on Malawi's economic and trade policies through roles on government advisory groups and committees.[30]

Tobacco farmers in LMICs are highly dependent on a production and purchasing system that is dominated by a few large MTCs. The farmers have too little influence to demand changes in the system, including higher leaf prices or new contract terms. Table 10.3 summarizes the links in the global tobacco value chain, the roles of the participants in this chain—tobacco growers, major leaf dealers, and cigarette companies—and the dynamics of income distribution within each link.

In summary, global expansion of the tobacco industry during the past few decades has led to sharp increases in tobacco leaf production and increased participation of LMICs in tobacco farming. Although tobacco-growing activities are increasingly concentrated in LMICs and encompass thousands of small farmers, there has been little correspondence between the geographical reach of these economic activities and the distribution of economic gains resulting from participating in the global tobacco industry.

Table 10.3 The Global Tobacco Value Chain: Major Participants and Trends

Links/activities in the chain	Main participants	Major trends
Tobacco growing	Millions of tobacco farmers, particularly in LMICs	▪ Intense competition based on lower production costs and compliance with quality standards ▪ Higher volumes associated with declining revenues
Tobacco leaf processing and exporting	Major leaf dealers: ▪ Universal Corporation ▪ Alliance One	▪ Increasing consolidation (mergers and acquisitions) and overseas expansion ▪ High revenues associated with economies of scale on processing and trading, and higher productivity levels
Cigarette manufacturing and retailing	Largest MTCs: ▪ Phillip Morris ▪ British American Tobacco ▪ Japan Tobacco International ▪ Imperial Brands	▪ Increasing consolidation (mergers and acquisitions) and overseas expansion ▪ High revenues associated with intangibles (research and development, brand names, and marketing)

Notes: LMICs = low- and middle-income countries. MTCs = multinational tobacco companies.
Source: Vargas 2004.[140] Reprinted with permission.

Price Supports and Other Support/Subsidy Programs

Many tobacco-growing countries provide some form of support or subsidies for tobacco growers, along with other agricultural subsidies. Governments use these subsidies to manage the supply and price of agricultural commodities and to support agricultural activity. The extent of government intervention in tobacco production varies considerably across countries. In some countries, government exerts a pervasive influence by means of subsidy concessions, trade barriers, legal restrictions, and export taxes. In other countries, the impact of governmental intervention on tobacco growing and trade is minimal. Given the diversity and complexity of the mechanisms of support employed by different countries, assessing the actual impact of these subsidies on global production and trade of tobacco is extremely difficult.

In the past, governments in many HICs relied on the use of traditional tobacco price support programs, which were based on a combination of marketing quotas and loans. These programs were widely used to support tobacco farmers by keeping tobacco prices stable and higher than they would be otherwise. The U.S. program, created in the 1930s in the wake of the Great Depression, mainly supported income by stabilizing the price of tobacco received by farmers. Tobacco growers participating in the price support program were subject to marketing quotas, which acted as a supply control mechanism and indirectly increased market prices.[31] In the EU, the Common Market Organisation for raw tobacco consisted of a premium system, a system of production limitation (a national threshold and quota system) and production orientation, measures to convert production from tobacco to other crops through the Community Tobacco Fund, and trading arrangements.[32] However, as described below, in recent years, HICs have been gradually phasing out production support for tobacco growers.

United States

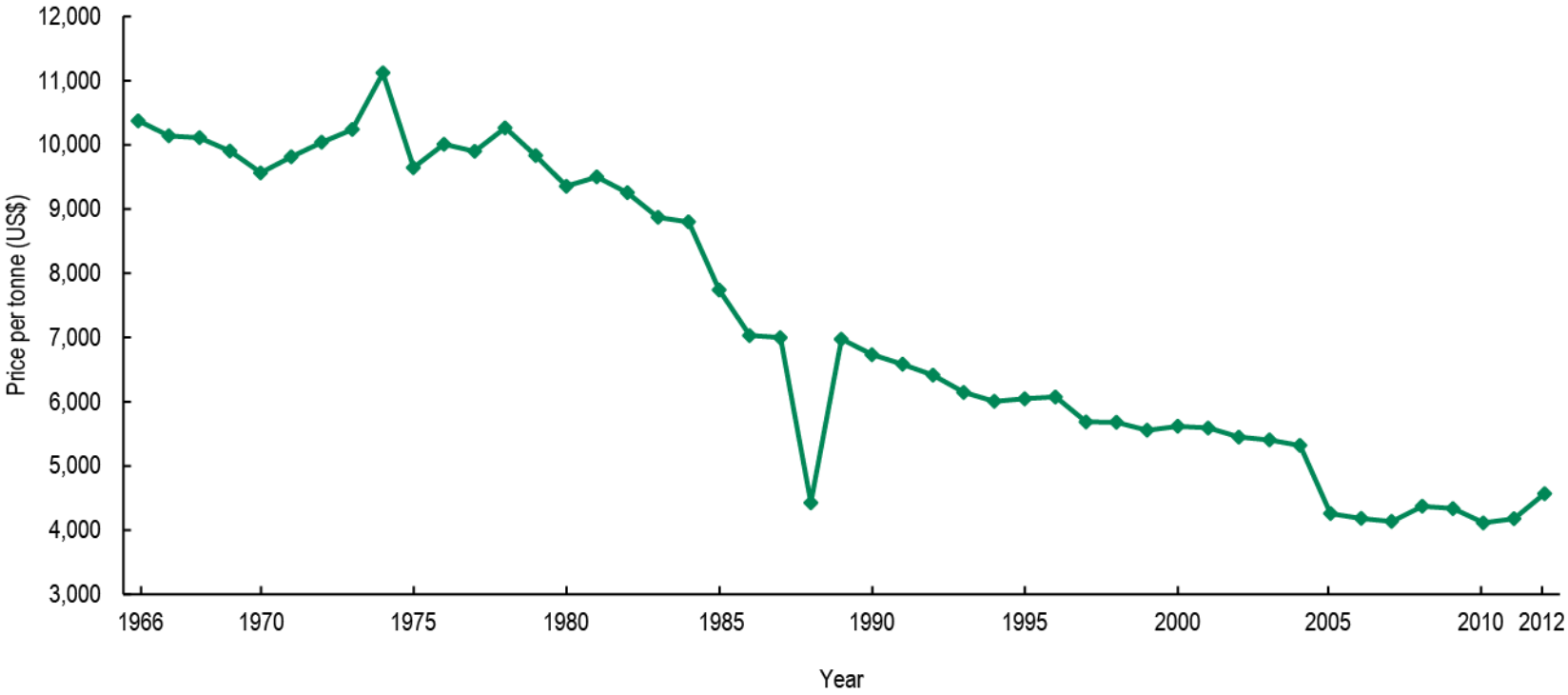
In the United States during the 1990s, in an atmosphere of increasing regulation and litigation directed at the tobacco industry, attention was focused on the decades-old system of federal support for tobacco growing. When the Food and Drug Administration (FDA), an agency of the U.S. Department of Health and Human Services, proposed new regulations on cigarettes in 1996, President Clinton highlighted the potential negative impact on tobacco farmers, and concerns about the fate of tobacco farmers influenced tobacco control policy discussions.[33] The Fair and Equitable Tobacco Reform Act of 2004 eliminated the tobacco marketing quota and price support programs and, through its Tobacco Transition Payment Program, commonly referred to as the "Tobacco Program Buy-out," provided about US$ 10 billion in payments to quota owners over the next 10 years, financed by an assessment on tobacco product manufacturers and importers.[34] The Buy-out was launched in part to benefit the economic interests of tobacco farmers, who faced declining demand for their crops in the face of shrinking global tobacco markets and relatively high prices.[35] When the quota system ended, no constraints remained on who could grow tobacco or how much they could grow. As a result, prices dropped substantially because they were determined solely by supply and demand, as shown in Figure 10.4. Although this price drop had a minimal impact on U.S. cigarette prices (approximately 0.5%), it ultimately led to the replacement of a large number of small family-held tobacco farms with a smaller number of large corporate farms.[36,37] Additionally, an offshoot of the 1998 Master Settlement Agreement (MSA) between the major cigarette manufacturers and state governments created the National Tobacco Growers' Settlement Trust Fund to offset the impact of the MSA's tobacco control measures on farmers; this trust fund provided payments of US$ 5.15 billion over 12 years to farmers/quota holders in 14 states.[38]

Payments from both the Buy-out and MSA funds ended in 2014. The U.S. Department of Agriculture (USDA) continues to administer subsidized crop insurance for tobacco (though this has come under challenge), but the agency has discontinued all extension program expenditures on education and management related to tobacco; the USDA was also prohibited from spending research funds on the production, processing, or marketing of tobacco, and from promoting the export of tobacco or tobacco products.[31] The Tobacco Buy-out was an important milestone leading to political support for broad tobacco control measures,[36] including eventually the 2009 Family Smoking Prevention and Tobacco Control Act (Tobacco Control Act). The Buy-out also led some farmers to leave tobacco production. However, the Buy-out required a large commitment of funds, through government-mandated fees on manufacturers and importers as well as the legal settlement with leading cigarette companies; the impact of the program's end in 2014 remains to be seen.

Europe

Although the EU produces a small portion of the world's tobacco (less than 3%), and imports twice as much raw tobacco as it grows, the EU has historically subsidized tobacco growing.[39] In 2013, 207,272 tonnes of tobacco leaves were produced in 14 EU Member States: Belgium, Bulgaria, Croatia, Cyprus, France, Germany, Greece, Hungary, Italy, Poland, Portugal, Romania, Slovakia, and Spain. The leading European producers were Italy, Bulgaria, Spain, Poland, Greece, and Croatia (listed in order from most to least production); together these countries accounted for 83% of EU production in 2013.[8]

Figure 10.4 Inflation-Adjusted Tobacco Leaf Prices in the United States, 1966–2012



Note: Tobacco leaf prices adjusted for inflation using 2012 U.S. dollars.
Sources: U.S. Department of Agriculture, Economic Research Service 1966–1990,[141] FAOSTAT 1991–2012,[8] and U.S. Department of Labor 2014.[142]

The market for raw tobacco in Europe was previously regulated under a Common Market Organisation created in 1992.[40] This system provided payments to farmers (a premium) per kilogram of tobacco, depending on the tobacco variety and other conditions, and established production limits through country-specific thresholds and production quotas. The regulation also established a Community Tobacco Fund which supported research and provided assistance related to crop substitution and alternative livelihoods.[32]

Over the years, concerns were raised about the EU system of support for tobacco growing, and the need for reform was increasingly recognized. A 1997 EU report acknowledged the apparent contradiction between EU policies to reduce tobacco consumption while at the same time supporting raw tobacco production. This report cautioned that abolishing support altogether would impact the livelihoods of an estimated 200,000 workers and threaten tobacco growers who depended on production premiums for most (over 80%) of their income.[41] It was also argued that the premium system failed to provide incentives for improving the quality of the tobacco grown, resulting in a surplus of poor quality tobacco, which was in turn exported at low prices to Eastern Europe and Africa.[42]

Starting in 2004, as part of broader reforms of the EU Common Agricultural Policy (CAP), the premium system was phased out over several years. Production quotas were abolished and financial aid was "decoupled" from production, which meant that aid was no longer tied to the amount of tobacco produced. Thus, farmers were freed to grow other crops in place of tobacco. The CAP also had the effect of removing from the market lower quality tobacco varieties which may have been grown primarily to benefit from the earlier production-based subsidy.[43] Since 2010, the EU has not granted any specific subsidies for raw tobacco production, but it continues to provide general agricultural aid through direct payments and rural development programs.[39] As a result, raw tobacco production has declined.[44]

Low- and Middle-Income Countries

Many LMICs continue to apply price support systems for tobacco growing. For example, starting in 1940, the Turkish government set a minimum purchase price for each grade of tobacco leaf purchased by Tekel, the government's tobacco-producing monopoly. Farmers were free to sell their tobacco leaf on the open market, but most contracted with Tekel to sell at the established price. In 2000, the government replaced its price support program with "direct income support" for farmers, providing a subsidy based on the size of the farm.[45]

In many LMICs, however, governments are less focused on guaranteeing minimum prices to tobacco farmers and more concerned with providing and improving infrastructure facilities that expand tobacco-farming activities (e.g., roads and irrigation, loans, and tax incentives). For example, in the Philippines, 15% of tobacco tax revenues for specific types of tobacco are returned to tobacco-growing provinces and are used to support a variety of activities, including efforts to improve tobacco farming and infrastructure development.[46] As another example, Argentina has provided subsidies and technical assistance to tobacco growers since 1972 through the "Fondo Especial del Tabaco" (FET, or Special Tobacco Fund), which is financed through a 7% tax on the sale of cigarette packs.[47–49] In addition, for several decades the World Bank provided loans to tobacco farmers as part of its economic development efforts in LMICs; in 1991, the World Bank changed its policy and no longer supports tobacco projects or provides aid for tobacco production.[50]

Crop Substitution and Diversification Programs

Crop substitution and tobacco farming diversification programs are unlikely, by themselves, to result in reductions in tobacco use, but there is consensus that efforts to help small farmers switch from tobacco to alternative crops can be a useful part of sustainable local economic development programs and can help overcome barriers to adopting and implementing strong tobacco control policies.[11,51]

Substantial barriers hamper the adoption of broader diversification programs and alternative livelihoods for small family farmers in tobacco-producing regions, particularly in LMICs. Three major challenges are:

- **Profitability:** In many LMICs, tobacco remains a highly attractive and profitable cash crop for small family farmers, particularly when compared with other cash crops and traditional food crops.
- **Economic dependence:** In some LMICs, local economies, regional governments, and individual farmers are highly dependent on income from tobacco-growing activities, a dependence that is also fostered by existing tobacco industry distribution and purchasing networks.
- **Support from governments and tobacco companies:** In some LMICs, local and central governments provide significant support and subsidies for tobacco growing and processing.

The net return on tobacco compared with alternative crops is a key issue for any crop substitution program aimed at supporting small family farmers to change from tobacco to other crops. Many tobacco-growing farms, even small family farms, are already quite diversified, and farmers may derive substantial earnings from relatively small areas devoted to tobacco cultivation because of its profitability.[6] Most other crops are for sustenance purposes, and farmers only sell occasional surpluses. Although the profitability of tobacco farming has fallen in recent years, tobacco remains a highly attractive crop to small family farmers, providing a higher net income yield per unit of land than conventional food crops like corn or black beans.

Transition to the existing alternative cash crops is impeded by lack of resources, an inability to create new market niches for most traditional food crops, and other constraints associated with transport and storage infrastructure. In countries with weak supply chains for agricultural commodities, farmers may have limited opportunities for pursuing alternative crops. The tobacco industry has invested in infrastructure for tobacco grower contracts and leaf purchasing, but similar systems may be lacking for other crops.

Some profitable alternative crops may require specialized expertise or infrastructure. For example, a 2001 analysis of Zimbabwe found that the most profitable crops are both skill-intensive and expensive to grow.[16] This is especially true with respect to roses and supermarket vegetables like baby corn, baby carrots, and mangetout peas, which can be very profitable but also require a high level of skill and expense to grow. In addition to field costs, value chain development for these enterprises requires large capital investments in processing and packing facilities, special irrigation equipment, and other infrastructure, including greenhouses and insulated trucks for roses and appropriate accreditation for vegetables. These products also must meet exacting growing standards and must be delivered in fresh condition according to tight schedules.

The following sections examine crop substitution and diversification opportunities and experiences in selected countries. Diversification opportunities vary greatly between countries and regions depending on factors like local growing conditions, market infrastructure, and availability of land per capita. The purpose of these case studies is not to provide comprehensive guidance for developing alternative crops, but to describe some practical issues and lessons from past experience that can help in evaluating current opportunities. A few well-documented case studies are presented here, followed by some general observations about the future of crop substitution and diversification and possible lessons for other countries in promoting crop substitutes and other economic alternatives to tobacco. However, as the following case studies demonstrate, experience with crop substitution and diversification can be highly dependent on context, and caution is warranted in generalizing the findings of these case studies to other countries.

Indonesia

This section draws heavily on Keyser and Juita's 2005[52] supply-side analysis from Central Java, which was summarized in a case study report by Keyser in 2007.[53] This work examined how financial costs and returns for tobacco compare with costs and returns for a range of crops that could either complement or substitute for tobacco.

While Indonesia's farm economy is diverse overall, tobacco is a dominant crop in some locations.[53] Approximately 270,300 hectares were planted in tobacco in 2012, a year in which tobacco contributed around US$ 159.6 million in gross export earnings to Indonesia.[8] In addition to Central Java, tobacco is also an important crop in East Java, Lombok, and North Sumatra.[53]

Two main types of tobacco are produced in Central Java: a sun-cured Virginia tobacco grown mostly in upland areas where the climate is mild, and a type of tobacco grown mainly in the hot, tropical lowlands. More than 98% of Virginia tobacco is used domestically to manufacture kretek cigarettes, for which tobacco is blended with cloves and other aromatic ingredients. Local consumers are the largest market for Indonesian kretek cigarettes. In contrast, 98% of lowland tobacco is exported; it is mainly sold on a pre-negotiated basis and used in the manufacture of cigars.[53]

Most farms in Central Java are extremely small (0.25 to 0.5 hectares).[53] Achieving the maximum income from such a small parcel is a challenge for farmers. Therefore, no matter how attractive the rates of return are from an alternative investment, a high-income crop is still needed as part of the rotation. Tobacco in Central Java is only one part of a complex rotation of different crops. A typical practice in upland areas growing Virginia tobacco is to follow tobacco almost immediately with corn, soybeans, or some other relay crop that grows well before the start of the heavy rains, followed by a second rotation of mixed intercrops like garlic, green beans, cabbage, or onions. Traditionally, in many densely populated areas tobacco has served as the essential high-income crop, and any successful diversification strategy will need to ensure at least as much income to farmers over the long run.[53]

Data from the 2005 Keyser and Juita study[52] suggest that alternative crops offer a potential for net profits and rates of return that are similar to or better than those for tobacco. Staples like rice, corn, and ground nuts are important for food security but provide only a third as much income as tobacco. Thus, higher value commodities would be needed to replace income from tobacco. The results for chilli, potatoes, and nilam are particularly encouraging. In terms of total costs, the data also show that tobacco

is relatively expensive to grow, both in terms of cash and labor. Compared with other enterprises, only chilli requires more cash before sale than Virginia-kretek tobacco.[52]

The fact that other crops can be more profitable than tobacco, however, does not mean that these alternatives are necessarily better choices. The data show that high-value alternatives are also expensive to grow and sometimes more costly to grow than tobacco.[52] Newer crops can also be difficult to market since the same type of trading networks do not exist. Total market demand for each alternative is also much smaller compared with tobacco, so that no one enterprise could be expected to substitute completely. For this reason, farmers may decide to scale back on tobacco over time as efforts to reduce smoking take effect.

From these data, the Keyser and Juita[52] report concluded that agricultural planners would do well to focus on developing the specialized support services and private trading networks smallholders need to succeed with new enterprises. Especially in the case of perennial crops with a long maturity period, any shift from tobacco can be difficult and risky in terms of high establishment costs and limited access to long-term credit. From the farmer's perspective, substitute crops may appear to have less certain cost structures and markets compared with tobacco. Considerable efforts are therefore required to develop new, economically competitive markets and support services.

Malawi

Malawi has one of the most heavily tobacco-dependent economies in the world and has relied on tobacco export earnings for most of the past century.[54] One report stated that tobacco crops account for about 60% of Malawi's total export earnings, 23% of its tax base, and 13% of gross domestic product.[13] Malawi has surpassed the United States as the world's largest exporter of burley tobacco,[55] and in 2013, the country was the sixth-largest tobacco leaf exporter.[8] This case study is based on a 2003 report by Jaffee[13] and also draws on Mataya and Tsonga,[56] the Food and Agriculture Organization of the United Nations,[15] and Keyser and Lungu.[53]

Because tobacco is so important to its economy, Malawi is regarded as one of the countries most vulnerable to the threat of shrinking tobacco markets. From 315,000 to 330,000 small farms grow tobacco on plots ranging in size from 0.1 to 0.3 hectares. Small-scale producers account for 70% of Malawi's total tobacco output, and one in five Malawian households derive a substantial share of their cash income directly from tobacco.[13]

Until the late 1970s, tobacco production in Malawi was restricted to an elite group of large-scale growers who owned or leased estate land. These farmers could sell their tobacco directly to international buyers at officially recognized auctions. Smallholder farmers, on the other hand, were only allowed to grow a limited number of tobacco varieties and were mostly required to sell to government agencies at prices below prevailing market levels. During the 1980s, the situation began to change when medium-scale entrepreneurs were allowed to lease land and establish "estates" (typically 10–20 hectares) on which to grow burley or flue-cured tobacco and to sell their tobacco directly through auction rather than a government agency. The situation eased further in 1993 with the introduction of tobacco sales quotas to groups of smallholder farmers who were organized into "clubs" and allowed to sell through a program of intermediate buyers who were meant to facilitate the logistics of bringing the smallholder crop into the auction.[13] Smallholder farmers responded quickly to these policy reforms: The number involved in tobacco cultivation increased from 200,000 in 1996 to more than 300,000 in the early 2000s.

Over 90% of tobacco grown in Malawi is burley, which is typically air cured and so does not require use of charcoal or other materials for curing.[53]

During the early 2000s, the profits of the burley estates smallholders seemed in jeopardy. Many estates simply ceased burley tobacco production because their labor force had abandoned them or their farm tenants and/or estate managers had sold their tobacco to intermediate buyers or others. Although no definitive data are available, Jaffee[13] estimates that 40–50% of estates that had been producing tobacco in the early 1990s gave up production or scaled back their operations. Marketing was also an important constraint in that smallholder growers still had only indirect access to auctions, which are much more profitable to farmers than going through an intermediate buyer.[53]

From a policy and business environment perspective, a number of other factors contributed to the diminishing profitability of tobacco,[13] including exchange rate movements; rising costs associated with transport, handling, and auctioning; and a variety of institutional fees charged by state and industry bodies.[13,57,58]

Studies have gone beyond simple financial calculations and looked at underlying economic efficiency. Malawi is very efficient in the production of many agricultural commodities, including paprika, tobacco, groundnuts, and soybeans, because the country is protected from competition from imports as a result of its landlocked geography and correspondingly high transportation costs. Producing crops to be sold domestically was found to be more efficient than producing crops for export. For example, Malawi has no comparative advantage in the production of maize for export, but can grow the crop efficiently as an import substitute. At the same time, most crops in the smallholder sector provide extremely poor financial profits. For example, only 8 of 20 different enterprises were found to return more than US$ 65 per hectare with average management, and just 5 activities provide more than US$ 327 per hectare. These results were attributed, in part, to high input costs following market liberalization.[53]

The income-earning potential of crops is especially important for smallholders because of the limited size of their plots, typically less than 1 hectare. Thus, in order to replace tobacco, any alternative crop must be highly profitable as well as being suited to the same growing conditions. For example, macadamia nuts can be very profitable but are probably not an option for smallholders because the crop needs to be grown over a large area.[56]

Kenya

Tobacco production in Kenya has increased dramatically since 1980. During the 1980s, economic conditions and government policies encouraged many farmers to shift to tobacco. Public investment in agricultural research and market supports was cut during this decade, and at the same time, prices for other crops dropped in response to deregulation and international competition. Farmers were also drawn into tobacco production by crop inputs and technical assistance from tobacco companies and by promises of a ready market. In 2011, an estimated 55,132 farmers were producing tobacco,[59] harvesting 22,604 hectares to produce 14,000 tonnes of unmanufactured tobacco.[8]

Studies have shown that tobacco farmers in Kenya actually do worse than other farmers, netting US$ 198 less in income and spending an annual average of US$ 35 more of their income on health care per year compared to farmers growing other crops.[60] Thus, research efforts have been made to support agricultural diversification and develop alternatives to tobacco growing. One particularly successful research program, experimenting with bamboo cultivation as a substitute for tobacco, began in 2005 at

the South Eastern Kenya University with support from the Canadian International Development Research Centre. Bamboo is a highly versatile material that can be used worldwide in the manufacture of products such as furniture, mats, baskets, scaffolding, building material, paper, bioenergy products, and musical instruments.[61] Feasibility studies in Kenya revealed that the market potential for handicrafts and furniture is enormous.[62] Evidence from local urban areas indicates a demand for tables, stools, beds, shelves, stands, sofa sets, and beach chairs that could be made with bamboo; bamboo has also been used in the housing sector as flooring tiles, wall reinforcements, and ceiling and interior decorations.[63]

A 2006–2009 trial further tested the feasibility of bamboo as an alternative to tobacco and the development of a sustainable value chain market for bamboo products within four districts of the South Nyanza Region, where tobacco farming is prominent. Trainings and capacity building were conducted with 240 smallholder farmers, and a number of challenges were identified. The first was the 3- to 4-year lag time between initial input and harvest. Intercrops, such as kale and beans, were introduced to allow the farmer to maintain cash flow while waiting for the bamboo to mature. One of the obstacles for most farms attempting to leave the tobacco industry was the initial large investment in curing barns. Tobacco kilns could be repurposed to create market-ready dried bamboo poles that can be used to make construction scaffolding and bamboo furniture, which increases the base value by 100% and 200%, respectively. The net return value for bamboo crops was over 300% higher than that for tobacco crops. Another challenge was a 1986 ban on bamboo harvesting from government forests, which meant that little local bamboo was entering the market. The Kenyan government lifted this ban in 2013, eliminating the barrier to getting local bamboo to the market.[59] Study sites have reported that bamboo is being used locally for construction, fencing, furniture, and handicrafts.[62]

The program has proven to be sustainable, with over half of farmers who participated in the study continuing to allocate a portion of their crops to bamboo production, and 73.8% abandoning tobacco farming completely.[59] More than 75% have reported that their household livelihoods have improved.[62] By organizing farmers into cooperatives, in addition to offering inputs, training, and marketing support, the study was able to achieve a high level of buy-in from the farming community.[59]

Brazil

In sharp contrast to Malawi, Brazil's economy is already extremely diverse, and tobacco accounts for less than 1.5% of total merchandise exports. Still, as of 2012, Brazil was the world's second-largest tobacco grower, with a total tobacco production of 810,550 tonnes. Brazil also was first in tobacco exports: 77% of its 2012 total production was exported, earning about US$ 3.2 billion in gross foreign revenues.[8] This case study draws extensively on a description by Vargas and Campos[64] of three attempts to introduce alternative agricultural crops in the main tobacco-growing areas in southern Brazil.

Almost 90% of the land used for tobacco farming in Brazil lies in three states, Rio Grande do Sul, Santa Catarina, and Paraná, in the southern part of the country, an area that produces 93% of Brazil's total tobacco crop. Most of the remaining production comes from northern states that mainly supply dark tobacco used for cigars. According to the Brazilian Tobacco Growers Association (AFUBRA), more than 600 localities and some 170,000 to 190,000 growers, mainly small landowners, are involved in growing tobacco in the south.[64] For these families, tobacco is the primary source of cash income. About 80% of total production in the south is flue-cured Virginia tobacco, and the rest is air-cured burley.[15]

Individual landholdings where tobacco is grown average 16.8 hectares, with 2.6 hectares planted to tobacco, 9.4 hectares to other crops, and the remainder being in pasture or non-agricultural use. About a quarter of the family farms in southern tobacco-growing areas rent land or have sharecropping arrangements with landowners, which require the farmers either to grow tobacco or to leave the farms.[15] Plot sizes of 2.6 hectares for tobacco, although small by Brazilian standards compared with other crops, contrast sharply with Malawi and Indonesia, where tobacco plots are rarely larger than 0.3 hectares.[13,15]

Vargas and Campos[64] identified three main barriers to the adoption of alternative livelihoods in Brazil's tobacco-producing regions: the integrated production system, which keeps farmers financially dependent on tobacco companies; local and state governments that support and subsidize tobacco growing and processing; and the high financial returns from tobacco, particularly compared with traditional food crops.

Vargas and Campos[64] compared the profitability of Virginia flue-cured and burley tobacco with corn and beans (see Table 10.4), and found that tobacco is far more profitable and expensive to grow compared with staple commodities, as measured in gross and net terms and by the daily returns to labor. These data indicate that the search for viable alternatives to tobacco will require considering high-value commodities rather than basic foods.

Table 10.4 Costs and Returns for Selected Crops in Brazil, 1999/2000

Category	Virginia flue-cured tobacco	Burley tobacco	Corn	Beans
Costs				
Variable	1,738.08	1,343.93	335.06	247.60
Fixed	170.82	170.82	56.54	56.58
Total	1,909.09	1,518.75	391.60	304.18
Profits				
Gross margin	2,370.42	1,879.36	396.00	264.00
Net profit	454.57	360.91	1.51	-42.11
Labor				
Total days worked	149	134	22	26
Return per day	3.05	2.69	0.07	–1.62

Note: Costs and returns shown in US$ per hectare.
Source: Vargas and Campos 2005.[64]

The challenge of crop diversification cannot be discussed in isolation from the current costs and benefits of tobacco, and diversification will require concerted efforts by the private sector, government, individual farmers, and farmer associations to succeed. Development of new value chains with support systems that are similar to (or better than) those available for tobacco is a major challenge for Brazil and other countries. Vargas and Campos[64] offer examples of diversification initiatives from which several lessons may be drawn.

Local initiatives have attempted to introduce organic food crops as alternatives to tobacco. For example, beginning in the late 1980s the search for an alternative model led to the establishment of various "agro-ecological" endeavors based on the principles of organic farming in Santa Cruz do Sul, a municipality in the Rio Pardo Valley. These efforts eventually gave rise to a regional cooperative of ecologically based family farmers known as ECOVALE. Farm products—including a wide variety of horticultural crops, erva-mate (Brazilian tea), peaches, oranges, beans, and corn—are sold in fairs and to regional and local supermarkets and restaurants. Vargas and Campos[64] cite data from the Center of Assistance for Small Farmers which show that an average household earns an annual income of US$ 1,560 from agro-ecological crops, compared with only US$ 938 to US$ 1,182 from tobacco, based on an average 2.6-hectare plot.

The financial returns that are reported for agro-ecological enterprises, however, are very uncertain, and the estimates do not show how these enterprises compare with respect to variable costs, labor requirements, investment needs, returns to capital, and other matters of importance to farmers. Moreover, Vargas and Campos[64] report that more than 330 families are involved in agro-ecological products in the Rio Pardo Valley, which is a very small number compared with the number of tobacco growers. For widespread farmer participation, market linkages clearly need to be extended beyond local fairs and restaurants and will therefore involve completely different cost and price structures than the ones encountered so far. Horticulture production and marketing is one of the most demanding areas of agriculture and requires specialized infrastructure. Whether programs similar to ECOVALE can be built up to this level is the real challenge for developing an alternative crop as a competitive substitute for tobacco. Other initiatives have yielded similar lessons, including the need for diverse distribution networks, coordination, and government support.

Canada

The experience of HICs yields additional insights into the issue of crop substitution. These countries are in a much stronger position than LMICs to promote alternative enterprises, both in terms of the ability to afford farmer quota buy-outs and greater opportunities for farm and non-farm diversification. Canada's 1990s diversification experience helps illustrate these points as well as a number of similarities in terms of the challenges of competitive value chain development.[65]

In the mid-1990s, Canada ranked as the world's sixth-largest producer of flue-cured tobacco and among the world's top 20 producers of tobacco overall. About 90% of the tobacco grown in Canada was produced in a highly concentrated area in southwestern Ontario near the north shore of Lake Erie. Historically, tobacco companies in Canada have encouraged and helped farmers to begin growing tobacco, and tobacco has made a major contribution to the local economies of four Ontario counties.[65]

Although the government of Canada has a history of supporting tobacco farming dating back to the early 1900s, Canada in the 1980s and 1990s took some of the most aggressive steps in the world to reduce tobacco production. Between 1987 and 1993, federal and provincial governments paid more than 50 million Canadian dollars (CA$) to farmers who stopped growing tobacco. A further CA$ 13 million was spent on projects seeking alternative crops.[65]

Canada's Tobacco Diversification Plan, announced in 1987, consisted of two components, the Tobacco Transition Adjustment Initiative (commonly known as Redux) and the Alternative Enterprise Initiative, which provided financial incentives for farmers to cease tobacco production. The Diversification Plan

had a substantial impact. By 1990, about one-third of tobacco growers across Canada had left tobacco production. Of the Ontario farmers who ceased growing tobacco, half said they would have done so regardless, and one-third said the program prompted them to discontinue. However, many eligible farmers did not take advantage of the program because they felt they were better off financially continuing to grow tobacco. Of the farmers who did leave, about 40% were still involved in tobacco growing afterward, typically as employees of other farmers.[65]

In addition to the financial incentive to stop growing tobacco, the Alternative Enterprise Initiative provided financial support for the development and marketing of non-tobacco crops. This effort was not immediately successful, as some farmers were reluctant to leave tobacco, a high-income crop, for a riskier, low-income activity, and some funded ventures failed. Despite these difficulties, "since the early 1980s many Canadian farmers who once grew tobacco have produced alternative crops, including ginseng, baby carrots, rhubarb, Spanish onions, zucchini, coriander, garlic, melons, early and sweet potatoes, buckwheat, and hay."[65,p.166] Cunningham concludes that while government programs have contributed to diversification, the biggest factor has been the free market. As the demand for Canadian tobacco fell in the 1980s, farmers realized they could make more money by growing something else, either instead of or in addition to tobacco. By the late 1980s, tobacco farming had stabilized and the number of farmers exiting tobacco dwindled.

The Future of Crop Substitution and Diversification

For countries planning substitution and diversification programs, these and other case studies offer valuable examples and highlight the types of issues and challenges that may be encountered. These case histories show that alternative crops can substitute for some of the income earned from tobacco, but that programs designed to promote diversification simply for the sake of promoting diversification are likely to face significant challenges. Alternatives must be competitive and well managed; if they have not developed of their own accord, factors other than the dominance of tobacco may be at work.

The Canadian experience is very different from what most LMICs can expect. While donor funding for programs like tobacco buy-outs may be possible, Canadian farmers benefited from many favorable economic conditions that most LMICs cannot offer. The same principles of being subject to market forces and the risk of diversification for the sake of diversification still hold true, but the development of new enterprises will likely be more complicated and slow in LMICs without a large consumer base for alternative products and other opportunities for non-farm employment.

Approaches to crop diversification and substitution vary considerably across countries. In general, a consensus is growing that alternatives to tobacco farming do exist, but they tend to be highly country- or region-specific. To facilitate these diversification and substitution efforts, the Conference of the Parties to the WHO Framework Convention on Tobacco Control (WHO FCTC), at its third meeting, established a Working Group on economically sustainable alternatives to tobacco growing. The Working Group's policy options and recommendations were adopted by the Conference of the Parties at its sixth session in October 2014[51] (see Box 10.2).

Box 10.2: Working Group Report: Policy Options and Recommendations on Economically Sustainable Alternatives to Tobacco Growing (in Relation to Articles 17 and 18)

This report was intended to assist Parties to the WHO FCTC in complying with Article 17 (Provision of support for economically viable alternatives to tobacco production) and Article 18 (Protection of the environment and the health of persons). The report identified six guiding principles:

1. Livelihoods diversification should be the concept guiding implementation of economically sustainable alternatives to tobacco growing.
2. Tobacco growers and workers should be engaged in policy development concerning Articles 17 and 18 in line with Article 5.3 of the WHO FCTC [Protection of public health policies with respect to tobacco control from commercial and other vested interests of the tobacco industry] and its guidelines.
3. Policies and programs to promote economically sustainable alternative livelihoods should be based on best practices and linked to sustainable development programmes.
4. The promotion of economically sustainable alternative livelihoods should be carried out within a holistic framework that encompasses all aspects of the livelihoods of tobacco growers and workers (including the health, economic, social, environmental, and food security aspects).
5. Policies promoting economically sustainable alternative livelihoods should be protected from commercial and other vested interests of the tobacco industry, including leaf companies, in accordance with Article 5.3 of the WHO FCTC and its guidelines.
6. Partnership and collaboration should be pursued in the implementation of these policy options and recommendations, including in the provision of technical and/or financial assistance.[51]

A common perception is that tobacco is the most profitable crop a farmer can grow. As described in the case histories above, at least in some countries other crops have the potential to rival or surpass tobacco in terms of gross and net profits, returns to cash, and returns to family labor. In Kenya, initial trials have shown that bamboo can be a successful commodity, offering a diversity of uses and higher profits. In Indonesia, potato, chilli, nilam, and oranges were all found to return higher profits than tobacco, depending on farm management. Similarly, in Zimbabwe, analysis shows that paprika, coffee, and specialty horticulture crops offer greater profits than tobacco, and in Malawi, tomato, paprika, rice, confectionery groundnuts, and coffee all provide higher incomes for smallholder farmers, depending on market arrangements.

Policy incentives that encourage tobacco growers to use their incomes to invest in other farm activities are well worth considering. In this way, tobacco itself could help fuel the process of diversification.

Hu and colleagues[66] conclude that tobacco growing provides lower returns than alternative crops such as grains, oilseeds, beans, and fruit. However, they also observe that local governments use various incentives to promote tobacco growing because of its importance to their tax revenues, and the quotas mandated by local governments do not allow farmers to determine which crops they will grow.

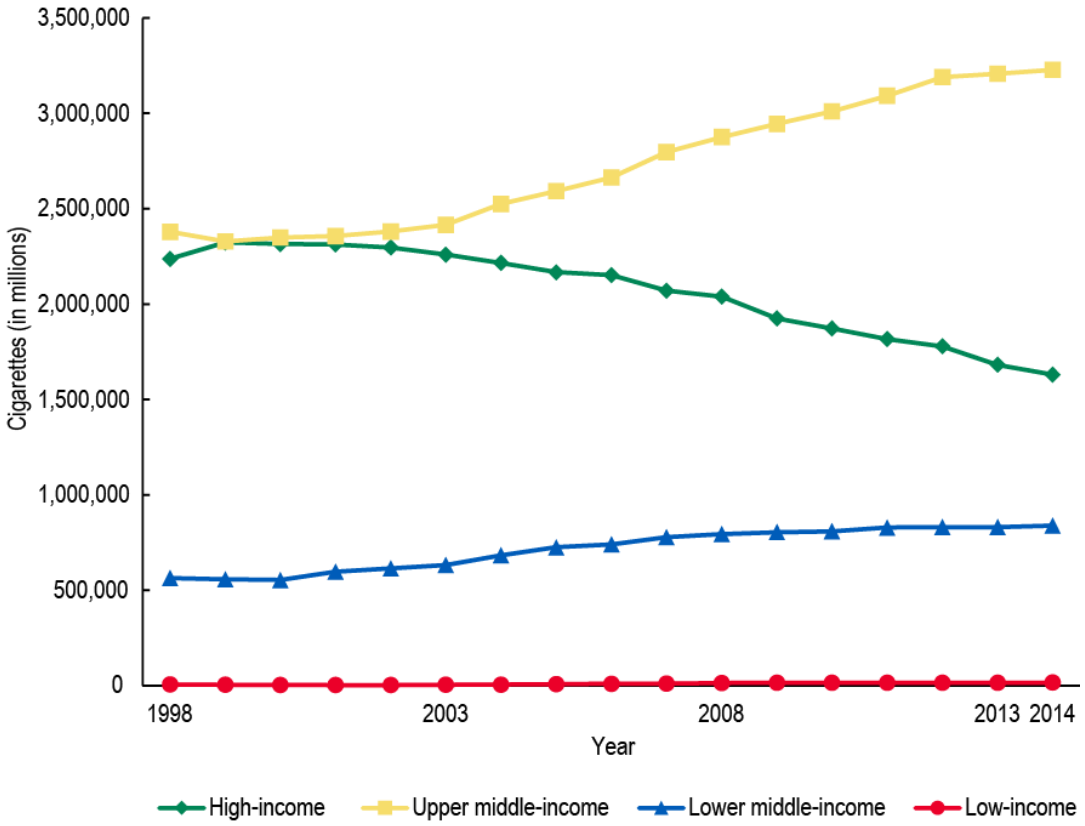
The markets for most high-value products that could to some extent make up for a loss of tobacco revenue are much smaller and more difficult to penetrate. The challenge of developing new supply chains for alternative products may appear daunting, but this does not mean that new products cannot, or will not, emerge over time to replace tobacco. As the markets for tobacco begin to shrink, other commodities could become relatively more attractive and gradually emerge alongside tobacco.

The Evolving Tobacco Industry

A wide variety of tobacco products are available and consumed globally as a result of economic, cultural, historic, and other forces. As described in chapter 2, these products can be grouped into two broad categories: smoked products such as cigarettes, cigars, bidis, kreteks, roll-your-own tobacco, and waterpipe tobacco; and smokeless products such as chewing tobacco, moist snuff, and dry snuff products. New products such as electronic nicotine delivery systems (ENDS)—battery-powered devices designed to heat a liquid, which typically contains nicotine, into an aerosol for inhalation by the user—have received increasing attention internationally. All tobacco products carry health risks for the user, but the risks vary due to differences in product characteristics and consumer usage patterns.

Cigarettes remain the dominant tobacco product worldwide. From 1970 to 2004, world production of cigarettes increased by 57%, but most of this increase occurred in the 1970s.[67] Figure 10.5 depicts global cigarette production during the years 1998 to 2014.[68] Cigarette production has steadily declined in HICs since the early 2000s, but has increased in lower middle-income and especially in upper middle-income countries. In 2014, 71% of world cigarettes were produced in LMICs.[68] This shift from HICs to LMICs can be explained by several factors: (1) the largest proportion of smokers (77%) now live in LMICs[69]; (2) many locations in LMICs can produce cigarettes at a lower cost than in HICs; and (3) historically, tobacco control measures have been nonexistent or weakly enforced in many LMICs, which encouraged large tobacco manufacturers to relocate factories to these countries.

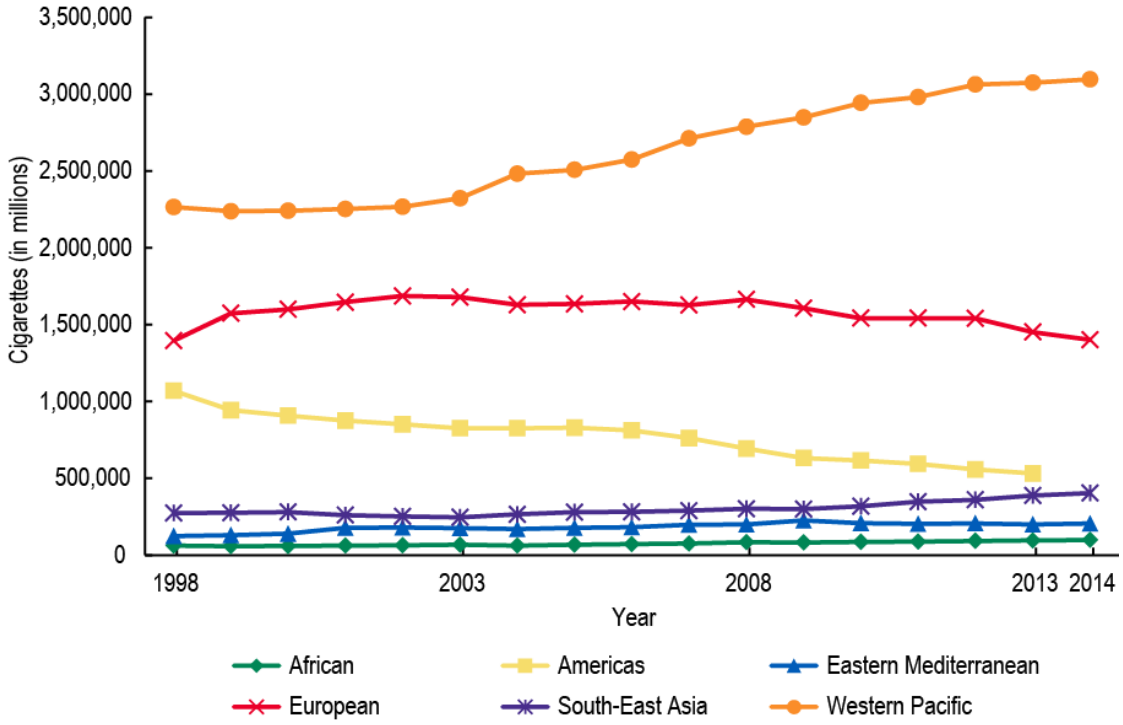
Figure 10.5 Cigarette Production, by Country Income Group, 1998–2014



Notes: Data from a total of 74 countries are shown. Only one country is included in the low-income group (Kenya). Country income group classification based on World Bank Analytical Classifications for 2014.
Source: Euromonitor International 1998–2014.[68]

The WHO Region that produces more cigarettes by far than other regions is the Western Pacific, which includes China and other large producers such as Japan, the Republic of Korea, and the Philippines[68] (Figure 10.6). The largest share is produced by China, which is the largest cigarette-producing and -consuming country in the world. The African Region produces large quantities of raw tobacco,[8] but manufactures few cigarettes. The Eastern Mediterranean Region also has a very small share of global cigarette production. The South-East Asia Region, which includes Indonesia and India, produces fewer cigarettes as a region than the Western Pacific, European, and Americas Regions.[68] India, a major tobacco grower, is not a large manufacturer of cigarettes, but it produces very large quantities of bidis (small hand-rolled cigarettes wrapped in a tendu leaf).[70] Cigarette production in Indonesia is mostly limited to clove cigarettes, called kreteks.[71,72]

Figure 10.6 Cigarette Production, by WHO Region, 1998–2014



Notes: Data from a total of 74 countries are shown.
Source: Euromonitor International 1998–2014.[68]

Evolution of Manufactured Cigarettes and Other Tobacco Products

The evolution of the tobacco industry has been marked by significant changes in product design and manufacturing. Changes in the product itself and how it is produced and marketed have, at various times, had a dramatic impact on patterns of tobacco consumption. This section briefly reviews some key product design changes that have occurred over the past century, focusing primarily on the U.S. tobacco industry.

Before the mid-19th century, most tobacco was consumed in the form of chewing tobacco, plug tobacco, pipe tobacco, snuff, and cigars. Early cigarette manufacturing was a highly labor-intensive activity, given that cigarettes were rolled by hand. Much of the tobacco used in early American and British cigarettes was relatively expensive, imported Turkish tobacco or comparable domestically grown

heavy, dark varieties which produced strong-tasting cigarettes. Given the labor-intensive nature of production and the use of costly imported tobacco, cigarettes were expensive relative to other tobacco products; the expense, combined with their strong taste, contributed to their low share of the overall tobacco product market.[73]

The first design innovation that led to increased cigarette consumption was a change in the blend of tobacco used in cigarette production. U.S. manufacturers began to shift from strong imported tobacco to lighter varieties grown domestically—initially bright leaf tobacco and eventually burley tobacco. The new taste had wider appeal and led to a significant increase in cigarette consumption in the United States during and after the Civil War.[74]

The next and most significant manufacturing innovation was the shift from hand-rolling to mechanized cigarette production. In 1876, Allen and Ginter, the leading U.S. cigarette manufacturer of the time, offered a substantial cash prize for the invention of a cigarette-rolling machine,[72] and James Bonsack patented the first such machine in 1881. In contrast to the highly skilled hand-rollers, who could produce 3,000 cigarettes per day, Bonsack's machine could produce 12,000 cigarettes per hour and also produced highly standardized products at greatly reduced cost.[75]

W. Duke, Sons & Co., led by James Buchanan "Buck" Duke, was the first U.S. cigarette company to fully take advantage of the new machine. Through an exclusive deal with Bonsack, Duke aggressively expanded production capacity for manufactured cigarettes and heavily marketed their products. Duke became the American Tobacco Company (ATC) and by 1890 had a near-monopoly on the U.S. cigarette market, with a market share of approximately 90%.[74] Over the next two decades, the company used its position to take over additional competitors and expand into international markets. The company dominated the market so completely that in 1911 the U.S. Supreme Court ordered the monopoly to be broken up.[76]

The U.S. Supreme Court divided ATC into 16 different firms—including a new American Tobacco Company, R.J. Reynolds Tobacco Company (RJR), Liggett & Myers Tobacco Company (L&M), and P. Lorillard Company (PLC). ATC was divested of its foreign holdings, notably Imperial Tobacco Company (IT) and British American Tobacco Company (BAT). Following the breakup, the new ATC, L&M, and PLC together controlled 90% of the U.S. cigarette market; IT would come to monopolize cigarette markets in the United Kingdom of Great Britain and Northern Ireland, and BAT would do the same in various British colonies and elsewhere.[74] The structure of the U.S. market, however, would change in subsequent decades as the leading U.S. manufacturers competed with each other and introduced product changes and new marketing strategies.

RJR pursued a novel integrated advertising, pricing, and design strategy centered around its Camel brand. Although a minor player following the breakup of the monopoly, RJR became the dominant firm in the U.S. cigarette market by the end of World War I.[75]

Camel cigarettes contained a blend of relatively mild, flue-cured bright tobacco and sweetened burley tobacco (unique to Camel at the time), with a small amount of Turkish tobacco; eventually, Maryland tobacco was added to the blend to give it a slower burn.[77] The milder smoke it produced was appealing, particularly to those taking up smoking at the time. Camel's product design was featured in its marketing efforts, with the exotic blend noted on the pack and the camel imagery drawing attention to

the Turkish tobacco it contained, but Camel cigarettes were also priced well below imported brands or other domestically produced brands containing Turkish tobacco.[75,78]

By 1918, Camels accounted for more than one-third of the U.S. cigarette market.[79] ATC focused on its Lucky Strike brand, emphasizing the "toasted" tobacco it contained, and L&M changed the tobacco in its Chesterfield brand to a blend similar to Camel's.[75,78] By the mid-1920s, the three firms had more than 80% of the U.S. market, with the market share of each almost entirely accounted for by their leading brand.[79] By this time, the combination of the changes in product design, aggressive marketing campaigns, and pricing strategies (including distribution of free cigarettes to soldiers during World War I) had completely changed U.S. tobacco product markets, with cigarettes going from a small share of the market early in the 20th century to becoming by far the most widely consumed tobacco product.

The cigarette and the U.S. cigarette industry continued to evolve over the next few decades. Changes in product design were gradual and intended to improve the mildness of the smoke in an effort to appeal to a wider range of potential consumers while allaying concerns about health (e.g., the "not a cough in a carload" tag line used in PLC's advertising for its Old Gold brand). The industry changed in more significant ways as well. A price war broke out in the 1930s that cost RJR its leadership position and allowed Philip Morris (PM) and Brown & Williamson (B&W) to gain toeholds in the market.[74]

The next significant innovation—development and mass marketing of filter-tipped cigarettes—came in the 1950s in an apparent response to mounting evidence about the adverse health consequences of smoking. Filter-tipped cigarettes had been around for many years, but in 1950 accounted for less than 1% of cigarette sales. Given the growing health concerns, however, cigarette companies experimented with new filter designs, including cellulose acetate, charcoal, and asbestos-based filters, and marketed brands using these filters as delivering less tar and nicotine to smokers. B&W was the first to adopt and market the cellulose acetate filter in its Viceroy brand, with its ads stating that "filtered cigarette smoke is better for your health."[74,p.87] Others quickly followed, including RJR with its Winston brand, and PM with a filter-tipped version of its Marlboro brand. Filter-tipped cigarettes accounted for more than a quarter of the market by 1956[74] and more than half of the market by 1960,[80] despite the finding of a U.S. congressional committee in 1958 that "cigarette manufacturers have deceived the American public through their advertising of filter-tip cigarettes . . . , [through] phrases implying health protection, when actually most filter cigarettes produce as much or more nicotine and tar as cigarettes without filters."[81,p.24-25] Though designed to allay smokers' health concerns, filtered cigarettes were almost certainly less costly to produce than non-filtered cigarettes because they contained less tobacco (because the length of the cigarette including the filter was the same as for non-filtered cigarettes).[74]

Scientific evidence on the health consequences of smoking continued to accumulate, however, and in January 1964 the first U.S. Surgeon General's report on the health consequences of smoking was released, summarizing this evidence. The report concluded that cigarette smoking caused lung cancer in men, and contributed to emphysema, chronic bronchitis, and cancers of the mouth, throat, respiratory tract, and larynx, and noted that smokers had higher death rates from cardiovascular disease and liver cirrhosis.[82] The Surgeon General's report was a landmark event, which eventually led to a variety of public and private efforts to discourage cigarette smoking and other tobacco use.[83]

At the same time, the release of the 1964 Surgeon General's report spurred a new wave of changes in cigarette design and accompanying marketing efforts intended to alleviate consumers' concerns about the health consequences of smoking, this time focused on the tar and nicotine content of cigarettes. Reductions in machine-measured tar and nicotine content were achieved by making cigarettes using reconstituted tobacco sheet (a combination of tobacco stems and dust that in the past had been discarded), expanded tobacco, more porous cigarette paper, and increased filter ventilation.[84,85] Again, these design changes not only helped alleviate consumers' concerns about the health consequences of smoking, but almost certainly lowered production costs. After dropping a bit following the release of the 1964 report, per capita cigarette consumption in the United States rose, albeit unevenly, for several more years before peaking in 1973.[86]

Tobacco Product Regulation

Introduction

As the previous section has described, the evolution of cigarette and other tobacco products in the United States has been characterized by changes intended to appeal to more consumers, to respond to consumers' concerns about the adverse health consequences of tobacco use, and/or to make cigarettes less expensive to produce for the manufacturer. This evolution occurred at least in part because of the lack of regulatory control over tobacco products in the United States before 2009, as well as limited understanding by both policymakers and the public of the long-term health consequences of changes in tobacco product design. Similar trends were seen in other countries with high cigarette use during the twentieth century, including Canada and the United Kingdom.[87,88]

This section describes tobacco product regulation, beginning with a discussion of the inherent challenges, and moving on to a review of several approaches to product regulation and the impact or potential impact of each. This section focuses on moves to restrict availability of at least some tobacco products or to regulate various aspects of product design. Given that these types of regulations are quite new, limited evidence is available on the actual impact of these efforts. Other product regulations, including bans on using descriptors like "light," "mild," and "low-tar," and mandated warning labels for tobacco products, are discussed in chapter 8.

Tobacco product regulation has two primary goals: to reduce the harm that results from continued tobacco use and to reduce the prevalence and consumption of tobacco products. As discussed in the 2010 Surgeon General's report,[89] these two goals can at times compete with one another. For example, allowing the sale and marketing of a potential reduced-risk product might reduce the harms that would accrue to continuing users, but at the same time it might cause a decline in the number of users who stop smoking or lead more users to begin smoking than would have occurred had the product been kept off the market. Without effective regulation, such negative consequences pose a greater threat and may go undetected. The historical case of "light" and "low-tar" cigarettes provides a powerful example of the damage that can occur in the absence of appropriate regulatory oversight (see Box 10.3).

Box 10.3: The "Light" Cigarette Story

During the 1960s and 1970s, tobacco companies increasingly marketed new cigarette brands with lower machine-measured levels of tar and nicotine as low-tar or "light." Filtered, low-tar cigarettes came to dominate U.S. cigarette markets, accounting for 86.4% of the market as of 2010,[144] in large part due to the perception that they were less harmful than other cigarettes. This perception was not only driven by tobacco company marketing campaigns for their filtered and low-tar brands, but was also influenced by early statements and actions of the U.S. Public Health Service and those of the U.S. Federal Trade Commission (FTC).[89] For example, the U.S. Public Health Service recommended "the progressive reduction of the 'tar' and nicotine content of cigarette smoke" in 1966.[82,p.2] Indeed, average machine-measured tar and nicotine levels in cigarettes fell dramatically in the 1960s and 1970s. Sales-weighted measures of tar, for example, fell from 38 milligrams per cigarette in 1954 to 12 milligrams in 1993.[85] This led some scientists to conclude that if smokers switched to brands with reduced (machine-measured) levels of tar and nicotine, their risk of disease would decline, providing that they did not compensate by increasing cigarette consumption. Additionally, the FTC decided to allow companies to make statements in their marketing about the tar and nicotine content of their cigarettes when such statements were based on standardized machine measurements.[145,146]

Decades passed, however, before it became clear that the significant reductions in machine-measured tar and nicotine had not been followed by significant reductions in the death and disease caused by smoking. Over time, it was understood that this was largely the result of cigarette design features and changes in design that offset any potential benefits resulting from the apparent reductions in machine-measured tar and nicotine delivery. Of particular importance were the ventilation holes in cigarette filters. When "smoked" by machine, these holes allowed smoke to escape, reducing machine-measured tar and nicotine. However, smokers learned to cover these holes with their fingers, often without realizing it, resulting in considerably higher actual tar and nicotine intake than the machine measures.[85] Other research demonstrated that ventilated cigarettes delivered more free nicotine, adding to the addictiveness of the product, and producing a milder smoke that led smokers to inhale more deeply.[91,147,148] For example, Monographs 7[149] and 13[150] published by the National Cancer Institute of the National Institutes of Health, an agency of the U.S. Department of Health and Human Services, describe the problems with the machine measurement of tar and nicotine, and Monograph 13 concluded that changes in cigarette design during the latter half of the 20th century did not result in improvements in public health. In 2006, U.S. District Judge Gladys Kessler ruled, as the United States had argued, that the country's major cigarette companies had engaged in fraud and deception for more than half a century; one of the seven specific areas of fraud identified was that the companies falsely marketed and promoted light/low-tar cigarettes as less hazardous than full-flavor cigarettes.[113]

In 2008, the FTC stopped allowing companies to make marketing statements about the tar and nicotine yields of their brands based on the so-called "FTC Method," stating: "the Commission believes the statements of tar and nicotine yields as measured by this test method are confusing at best, and are likely to mislead consumers who believe they will get proportionately less tar and nicotine from lower-rated cigarettes than from higher-rated brands".[151,p.74503]

As the history of "light" cigarettes shows, effective tobacco product regulation is complicated by the design of the product, by how consumers use the product, and by how consumers perceive the product. Consumers may be unaware of the modifications that are continually being made to cigarettes but which respond to changing tastes and health concerns. Design changes can include changes in tobacco blends, additives, engineering, length, circumference, filters, paper, and much more, creating challenges for regulators. Regulatory authority provides governments with tools to respond to market changes that have

implications for health. Components of a tobacco regulatory program may include standardized testing of all products; requiring manufacturers to disclose product information; surveillance of patterns of product use, health effects, and knowledge; and classification of products by their constituents, design, or other characteristics.[90,91]

Regulatory Challenges Facing Governments

Governments face at least three challenges in implementing effective product regulation: diversity of tobacco products in global tobacco markets, including variability in the same product/brand within and across countries; diversity of the tobacco industry and the political power wielded by the industry in some countries; and lack of regulatory capacity.

The evolving tobacco product market and the diversity of products used around the world pose challenges for a common regulatory approach. For example, the emergence of ENDS has created new challenges for regulatory efforts. These products are relatively new, only appearing in the marketplace over the past decade.[92] Regulating the ENDS market will be a challenge because these products represent a very diverse set of devices, with hundreds of brands and thousands of liquid nicotine solution flavors available on the U.S. and global markets.[93] The non-standard aspects of the devices (e.g., different sized batteries with different heat generation capacity, different heating elements with varying abilities to transfer the heat to the liquid) and the varied composition of the liquid (e.g., solvent used, nicotine content, flavorings) present unique challenges for product regulation. All aspects of product use—including the type of device, type of liquid used in the device, and user behavior—can interact to create different exposure conditions which make it difficult to determine the individual and public health impact of product use. In 2016, the U.S. Food and Drug Administration finalized a rule extending its authority to all tobacco products, including e-cigarettes, cigars, waterpipe tobacco, and pipe tobacco, among others.[94]

Tobacco product regulation is also challenging where tobacco products are not standardized because they are produced in local "cottage industries." For example, it has been estimated that, by volume, 91.3% (588 billion tonnes) of smokeless tobacco products worldwide (644.3 billion tonnes) are sold in traditional cottage industry markets.[7] These products, widely used in countries like India and Bangladesh, are assembled by local vendors and often customized to the customer's preference. Thus, the ingredients and other characteristics of the product, including levels of nicotine and toxic constituents, can vary widely from one sample to another. Indeed, forms of smokeless tobacco that are produced using non-standardized methods may pose the greatest risk to health because of the high levels of toxicants they contain. A wide variety of products and methods of manufacturing and distribution within a country make it more difficult to set up a regulatory regime. Difficulties are encountered especially in countries where products are manufactured and distributed in informal settings that are less amenable to a conventional regulatory system of product registration, inspection, and enforcement.[7]

Regulation of tobacco products also differs in important ways from regulation of other consumer products. The inherently harmful and addictive nature of the product and the fact that most users start in adolescence set tobacco apart from other products. The differences between regulating tobacco and regulating other products are illustrated when conducting a cost–benefit analysis for tobacco products (see Box 10.4).

Box 10.4: Analyzing the Costs and Benefits of Regulating an Addictive Substance

Cost–benefit analysis has been routinely used to assess new federal policies and regulations in the United States and elsewhere since the 1960s. Like other U.S. federal agencies, the FDA is required to conduct such an economic impact analysis for any "significant" new regulation.

The FDA conducted a cost–benefit analysis for its proposed and final rule requiring pictorial warning labels on cigarette packages; the final rule was successfully challenged in court by several tobacco companies and never went into effect.

The methodology the agency used in this analysis has generated substantial controversy and criticism.[152–155] Critics argued that conventional assumptions about rational behavior used in economic analyses can result in distorted estimates of benefits and costs when applied to an addictive product. The most controversial aspect of the analysis is the use of the concept of "lost consumer surplus" (the loss of smoking-related "pleasure" for those who reduce their consumption or quit smoking entirely because of a new regulation) as part of the cost of imposing a new regulation. While lost consumer surplus may be a meaningful concept in some circumstances, critics state that its application is problematic for an addictive product like tobacco.[154,155] Research on smoking behavior has shown that most smokers would like to quit and many try to do so each year. In addition, the proportion of smokers who regret ever having started smoking is extremely high (~75–90%).[156,157] Moreover, the use of lost consumer surplus assumes that smokers are fully informed, rational consumers—that is, they understand all the costs and benefits of their actions. However, most smokers begin smoking and develop their addiction before age 18; research indicates that adolescent smokers tend to underestimate the risks of their behavior and the potential for long-term addiction.[158] There is currently no consensus among experts regarding the appropriate quantification of lost consumer surplus when analyzing regulations affecting addictive products.

The government of the United Kingdom considered lost consumer surplus in its assessment of the impact of a plain (standardized) packaging law, but the government review concluded that there was insufficient evidence to include a monetary estimate of lost consumer surplus in the economic analysis.[159,160] The challenge of assessing lost consumer surplus will be greater in countries that are in earlier stages of the tobacco epidemic, where consumers are less informed about the health risks of smoking and may have even greater exposure to tobacco product promotions and advertising.[161]

A number of steps have been taken or are under way to strengthen the capacity of tobacco product regulators and facilitate effective implementation of Articles 9 and 10 of the WHO FCTC (Article 9: Regulation of contents of tobacco products; Article 10: Regulation of tobacco product disclosures). These steps include formation of the WHO's Study Group on Tobacco Product Regulation (TobReg), creation of the WHO Tobacco Laboratory Network, establishment of the WHO Global Tobacco Regulators Forum, WHO's efforts to establish new cigarette testing standards, and the WHO FCTC Conference of the Parties Working Group to develop guidelines for Articles 9 and 10 of the treaty.[95] These efforts are ongoing, responding to new developments in the tobacco product market and patterns of use, and continually informed by experiences of countries that have been early adopters of tobacco product regulations. The following sections outline a selection of regulatory approaches that have been implemented in some form and describe the experience of these countries to date.

Bans on the Sale of Tobacco Products

Perhaps the most direct form of tobacco product regulation is a complete ban on the sale of these products, based on the harms they cause. As of 2015, only the country of Bhutan has banned the sale of all tobacco products. Data from a 2009 International Tobacco Control Policy Evaluation (ITC) Project survey conducted in Bhutan indicate that prevalence of tobacco use in the country is 11.1% despite the comprehensive ban.[96] More recent data from the 2014 the WHO STEPwise approach to Surveillance (STEPS) survey indicate even higher rates of tobacco use, with 4% of adults ages 15 through 75 reporting tobacco smoking and 48% reporting smokeless tobacco use.[97] Data from the Global Youth Tobacco Survey indicate that youth tobacco use prevalence was 30.3% in 2013.[98]

Some governments ban selected classes of products. The sale of several types of smokeless tobacco is banned in all EU countries except Sweden.[98] Smokeless tobacco products have also been partially or completely banned in New Zealand; Australia; Turkey; Israel; Thailand; Singapore; China, Hong Kong Special Administrative Region; India; and the United Arab Emirates.[7]

In India, new rules introduced in 2011 under the Food Safety and Standards Regulations prohibit any harmful ingredient, including nicotine and tobacco, from being added to food. The Indian Supreme Court had previously ruled in 2004 that gutka, a commonly used smokeless tobacco product, was a "food product."[7] Thus, the 2011 rules authorized state food commissioners to ban gutka products. In March 2012, Madhya Pradesh became the first state to implement the ban on gutka by invoking the new regulation.[99–101] As of October 2013, all of India's states and union territories except Meghalaya and Lakshadweep had banned the sale of gutka.[102] While some states and union territories have been relatively successful in enforcing the ban on gutka, industry is circumventing these bans by selling gutka's components, pan masala and tobacco, in separate pouches.[103] A 2014 study conducted by the WHO India Country Office and the Johns Hopkins Bloomberg School of Public Health found that the state-level gutka bans have reduced use of the product.[104] Although bans on selected tobacco products may, if enforced, impact the use of a particular class of products, little evidence is available to assess whether they lead to reductions in overall tobacco use.

In the United States, the 2009 Family Smoking and Tobacco Control Act requires that new tobacco products—that is, those not on the market as of February 15, 2007—must undergo pre-market review. FDA can deny a marketing authorization on the basis of public health concerns.[105]

Mandating Reductions in Tobacco Product Constituents

One of the most widely implemented forms of product regulation globally is the mandated reduction of tobacco product constituents and emissions, most often tar and nicotine, but in some cases carbon monoxide (CO) and other toxicants as well. The United Kingdom was among the first to adopt this approach, with its "low-tar program" to reduce machine-measured tar and nicotine yields, which was implemented in the early 1970s and expanded in 1981 to include CO. In 1980, the British government and the tobacco industry agreed to set targets for tar yields, beginning in 1983 with a sales-weighted average yield of 15 mg of tar per cigarette.[106] A similar agreement in Australia called for reductions in tar and nicotine delivery, setting initial upper limits of 18 mg of tar and 1.6 mg of nicotine per cigarette. Over time, an upper limit for CO was added, and the limits for each were gradually lowered.[107] In addition, the European Communities set upper limits on tar yields, starting at 15 mg in 1992 and falling to 12 mg by the end of 1997[108]; the EU subsequently strengthened and expanded the limits, reducing the maximum tar yield to 10 mg, and adding limits on CO (maximum of 10 mg per cigarette) and nicotine

(maximum of 1 mg per cigarette) by the beginning of 2004.[98] Similar approaches have been used in many other countries.

Although such mandates have led to reductions in machine-measured average tar, nicotine, and CO yields in the countries that have adopted them, similar reductions have occurred in countries without such mandates.[109] This is not surprising given that lower tar and nicotine cigarettes were extensively marketed in many countries, and consumers switched to these brands believing that they were less dangerous. Moreover, given the inadequacies of machine measurement of yields, it is not clear that even lower mandated yields would have had a positive impact on public health (see Box 10.3).

An alternative approach has been proposed that would regulate the specific constituents of tobacco smoke or smokeless tobacco products, including carcinogens such as tobacco-specific nitrosamines and polycyclic aromatic hydrocarbons. For example, the International Agency for Research on Cancer and WHO working group proposed a regulatory strategy, which was approved by WHO TobReg, with two aims: to reduce the levels of specific toxicants in products allowed on the market, and to prevent the introduction of new products/brands with higher levels of toxicants than those already on the market.[110] TobReg notes that the existing science does not allow a definitive conclusion that mandatory upper limits of certain toxicants will result in meaningful changes in consumer exposure to toxicants, or reduce the incidence of cancer or any other tobacco-related disease. Therefore, TobReg has recommended prohibiting the use of the results of proposed testing in marketing or other communication with consumers, including product labeling, so as to avoid misleading the public.[110]

A key first step toward implementing such regulations is a more complete understanding of the constituents and emissions of tobacco products, as called for in Article 10 of the WHO FCTC. Countries are beginning to mandate that tobacco companies disclose this information. For example, Canada requires tobacco product manufacturers to report all research activity related to toxicity, health impact, ingredients, taste and flavor, modifications, marketing, and the way consumers use the product for each brand every year.[111] The United States (via the 2009 Tobacco Control Act) now requires cigarette manufacturers and importers to report the ingredients and additives used in their products, as well as the levels of certain harmful or potentially harmful constituents in tobacco or tobacco smoke, to the FDA.[112]

Reducing the Addictiveness or Appeal of Tobacco Products

Another type of regulation that has been widely discussed worldwide would (1) require reductions in the addictiveness of tobacco products, to be achieved by regulating nicotine content or limiting the use of additives that enhance the release of free (unprotonated) nicotine, or (2) reduce product appeal, for example, by banning flavor additives.

Changes in the design of cigarettes over time have enhanced their ability to quickly and effectively deliver nicotine. Internal tobacco company documents make clear that this was the intent of these design changes. In her findings in the U.S. Department of Justice's litigation against the U.S. cigarette companies, U.S. District Judge Gladys Kessler concluded that "defendants have designed their cigarettes to precisely control nicotine delivery levels and to provide doses of nicotine sufficient to create and sustain addiction."[113,p.515] The fact that cigarettes have been designed to maximize their effectiveness as nicotine delivery devices implies that design changes to reduce this effectiveness are feasible. Mandating progressive reductions in nicotine content in cigarettes to non-addicting levels has been

proposed as a strategy for reducing the potential for future addiction.[113] This strategy remains the subject of continued research.[109,114–116]

Some countries have begun to implement regulations aimed at reducing the appeal of tobacco products. For example, in the United States, the Tobacco Control Act bans cigarettes that have a characterizing flavor of the tobacco product or tobacco smoke (with the exception of tobacco and menthol flavors), although the use of these flavors in products other than cigarettes continues to be allowed (as of August 2016). The rationale for the ban is that cigarettes with characterizing flavors, such as fruit or chocolate, are especially attractive to youth and are widely considered to be "starter" products for new tobacco users.[117]

In Canada, a 2010 amendment to the federal Tobacco Act prohibited flavored cigarettes, cigarillos, and blunt wraps (menthol exempted). The law was enacted in response to the increased marketing of cigarillos with chocolate, peach, cherry, strawberry, vanilla, and mint flavors sold in colorful packaging.[118,119] However, the ban does not apply to all product categories, such as full-size cigars or smokeless tobacco products, and recent data suggest that flavored products are still widely used among Canadian youth.[120] A 2012 regulation from Brazil's regulatory agency Agência Nacional de Vigilância Sanitária (ANVISA; National Health Surveillance Agency) bans the use of all flavor and aroma additives (defined as any additive that can intensify or modify the flavor or aroma of the product) in any tobacco product,[121] but implementation of the regulation has been slowed by ongoing legal challenges from the tobacco industry.[122] The EU's revised Tobacco Products Directive,[123] adopted in April 2014, provides a number of new measures updating the 2001 Directive, including a ban on additives that give a characterizing flavor when used in cigarettes and roll-your-own tobacco. Other tobacco products such as cigars, cigarillos, and smokeless tobacco are exempted, but provisions allow for expanding the ban to these categories in the future.[124]

Limiting Brand Proliferation

Researchers have found that proliferation of cigarette brands—an increase in the number of brands available in a given product market—has led to increases in overall cigarette consumption. Simonich,[125] for example, estimated that a 10% increase in the number of brands in the United States resulted in a 4% increase in consumption. Brand proliferation can expand the market for tobacco products because it allows for greater market segmentation, such as by geographic region, demographic characteristics, consumer behavior, and by personality traits, values, attitudes, interests, and lifestyles (i.e., psychographic segmentation), which in turn allows for appeal to a larger number of potential customers.[126]

Analyses of previously internal tobacco industry documents, product designs, and marketing campaigns show that tobacco companies have effectively segmented the tobacco product markets along each of these dimensions, developing brands that appeal to specific segments. Philip Morris USA's Virginia Slims brand, for example, has long been marketed to women, using messages focused on fashion, independence, emancipation, thinness, and as a contrast to "men's cigarettes."[127] Specific brands have also been designed and marketed to appeal to other demographic groups, including youth, racial and ethnic populations, and gay men.[128–132]

Governments have adopted various policies that have the potential to limit brand proliferation. For example, as described in chapter 8, 114 WHO Member States have banned misleading descriptive terms such as "light" and "mild" for manufactured cigarettes,[133] and this practice may reduce the variety within a given brand family. Restricting the use of flavors can also reduce the variety of products available within a given brand family. Brazil's product regulation scheme, which requires manufacturers and distributors to pay an annual registration fee for each brand, raises the costs of brand proliferation to tobacco companies, but these costs would likely need to be substantial in order to significantly reduce brand proliferation. Uruguay has taken the most direct approach to limiting brand proliferation by allowing companies to sell only one variety of a given cigarette brand, a component of its product regulation scheme that was challenged by Philip Morris International (PMI) as a potential violation of the bilateral investment treaty between Uruguay and Switzerland, where PMI is based. On July 8, 2016, an international arbitration tribunal ruled against PMI and upheld Uruguay's limitations on the number of variants of cigarette brands (as well as the country's requirement that pictorial warning labels cover 80% of the front and back of cigarette packages).[134]

Summary

Tobacco is grown in 124 countries, but by far the largest proportion of tobacco (92% in 2013) is grown in LMICs; more than 40% of the world's tobacco is produced in China alone. Tobacco farming accounts for only a small share (<3%) of the global tobacco market. Tobacco growing, a very labor-intensive process, is believed to provide income to millions of families in the major tobacco-producing countries, although reliable estimates of the number of people involved are difficult to obtain.

Tobacco growing and manufacturing are increasingly concentrated in LMICs, but the higher value phases of the tobacco value chain increasingly take place in a small number of highly profitable MTCs, largely based in HICs. Additionally, the global tobacco leaf market is dominated by large multinational tobacco product manufacturers and leaf traders. Recent trends in the organization of the tobacco leaf production and marketing chain, including use of integrated production systems, have expanded these multinational corporations' control over price and other factors while making farmers increasingly dependent.

The manner and extent of government intervention in tobacco growing vary considerably from country to country. Historically, in HICs, particularly in the United States and the EU, efforts to support tobacco growing mainly relied on tobacco price supports. In LMICs, where tobacco can be an important source of foreign exchange and tax revenue, support programs are less focused on guaranteeing minimum prices to tobacco farmers and more concerned with restricting imports and improving infrastructure facilities that support expansion of tobacco-farming activities.

The global trend toward reducing or eliminating tobacco subsidies and price supports in HICs has significantly affected international production and trade patterns. Specifically, production has dropped in HICs that have phased out price supports, such as the United States, Canada, and traditional producing members of the EU like Greece and Italy. At the same time, tobacco production has increased in China, Brazil, Argentina, and in the three main producing countries of Africa—Malawi, Zimbabwe, and Zambia. In response to the declining production of good quality leaves in HICs, some of the main producers in LMICs have improved the quality of leaf they grow and have received increased farm gate prices.

There is a consensus that helping small farmers switch from tobacco to alternative crops can be a useful part of sustainable local economic development programs and can help overcome barriers to adopting and implementing strong tobacco control policies. Implementing successful crop substitution and diversification programs and supporting farmers' transition to alternative livelihoods require an understanding of the characteristics of tobacco-farming systems in producing countries and of the linkages between growers and tobacco companies. Tobacco is an expensive crop to grow, but so too are most high-value alternative crops. Research has shown that there are viable alternatives to tobacco farming, but these tend to be specific to individual countries and regions. Building new, and hopefully better, support systems for other crops is a clear challenge for diversification programs. It will take time for these systems to emerge, and any successful transition from tobacco will likely be a gradual process.

Tobacco product manufacturing is another key component in the tobacco supply chain and a major determinant of the impact of tobacco on public health. Since the mid-19th century, cigarettes have undergone significant changes in design. Modern cigarettes have been extensively engineered to include the use of additives and design features to deliver nicotine as efficiently as possible. These product changes have contributed to increased tobacco use and have created market power for the innovating firms. Some product design changes have been made in response to the public's increasing awareness of the health consequences of tobacco use, while others have been made to appeal to more consumers or to reduce manufacturers' costs. Product innovations likely contributed to attracting new users and may also have led some smokers, who would otherwise have quit, to continue to smoke. During the first decade of the 2000s, new products have emerged in the United States and elsewhere, including ENDS.

In the past, the evolution of cigarettes and other tobacco products in the United States and elsewhere has occurred in the absence of regulatory authority; as a result, these changes have sometimes harmed public health. A key goal of tobacco product regulation is to ensure that future changes in tobacco products benefit public health. Effective interventions for tobacco product regulation face many challenges, given the variety of tobacco products, the diversity of the tobacco industry, and the difficulties in assessing the health impact of the constituents and emissions of tobacco products. These challenges are likely to be greater in LMICs, where technical capacity is more limited and resources scarce. Given these challenges, the sharing of research and other information across countries, as well as the scientific and technical cooperation called for in Articles 21 and 22 (Article 21: Reporting and exchange of information; Article 22: Cooperation in the scientific, technical, and legal fields and provision of related expertise) of the WHO FCTC will be particularly important in advancing tobacco product regulation. The optimal policy response in a rapidly evolving market of tobacco products remains an area for further study.

Despite these challenges, it is clear from past experience with changes in tobacco product design that tobacco product regulation is a necessary component of a comprehensive tobacco control strategy. To date, however, few countries have adopted wide-ranging product regulations, although many have adopted policies that narrowly regulate some aspects of tobacco product design or availability. Product regulation can be expected to advance in the coming years as Parties to the WHO FCTC further develop and implement guidelines on Articles 9 (Regulation of the contents of tobacco products), 10 (Regulation of tobacco product disclosures), and further implement Article 11 (Packaging and labelling of tobacco products).

Research Needs

Tobacco growing, product manufacturing, and tobacco product regulation are the focus of a number of ongoing research needs. These three subjects have received limited research to date compared with other aspects of tobacco control, and increased research attention to these areas is important, especially in LMICs. Research on the economics of tobacco growing, including issues such as the profitability of tobacco farming and the structure of the leaf-buying industry and value chains, is needed in order to understand the impact of tobacco production on countries. Research is also needed on the potential adverse effects of tobacco growing on the health of farmworkers, the environment, and farmers' livelihoods, and on potential alternatives to tobacco growing in various contexts. The development of a general analytic framework aimed at providing guidelines for implementing crop diversification and substitution programs in LMICs is an important research priority.

The diversity of tobacco products in use around the world, as well as the introduction of new products such as ENDS, poses challenges for product regulation. A greater understanding of the characteristics of new and emerging products, including their addictive potential and their harmful constituents, would inform regulatory efforts. It is essential to document and learn from the experience of countries such as Brazil, Canada, the United States, the United Kingdom, and others as they put in place new regulations for tobacco products. Research evaluating comprehensive product regulation strategies, including their impact on patterns of tobacco use and health outcomes, would inform the evolution, adoption, and implementation of future regulatory actions.

Conclusions

1. In 2013, ten countries accounted for most of the world's tobacco leaf production (80%); China alone produced more than 40% of the world's tobacco leaf. Tobacco is increasingly grown in low- and middle-income countries, and many of these countries export a large proportion of the world's tobacco leaf.
2. In the past, governments have sought to control price and quantity in the tobacco leaf market through quotas and pricing restrictions and to provide technical assistance to tobacco growers, along with other agricultural producers. Although most high-income countries have reduced or eliminated subsidies for tobacco growing, many low- and middle-income countries still provide support for the tobacco-growing sector.
3. The vast majority of workers in the tobacco production chain are tobacco farmers doing highly labor-intensive work on small family farms, which are increasingly located in low- and middle-income countries. In contrast, cigarette manufacturing—the higher value phase of the chain—is highly mechanized and dominated by a few large multinational corporations largely based in high-income countries.
4. Tobacco growing is relatively profitable, but farming of other crops has the potential to be as or more profitable than tobacco growing. Alternatives to tobacco growing tend to be highly specific to a country or region. Policies that encourage crop diversification or substitution are useful as part of a comprehensive tobacco control strategy, but alone they will have little impact on tobacco use.
5. Changes in product design—often made in response to consumer concerns about the adverse health consequences of tobacco as well as to reduce costs to the manufacturer—have likely contributed to increased tobacco use.

6. Product regulation is a rapidly developing component of a comprehensive tobacco control strategy. Regulation of tobacco products is a highly technical area, which poses many challenges for regulators, including challenges relating to the diversity of products, the ability of the tobacco industry to respond quickly to changing market conditions, and the need for sufficient capacity for testing and enforcing regulatory measures; addressing these issues is likely to be particularly challenging for low- and middle-income countries.

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