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Agricultural and food policy for cardiovascular health in Latin America

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Summary
Background: As the prevalence of cardiovascular diseases has increased worldwide over the past 30 years, the agricultural sector has undergone marked and important changes. This paper asks whether these changes are linked to the development of dietary patterns associated with cardiovascular and other diet-related chronic diseases.
Methods: Data on agricultural production are collated and presented, and the literature on agricultural policy in Latin America reviewed and synthesized.
Results: Globally, agricultural production has risen for all major food groups in the past 25 years, but the rate of increase has been much faster for foods associated with cardiovascular and other diet-related chronic diseases, both in negative and positive directions. Latin America is a major producer of vegetable oils, meat and fish, and also of sugar and fruit. Agricultural policy in the region underwent a major paradigm shift in the early 1990s, moving from production-led to market-led policies as part of globalization. The food-consuming industries (distributors, manufacturers, processors and retailers) played a key role in this dynamic. Case studies from Brazil, Colombia and Chile show that these agricultural policy changes are linked to changing consumption patterns of soybean oil, chicken and beef, and fruit. Thus by facilitating greater consumption of specific foods, these changes in agricultural production and policy can be linked with the ''nutrition transition''. They also reflect a response to changing food demand.
Conclusions: Agricultural policies can affect the relative availability and price of different foods relative to others. Changes in agricultural production and policies can therefore be associated with dietary changes; historically, these have had both positive and negative implications for cardiovascular health. Governments in Latin America could use agricultural and food policies to promote cardiovascular health by creating incentives for the agricultural sector and the food-consuming industries to produce a food supply aligned with dietary guidelines.

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Introduction

As the prevalence of cardiovascular diseases (CVD) has increased worldwide over the past 30 years, the agricultural sector has undergone marked and important changes. Agricultural production patterns and agricultural policies have been transformed as a result of actions by governments, international organizations and the private sector. This paper asks, with specific reference to Latin America, whether these changes are linked to the development of dietary patterns associated with cardiovascular and other diet-related chronic diseases i.e. as the ''nutrition transition'' [1,2]. The paper also suggests ways in which agricultural and food policies could be reoriented to support the goal of promoting healthier diets and preventing diet-related chronic diseases in the region.

Changes in agricultural production patterns and policies

Changing agricultural production patterns

Globally, agricultural production has risen for all major food groups in the past 25 years, but the rate of change has been different between food groups: the rate of increase has been much faster for foods associated with diet-related chronic diseases. This applies both to the foods negatively associated with CVD, e.g. fats from meat and vegetable oils and those positively associated, e.g. fruits and vegetables. Worldwide, cereals are the largest crop group, but production has been growing at an average annual rate of just 1.1% since 1982 (Table 1a).

Table 1a Rate of increase of agricultural production, Latin America and world, 1982–2002

Food product	Annual percentage rate of increase of production, 1982–2002	
	World	Latin America and Caribbean
Cereals	1.1	1.5
Fruit	2.4	2.4
Vegetables	4.2	3.4
Meat	2.8	3.8
Fish	2.4	4.2
Oilcrops	3.8	6.0
Sugar, beet and cane	1.4	1.9
Milk and Eggs	1.4	2.6
Average rate	2.5	3.3

Source: calculated from [3].

In contrast, vegetable production grew at an average annual rate of 4.2% between 1982 and 2002, followed by oilcrops at 3.8%, meat at 2.8% and fish at 2.4%.

The rates of change become more distinctive from a regional perspective. Production growth has been led by Asia, most notably China, but Latin America has also been a major source of growth of vegetable oils, meat and fish. Between 1982 and 2002, Latin America was the second fastest oilcrop-growing region, particularly of soybean oil (6.0% annual growth relative to 6.6% in Southeast Asia, where palm oil dominates). Latin America is a major meat producer, registering an annual growth rate of 3.8% between 1982 and 2002. Production, which is mainly for domestic markets, is largely concentrated on beef, but production has increased far faster for poultry over the past two decades (Fig. 1). The Latin American and Caribbean region has long been the world's largest producer of sugar, and now accounts for almost 50% of world sugar production (Table 1b). Growth of sugar production has been relatively modest in the past two decades, though it was significantly faster in the 1990s (3.0% per year) relative to the 1980s (1.6% per year). As a region, Latin America and the Caribbean are also significant producers of fruit (Table 1b). Leading products are citrus fruit, bananas, grapes, pineapples, apples and mangoes [3]. Significant amounts of fruit are exported: Costa Rica, Colombia, Ecuador, Guatemala, Honduras, and Peru are major exporters of bananas while Mexico, Argentina, Brazil and Chile are major exporters of grapes, mangoes, melons, and frozen orange juice concentrate.

Overall, due to its enormous latitudinal range, varied topography and rich biodiversity, the Latin American and Caribbean region has one of the most diverse and complex ranges of farming systems in the world [4]. In 2001, 22% of the region's population was directly involved in agriculture.

Changing agricultural policies

The past sixty years have been characterized by two major agricultural policy paradigms.

The post-1940s era was characterized by the emergence of what Lang and Heasman [5] term the ''productionist paradigm''. Agriculture commercialized, intensified and industrialized, harnessing science and technology to produce as much of the key commodities as possible (staples in low and middle income countries; staples plus meat and dairy in high income countries). These changes were linked to consumption concerns, namely food shortages, regional and national food

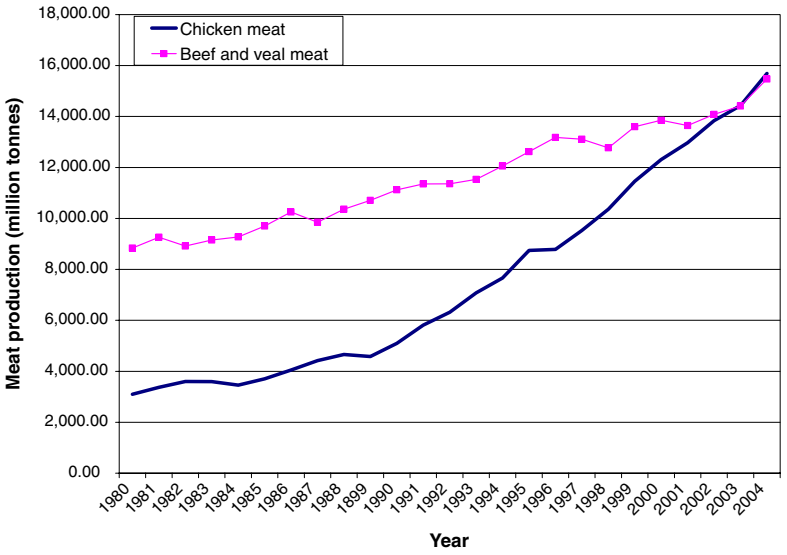

Figure 1 Production of chicken and bovine meat in Latin America, 1980—2004.

Table 1b Total production of key crops, Latin America and world, 2000/2002

Food product	Total production, 2000/2002, million metric tons	
	World	Latin America and Caribbean (% of world total)
Cereals	2068.4	142.3 (7%)
Fruit	474.1	97.8 (21%)
Vegetables	778.1	35.0 (4%)
Meat	240.7	33.1 (14%)
Fish	131.5	19.3 (15%)
Oilcrops	112.1	17.3 (15%)
Sugar (cane and beet)	1207.2	561.3 (46%)
Milk and eggs	648.8	65.6 (10%)

Source: calculated from [3].

insecurity, famine and chronic undernutrition. However, the policies were essentially production focused, based on the assumption that food consumption, diets and nutrition would automatically be enhanced by greater food production.

Implementation of the paradigm varied between regions. In North America and Europe, agricultural subsidy programs, including export subsidies, were put in place with the objective of raising agricultural productivity, while also improving income levels for farmers and stabilizing market prices [6]. In the developing world, production increased largely as a result of policies supporting agricultural research, technology and commercialization. This was the era of the ''Green Revolution'' — public investment in high-yielding crop breeds and intensive farming methods, and government subsidies for inputs (irrigation, fertilizers). In Mexico, where the Green Revolution commenced, dwarf wheat varieties introduced in the 1950s led to a threefold increase in yield by the 1970s [7]. Subsidies and new technology helped increase irrigation by 71% during the same time period, and fertilizer use increased by more than 20-fold. Further forms of state intervention such as government procurement of agricultural outputs by state marketing boards aimed to stabilize prices while quotas and tariffs aimed to protect domestic markets [8].

Yet, at the same time, quite unlike the policies directly protecting farmers in Europe and North America, policies in many developing countries tended to ''discriminate'' against agricultural producers (often termed a ''tax'' on agriculture) [8]. Low food price policies, income and land taxes on agricultural producers, and export taxes on food, aimed to use the food and income produced by agriculture to stimulate industrial growth in the cities [9,10]. Agriculture was seen primarily as fuel for industrial growth rather than as a source of growth in itself. There was, however, variation between countries: whereas Argentina and Ecuador taxed agriculture, Brazil and Chile protected it [11].

Despite these developed and developing world differences, the objective was the same: national or regional self-sufficiency, i.e. domestic/regional production for domestic/regional consumption, a strategy sometimes termed ''import substitution'' because it favored domestic production over imports.

As Lang and Heasman point out, production-led agriculture was spectacularly successful in its own

terms [5]. Yields increased hugely between 1950 and 1980. But the paradigm also proved problematic. Producer-led polices in the EU and North America generated surpluses, damaging the international market for agricultural products from developing countries. In the developing world, while agricultural growth rates in Latin America and Asia exceeded population growth, per capita food output in Africa declined [12]. In the 1970s, a crisis in food production saw production levels plummet. Concerns were raised by the international financial institutions that agricultural policies were reducing incentives for productivity growth and creating economic ''inefficiencies'' [8]. And perhaps most importantly, the policy paradigm was not solving nutritional concerns, with millions still experiencing undernutrition and food insecurity, and the burden of diet-related disease beginning to rise.

As these concerns were emerging, an important political, economic and ideological shift was taking place in the global macroeconomy: ''economic globalization''. In this context a new paradigm emerged for agricultural policy: the market-led paradigm. International institutions, backed up by the theoretical support of neoclassical economics and the vocal support of the agrifood industry, favored the development of a more market-oriented, economically efficient, competitive agricultural system — a *global* (rather than a domestic or regional) system that would lower the costs of production, produce a more consistent food supply, and lower the price of food. Like the production paradigm, consumption concerns also played a role: the assumption was that an agricultural sector more responsive to market demands would more efficiently provide more food for more people, i.e. consumption decisions should influence agriculture, rather than the other way around. To implement this paradigm developing countries opened up markets by dismantling state intervention mechanisms (such as marketing monopolies), reducing input subsidies, e.g. on fertilizers, and lowering barriers to trade and investment (Table 2). Wealthier developing nations also reduced discriminatory policies against the agricultural sector, though it is important to note that the market-led policies tended to discriminate against smaller relative to larger farmers. As a region, most Latin American and Caribbean countries actively implemented the market-led paradigm in the early 1990s, embarking on internal market and trade liberalization programs, typically eliminating and reducing state marketing boards, trade quotas, and export taxes [11].

The pace of change speeded up in the mid-1990s following the Agreement on Agriculture (1994), an international agreement forged through the General Agreement on Tariffs and Trade (GATT), which pledged countries to reduce tariffs, export subsidies and domestic agricultural support. The foundation of the World Trade Organization (WTO) in

Table 2 Changing agricultural policy paradigms, from production- to market-led

	Production-led paradigm (1940s—1970s)	Market-led paradigm (1980s—present)
Context	Growing populations, hunger, malnutrition	Continuing malnutrition yet rising food surpluses
Aim	Increase food production while protecting domestic agricultural producers and markets	Increase efficiency by opening agriculture to market forces
Scale	Self-sufficiency for countries and regions	Global production for the global market (though implemented regionally & nationally)
Characteristic policies	Adoption of research & technology (high-yield crop breeds, fertilizers, irrigation)	Removal of fertilizer subsidies, introduction of patents on seed material, privatization of agricultural research
	Producer support e.g. agricultural subsidies	Privatization of state marketing boards; elimination of government procurement
	Use of state trading agencies, quotas and high tariffs to reduce trade	Removal of state trading agencies, quotas and tariffs to liberalize trade
	Export subsidies (developed countries) and export taxes (developing countries)	Reduction of export subsidies and taxes
	Agricultural ''taxes'' in developing countries	Reduction of agricultural 'taxes''

1995 consolidated this policy shift. The inclusion of agriculture in international rule-making placed pressure on Europe and North America to shift to a more market-led approach (like developing countries) by reducing their subsidy programs. These regions subsequently made some changes, but high levels of producer support still remain — a major source of contention in international development circles.

Linking changes in agricultural production and policies with cardiovascular health

The emergence of the market-led globalization of agricultural production and policy took place during the same period as the ''nutrition transition'' to diets associated with poor cardiovascular health. Are these two changes linked? And if so, how?

The link could be in one of the two directions. One the one hand, agriculture production could have influenced consumption: as agriculture began to supply proportionally more foods associated with CVD (as a result of policy changes), people began to eat proportionally more. On the other, consumption could have influenced agricultural production: as people began to demand more foods associated with CVD, agriculture began to produce more (facilitated by changes in agricultural policy). The first scenario assumes that the food supply influences demand, the latter that demand influences supply. In reality, it is a mix of the two. While consumers certainly create demand for their food preferences, supply also influences demand. The key link here is through food availability and prices: agricultural policy plays a role because it creates incentives and/or disincentives to the production of different foods, and therefore their relative availability and prices [13]. This happens because the agricultural policies described above do not apply uniformly to all foods. Thus, as put by Nugent [14], ''both producer and consumer choices are important determinants of diet'' (p. 201) and the link between agriculture and diet is bidirectional, as depicted in Fig. 1.

The dramatic growth of the ''food-consuming industries'' was central to the emergence of this bidirectional linkage. As the market-led paradigm established its prominence, these industries — food distributors, manufacturers, processors and retailers — became more important consumers of primary agricultural products relative to the final ''eaters''. Facilitated by the market-oriented policy regime with less state intervention, these food-consuming industries assumed control of the food supply chain, vertically integrating by buying up companies, products and services and developing contracts with agricultural producers (for more detail see Hawkes [15]). Most of these industries became transnational food companies (TFCs), and their increased power allowed them to make demands from agricultural producers based on their own set of preferences, while also being influenced by what agriculture could supply most cheaply. Agricultural production thus became subordinated to the demands of the food-consuming industries, and, as put by Friedmann, ''instead of crops destined for the kitchen pot, agriculture increasingly supplied raw materials to the food processing industry for the production of durable foods'' [16, p. 66].

This dynamic means that the bidirectional link between what is produced by agriculture and what is eaten by consumers is strongly mediated by the food-consuming industries (Fig. 2). It is not simply a case of supply from agriculture and demand from consumers, but demand and supply from the food-consuming industries. These complex and dynamic links between agricultural policy, the food-consuming industries and food consumption are well-illustrated by three of the regions largest and most dynamic agricultural products: soybean oil, meat and fruit.

Case studies

Production of soybean oil in Latin America has soared in recent years (Table 1a), and accounts for 90% of all vegetable oil consumption [17]. But the really dramatic increases in production began in the early 1970s as the direct result of a policy choice to support soybean production.

Brazil presents a good example. In the 1970s, public funding for soybean breeding, guaranteed minimum price supports, production and marketing credit programs, agricultural subsidies, public infrastructure programs and supportive energy and taxation policies were all used to promote production [18]. These policies were implemented for a range of reasons. Owing to a balance of payments problem, the government wanted to promote soybean exports. The government also wanted to keep the prices of soybean oil low (given its influence in the calculation of Brazil's consumer price index), stimulate the growth of a domestic food processing industry, and reduce the amount of foreign exchange reserves spent on importing vegetable oils [18]. These changes stimulated huge increases in

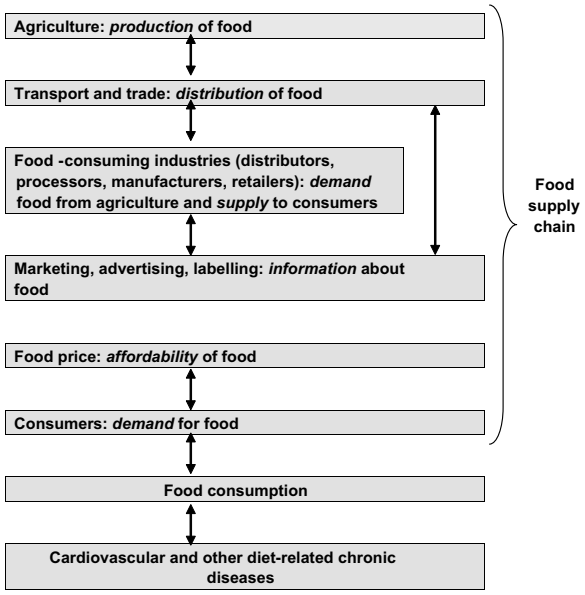

Figure 2 The food supply chain: the bidirectional link between agriculture and diet-related chronic diseases.

the production of soybean oil, produced increasingly on large farms, which emerged producing under economies of scale. Consumption was further promoted through lower prices and the use of advertising.

Between 1969 and 1981, soybean oil production increased by 27 times, from 99,157 metric tons to 2,630,000 (Fig. 3) [3]. Calorie availability from soybean oil per capita grew by 10 times, from 25.9 to 247.3 kcal per capita per day. Actual food consumption statistics from that time suggest a substitution of animal fats (lard, bacon, butter) by vegetable oils and margarines. According to Sawaya et al. [19], the overall effects of these changes on population health was positive, with the exception of an excessive increase in the total lipid content of the diet in the southeast of the country, which was close to 30% (the maximum level recommended by the WHO) by 1988.

Production stabilized somewhat in the 1980s but was soon stimulated once more by government policy. The government instituted a series of market-led reforms in the early 1990s, which opened up the soybean oil market and further encouraged production (Fig. 3). Yet this did not have the effect of stimulating domestic production; rather, greater production enabled greater consumption in export markets, such as China and India [15]. The policies

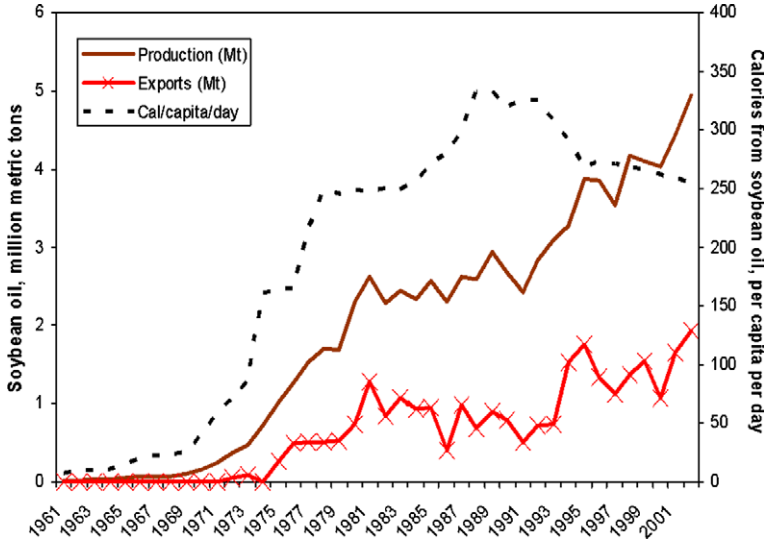

Figure 3 Soybean oil production, consumption and exports in Brazil: 1961—1989.

also resulted in the growth of foreign investment, and the importance of the processing industry — a consumer of soybeans — grew. In 1993, the transnational Cargill constructed a manufacturing plant to provide the growing food processing industry with hydrogenated fats. In contrast to the shift away from animal fats to soybean oil — a healthy transition from a cardiovascular perspective — this represented the introduction of a fat known to damage cardiovascular health, owing to the presence of *trans* fats in hydrogenated oils.

The second negative side to the growth of soybean oil was excessive consumption. Today, the three leading companies — Bunge (*Soya* brand), Cargill (*Liza* brand) and ADM (*Sadia* brand) — all compete for consumer spending through aggressive promotions as a means of encouraging greater consumption, especially among lower income groups [17].

Meat presents a second example of the link between agricultural production, policies and diet. Since the 1980s, chicken production and consumption have grown at the expense of beef (the meat traditionally consumed in most of the region) in the majority of Latin America. As shown in Fig. 3, chicken production now almost exceeds that of beef. In just 14 years (1990–2004), chicken production more than doubled on average, whereas beef production increased by around 20% (Table 3). Consumption followed the same trend: available calories from chicken almost doubled, whereas they declined from beef (the difference between production and calories available for consumption reflects imports and exports). This shift in production and consumption patterns reflects increasing consumer preference for chicken, partly because it is perceived as a healthier meat. But the shift in preference was likewise facilitated by changes in policy and technology.

An example comes from Colombia, where the poultry industry is particularly dynamic and chicken prices have declined sharply relative to beef. Chicken is now sold at half the price of either beef or pork, thus providing strong incentives for increased consumption [20,21]. Two government policies, combined with actions in the private processing sector had particularly strong effects on the price of chicken: investments in technology and infrastructure, and trade liberalization. Investment in technology and infrastructure to promote productivity in new breeds, feeds and (intensive) production facilities began in the 1980s under production-led policies aimed at modernizing the agricultural sector [22]. Echoing changes in the other major chicken producing countries, chicken productivity increased significantly, spurred on by the chicken processing industry in search of lower input prices of chicken for their processing plants [23].

In the shift towards a market-led paradigm in the early 1990s, a new government then implemented a market liberalization program, known locally as ''Apertura'' or ''Opening'', which, among other measures, relaxed imports on feed ingredients and reduced import duties [22]. Corn for animal feed flooded in at very low prices from the United States, which, according to industry analysts ''sharply lowered production cost and promoted growth in broiler and egg output'' [24, p. 1]. In general, the price of chicken is strongly influenced by feed prices. From almost zero in the late 1980s/early 1990s, corn imports rose to 1553 tons in 1995/97 and 2023 tons in 2002/04 [25]. Chicken producers are now also concerned that the recently signed free trade agreement with the United States will result in a flood of cheap chicken being imported. Although the system remains dominated by small firms, the industry is slowly heading towards increasing vertical coordination via produc-

Table 3 Chicken and bovine meat production and consumption in Argentina, Brazil and Colombia, 1990/1992 and 2002/04 (3-year average)

	Meat production (1000 tons)		Calories from meat/cap/day (kcal)	
	1991/1992	2002/2004	1991/1992	2002/2004
Chicken				
Argentina	381	741	51	73
Brazil	2622	7826	65	134
Colombia	364	679	35	56
Bovine meat				
Argentina	2903	2713	410	326
Brazil	4447	7381	114	141
Colombia	681	696	109	90

Source: [3].

Table 4 Exports of major fruits from Latin America to the United States, metric tons, 1989–2005

Year (3-year average)	Bananas	Pineapples	Grapes	Melons	Mangoes and guavas
1989/1991	3,070,454	71,257	294,034	No data	754
2003/2005	4,082,327	494,033	413,669	523,810	95,216

Source: [34].

tion contracts, resembling the structure of the poultry industry in the United States [20].

Increased consumption of chicken has positive aspects from a cardiovascular perspective, since chicken contains less saturated fat than beef. However, the rise of cheap chicken is associated with greater overall meat consumption – and the greater consumption of fast food. The fast food industry has grown rapidly in Colombia since the late 1980s, providing fatty chicken products targeted at affluent, e.g. *Frisby*, and low income consumers, e.g. *Avesco* [26]. In the past five years alone (2000–2005), the number of fast food outlets dedicated to chicken grew from 725 to 1083 [27]. Domestic chains dominate the market, although multinationals McDonald's and KFC are also present. All the fast food restaurants engage in heavy promotional activities to encourage greater consumption among children and adults.

A third case study comes from a quintessential healthy food – fruit. As already noted, the Latin American and Caribbean region is a leading fruit producer. Since the 1980s, fruit production has increased in line with the global average (Table 1a), yet consumption has not increased. In fact, Latin America is one of the lowest fruit and vegetables consumers in the world [28]. In Brazil, for example, the relative participation of fruits and natural fruit juices in total calorie consumption was just 2.4% in 2002/03, relative to 2.7% in 1987/88. In 2003, only 30% of Brazilian adults consumed fruit daily [29,30].

Likewise, in Mexico, fruit consumption has scarcely changed since 1989 (Leroy, personal communication). There is also a stark relationship between income and consumption. In Brazil, the highest income group class consumes 3.4% of their calories from fruits, relative to 0.6% for the lowest, and consumption is significantly lower in households with less education and fewer assets particularly in rural areas [29,30]. In Mexico, the amount of fruit consumed by the top quintile is at least twice the amount consumed in the bottom quintile (Leroy, personal communication). The situation is similar in the United States, where low-income groups spend consistently less on fruit relative to high income households [31]. Fruit consumption is on average 1.4 servings per day, compared with the recommended 4.0, and fruit consumption has only increased modestly since the 1980s [32–35]. Yet as a result of increased fruit exports from Latin America (Table 4), consumption of imported, relative to domestically produced, fruits in the United States has increased significantly, tripling from 6% in 1980 to 22% in 2000, and of fruit juices from 12% to 32% [36]. It is this consumption trend that has been affected by agricultural policies in Latin America, as indicated by the case of Chile. Chile is the leading fruit exporter in the southern hemisphere, most notably of grapes [37]. In the 1960s, the Chilean government laid the groundwork for fruit development through production-led policies, especially technological developments [38]. After the military coup of 1973, there was a radical policy shift. In line with the market-led paradigm, the government deregulated agricultural policy, privatized land ownership, provided more favorable conditions for foreign investment, liberalized trade, and cut labor costs through the dismantling of organized activity [38–40]. These policies were strengthened in the mid-1980s, with the provision of tax incentives to boost exports, increased investment in export-oriented agriculture and more provision to increase foreign investment [41]. Fruit was a major focus of these efforts [38]. The results were highly competitive exports, and unprecedented levels of private foreign investment in the fruit industry. Fruit exporters rather than producers, became the most important players in the supply chain [38,40]. At the same time, new cold-chain technologies[1], policy changes and investments in the United States also created a favorable regime for increased imports. Chilean fruit was actively advertised and promoted throughout the food supply chain to encourage purchase by retailers and consumers in the United States [42]. The result was palpable: fruit production exploded to become Chile's leading agricultural export, and the export value of the six main fruits increased from around $150 million in 1988 to $1200 million in 1996 [41]. With such success, farmers moved out of traditional crops for domestic use, which stagnated and declined, and into

[1] A cold-chain technology is one which allows a food product to remain cold when shipped over long distances, e.g. refrigerated transportation.

producing these non-traditional exports [39]. In the United States, groups of high socioeconomic status ate more Chilean fruit. In the meantime, the calories available for consumption from fruit in Chile increased from the early 1980s to the mid 1990s, but declined thereafter [43].

Discussion: using agriculture and the food supply chain to promote cardiovascular health

The case studies provided above show that:

(i) Agricultural policies can affect the relative availability and price of different foods relative to others. Technology has also played an extremely important role in altering the availability and prices of different foods, e.g. through plant and animal breeding, transport and processing technologies.
(ii) The paradigm shift to market-led agriculture, i.e. globalization, in the 1990s had a particularly rapid effect on the availability and prices of foods associated with CVD. Production-led agricultural policies can also be linked with dietary changes.
(iii) Major agricultural policies and technologies that promote increased production have facilitated increased consumption, but the link is often not direct, nor, owing to globalization, limited to the domestic market. In Brazil, for example, rising production of soybean oil in the 1990s did not lead to increased consumption domestically. Latin American is also a leading fruit producer, yet fruit consumption in the region is low. And while fruit exports had the effect of increasing the consumption of imported fruit in the United States, that did not lead to significantly higher overall fruit consumption. Rather, its effect was confined to the more educated, higher-income populations seeking healthy products.
(iv) Food industries, such as soybean oil and chicken processors, fast food chains, and fruit exporters, have become more important consumers of food, as have supermarkets. As a result of changes in agricultural policies, these food-consuming industries can now purchase cheaper foods from agricultural producers. This enables them to increase their profit margin, and/or lower prices for consumers. Both processes provide an incentive for them to expand their market for foods associated with CVD.
(v) Changes in agricultural production and policies can therefore be associated with dietary changes. As shown here, in the past these have had both positive implications for cardiovascular health, e.g. soybean oil replacing animal fats, chicken replacing beef, increased fruit production, and negative ones, e.g. excess soybean oil consumption, increasing consumption of chicken as ''fast food'', fruit produced for export rather than domestic consumption.

Given these linkages, can agriculture and the food supply chain be used to promote cardiovascular health? The answer must be yes (see also discussion in [49]) — but only through policies that target particular consumption shortfalls or excesses and take into account the specifics of the policy environment and the global nature of agricultural markets. Such policies must be complemented by those which affect consumer demand. Governments could use agricultural and food policies to promote cardiovascular health by creating incentives for the agricultural sector and the food-consuming industries to produce a food supply aligned with dietary guidelines. These do not have to be agricultural policies *per se*, but food policies targeting any component of the food supply chain that create signals to which agricultural producers can respond (Fig. 1). For example, mandatory labeling of *trans* fatty acids, implemented in the Mercosur countries, sends a signal to the oil processors to reduce their production of hydrogenated oil, which in turn, affects their demand from agriculture, and producer incentives [44]. Oil processors are already responding to consumer concerns about *trans* fats by developing new versions of soybean oil [45,46]. Taxing agricultural ingredients is another example. Following a trade dispute with the United States, Mexico imposed a tax on soft drinks sweetened with high fructose corn syrup (HFSC) — effectively a prohibitively high de facto tariff which made HFSC far more expensive than sugar [47]. Following the ruling, the Mexican bottlers of Coca-Cola soft drinks switched to 100% pure sugar to sweeten their drinks [48]. This does not have a positive health impact but indicates that food policies affect what producers produce and people consume.

Although these two examples did not intend to change the food supply, they had that effect. More targeted, health-oriented approaches, such as investing in fruit production for domestic markets while also educating consumers about the importance of consuming fruit should be a part of Latin

America's approach to improving cardiovascular health.

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