RESEARCH ARTICLE

Agrifood Vulnerability and Neoliberal Economic Policies in Mexico

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Abstract: This article studies the impact of neoliberal policies that have been implemented by the Government of Mexico from the 1980s on the food-base of the country. These policies have made the living conditions of large sections of the population precarious, making it harder for them to gain access to a diet that is sufficient, healthy, nutritious, and culturally acceptable. The article uses the concept of agrifood vulnerability to determine the social and environmental risks to which individuals, groups, sectors, and nations are exposed. This helps define the extent to which neoliberal policies provide, or do not provide, capacities and skills for individuals, groups, and nations to resist and recover from natural, economic, and social threats. These threats can put sustainable production and the access to food by present and future generations to risk. The concept of agrifood vulnerability can thus be used also to analyse the discriminatory food policy that prevails on a national and global scale.

Keywords: Mexico, neoliberal policies, vulnerability, food and agricultural policy, food security, food regimen, agrifood vulnerability.

The term "food security" has been widely debated in national and international forums ever since it was used at the World Food Conference of 1974, because of the wide range of meanings it encompasses (Maxwell 1996). In place of "food security," this article will use the term "agrifood vulnerability" to evaluate the results of Mexico's agricultural policy over the last 20 years. The term "food security" suggests an ideal state of development, whereas most persons, particularly in the developing countries, experience some form of food insecurity, and international efforts to relieve that insecurity have not shown adequate results. The term "food security" has, in this view, prevented a critical understanding of the problem (Beck 1992); further, it does not allow for the formation of a shared responsibility in taking effective action to deal with it.

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Defining Agrifood Vulnerability

Agrifood vulnerability is defined as a situation in which

> countries, social sectors, groups and individuals are exposed to or are liable to suffer hunger, undernourishment or sickness through not having sustained physical and economical access to sufficient nourishing food that is culturally compatible, or through consuming unsafe or contaminated products (H. González and Macías 2007, p. 48).

This definition uses elements proposed by the United Nations Food and Agriculture Organisation (FAO 1974; FAO 1996).

To establish whether a particular population is "agrifood vulnerable" (Blaikie *et al.* 1996, pp. 33–6), continually changing historical processes are studied over time in order to evaluate the weight and duration of natural and social factors that lead to social vulnerability. It helps, therefore, to situate vulnerable populations spatially and socially, and to classify them by age, gender, and health (including physical or mental disabilities), and by ethnicity and social class. Such socio-spatial specifications should take into account the risks or threats to which each social group may be subject, and its capacity to respond and recover (Moser 1996, p. 24). It is also necessary to consider the combination of disadvantages that prevents a group from using its economic and social resources to deal with situations of risk and to recover from them (M. González 2006; Van Ginneken *et al.* 1979).

Studying agrifood vulnerability requires an integrated perspective. On the one hand, we must consider the agrifood system as a whole (production, distribution, and consumption) with a focus on its inter-relatedness with the ecosystems in which food is produced (H. González 2014). On the other hand, vulnerability occurs within a given food regime (Friedmann and McMichael 1989) that determines the limits and the opportunities of actors in the agrifood system (Adger 2006). The conditions of risk, as we shall see in the course of this article, are environmental, economic, and social.

The study of vulnerability acquires greater significance when we examine its causes. This carries us further than defining and characterising situations of risk, and the capacity of individuals and collectives to deal with and recover from them (Ribot 2014, p. 670). It is necessary to consider the causal networks that converge in situations of crisis (Adger and Kelly 1999). Moreover, the causes of vulnerability have to be identified in natural phenomena (whether anthropogenic or not), patterns of socio-economic organisation, and even, as this article will attempt to show, those of an ideological nature that guide the public policies of nation-states. To address this, it is useful to conduct a multi-scale and multi-factor analysis that studies "network political ecology," and determines the "connectivity" between political and ecological processes (Birkenholtz 2012). Studying power relations in a society can

account for the ways in which the conditions of social vulnerability of specific sectors and groups are maintained. Finally, such an approach allows for an analysis of the human agency of groups and classes resisting and transforming structural conditions of power, thereby changing the conditions of their vulnerability (*ibid.*).

A study of the causes of agrifood vulnerability involves an inter-disciplinary approach. It must incorporate conceptual and methodological contributions from the natural and social sciences, and from traditional knowledge systems that conserve genetic diversity. These systems have a great wealth of experience for dealing with current food and environment crises (Francis *et al.* 2008; Nicolescu 1996; Toledo and Barrera-Bassols 2008).

This article will study the relation between agrifood vulnerability and the neoliberal policies of the Mexican state from the 1980s onwards. These policies are the anthropogenic cause of agrifood vulnerability that have made the living conditions of large sections of the population insecure, making it hard for them to gain access to an adequate, nutritious, and culturally appropriate diet. The article examines state initiatives and failures that have put to risk the food production system for current and future generations. From this perspective, the study of agrifood vulnerability allows us to evaluate the discriminatory food policies that prevail in countries such as Mexico at this stage of global capitalism. The sweeping and radical application of neoliberal policies in Mexico (Cameron and Tomlin 2002; Puyana *et al.* 2008) makes it a suitable example for evaluating the effects of such policies.

The International Context of Mexico's Neoliberal Policies

After changes effected in the food and agricultural policy of Mexico in the mid-1980s, the production of adequate quantities of food for the population was no longer an important goal. This shift in the country's development paradigm was directed by a new bureaucratic elite (Babb and Babb 2004) and transnational corporate interests (Robles 2012). It was accompanied by encouragement from the International Monetary Fund (IMF), the World Bank, and the World Trade Organisation (WTO) to Mexico and other developing nations to adopt free trade policies and reduce state participation in the economy (McMichael 2005). Agricultural policy was designed, justified, and evaluated on the basis of the new paradigm, which gave greater weight to agricultural and livestock productivity and competitiveness in the international market. These criteria were used to make changes in institutional regulations that would remove trade barriers. This path became the principal strategy of "development." Economic, social, and regional inequalities, and the environmental degradation accompanying agricultural intensification and monoculture for exports, were considered to be "externalities," or transitional pains to a new world economic regime (H. González 2014).

Two events marked the new economic and commercial orientation of the country. The first was Mexico joining the General Agreement on Trade and Tariffs (GATT) in 1986. As a result, there was an abrupt reduction in the number of customs restrictions and tariff barriers without corresponding policy support for sectors that found it difficult to face international competition. The second was the signing, in 1994, of the North American Free Trade Agreement (NAFTA), which was negotiated without accounting for preferential treatment to compensate for the enormous economic and agricultural inequalities between Mexico and its northern neighbours, or without gaining the effective participation of all productive organisations of agriculture and livestock (Cameron and Tomlin 2002).

Unlike the developed countries of the north (such as the United States, the European Union, and Japan), the Government of Mexico slashed the budget for the farming sector in real terms, on the premise that the agriculture sector would witness more efficient development alongside a free market.

In 1981, the expenditure of the federal government on agriculture, livestock, and fishing was 1.37 per cent of Gross Domestic Product (GDP), whereas this sector contributed about 6.5 per cent to GDP and employed a quarter of the population (SHCP 2014). With the economic crisis of the 1980s, the budget for farming was reduced to 0.36 per cent of GDP in 1999 and raised only slightly to 0.53 per cent in 2015 (*ibid.*). In 2015, the food sector accounted for 3.2 per cent of GDP (INEGI-BIE 2016a). The smaller share of the food sector in GDP has led – in Mexico as in other countries – to undervaluing its contribution to the well-being of the population. This has undermined the strategic value it was formerly seen as possessing, at a time when national security was linked to "food security" as a clear objective of state policy.

Another strategy adopted by the federal government was to make agriculture follow "market forces."[1] This involved shutting down and privatising nearly all semi-state (parastatal) companies and institutions providing support to the agriculture and livestock sector, whether in production (for example, Mexico Fertilizers – FERTIMEX and the National Rural Credit Bank) or sales (such as the National Company of Popular Subsistence – CONASUPO).

Further, credit to farming was reduced from an average of 214.9 million pesos per month (mpm) between 1990 and 1994 to only 30.8 mpm between 2006 and 2010, and 45.2 mpm between 2011 and 2015 (indexed to December 2010 prices) (Table 1). Thus, the average monthly value of credit to farming in 2015 was 75 per cent less than in 1995.

[1] Changes to economic and agricultural policies do not imply, as is commonly stated, "deregulation," but "neo-regulation." Pechlaner and Otero (2010, p. 180) use this term to note that the state imposes the market as a self-regulating mechanism while guaranteeing property rights with respect to the biotechnological developments of big global corporations.

Table 1 *Credit to agriculture, livestock, forestry, and fishing* in pesos and per cent

Period	Monthly average (in million pesos at December 2010 prices)		
	Commercial banks	Development banks	Total
1983—90	74,175	89,929	164,105
1990—94	157,773	57,138	214,911
1995—2000	110,467	38,434	148,901
2001—05	34,229	16,664	50,893
2006—10	30,386	483	30,869
2011—15	43,882	1,309	45,191
	Average annual rates of growth of credit to agriculture (in per cent)		
1983—90	11.1	−3.5	3.5
1990—94	17	−3.8	10.5
1994—2000	−13.6	−9.9	−12.8
2000—05	−15.4	−46.5	−19.8
2005—10	4.2	−31.3	3.5
2010—15	8.6	74.9	9.5

Note: The figure for commercial banks includes loans granted by foreign agencies.
Source: For the periods 1983–1990 and 1990–1994, see Yunes-Naude (2002); for the other periods, see Banco de México (2016b).

The drastic reduction in the amount of credit given by development banks to farming can be attributed to the gradual disappearance of most public institutions that provided such credit (Yunes-Naude 2002, p. 7). Between 1991 and 1994, the privatisation of commercial banks encouraged private lending to agriculture (Table 1); however, with the Mexican financial crisis in 1995 there was a reduction in credit, especially to the farming sector (Reyes and Martínez 2000, p. 25). In 2005 a slight recuperation began, but the level did not return to the amount provided in the 1980s.

Added to the negative consequences of reducing credit was the fluctuation in government support for agricultural and livestock producers, which created uncertainty and affected the stability of companies (Table 2). On average, domestic support to producers in Mexico is below what is provided in the European Union (EU), and by Mexico's principal trading partners, Canada and the United States. In the United States, which is the main supplier of agricultural and livestock imports to Mexico, subsidies to producers went up during the 1990s, while in Mexico, they fell. Interest rates also went up in Mexico, causing great financial instability (Garrido and Leriche 1998). This meant unfair competition for Mexican producers and undermined their productive capacity, and caused a large number of agricultural and livestock firms to go bankrupt between 1993 and 1996 (*ibid.*).

Unlike the WTO, NAFTA did not establish any mechanism to discipline subsidies; as a result, the Government of Mexico had no effective instrument to protect its producers. In a study of the commercial relations between Mexico and the United

Table 2 *Average subsidies to agro-producers as a proportion of the value of production* in per cent

Period	Mexico	USA	Canada	EU	OECD
1986—90	14.0	32.9	48.7	44.8	45.9
1991—95	28.7	28.0	36.8	46.8	45.4
1996—2000	20.6	33.9	24.0	45.9	44.4
2001—05	22.2	33.1	30.1	44.1	41.7
2006—10	17.0	23.8	24.7	32.6	31.8
2011—13	15.5	20.6	19.5	25.9	27.2

Note: EU stands for European Union and OECD stands for Organisation for Economic Cooperation and Development.
Source: Producer and Consumer Support Estimates (OECD 2015).

States, Wise (2009, pp. 2–3) found that between 1997 and 2005 the United States exported agricultural products to Mexico at a price lower than the cost of production, which could be classified as "dumping" by the WTO. The study covered maize, soybean, wheat, rice, cotton, beef, pork, and poultry. This practice cost Mexican producers USD 12.8 billion (at constant 2000 USD). Producers of maize, in particular, were the worst affected, suffering a loss of USD 6.6 billion (*ibid.*) as estimated by this author.

We can distinguish three kinds of agrifood vulnerability. The first is a consideration of the agricultural and economic conditions of production that make it possible to have a supply of sufficient food for the population (agri-economic vulnerability). The second relates to environmental conditions that allow the use of natural resources for guaranteeing that food production for present and future populations is sustainable (environmental vulnerability). The third dimension is the social conditions that enable us to specify which sectors of the population suffer from, or are likely to suffer from, undernourishment and hunger (social vulnerability).

Agri-economic Vulnerability

In order to evaluate agro-economic vulnerability in Mexico over the last three decades, we shall examine features of agricultural production, trade, and consumption.

Agricultural Production

Overall, production in the food sector has increased, though its share in GDP has fallen. In 1986, the agriculture, livestock, and fisheries sector accounted for 6.8 per cent of GDP. That share fell to 3.2 per cent in 2015 (INEGI-BIE 2016a).

The growth rates in Mexico for the production of principal groups of farm products were relatively high till 1985. However, between 1986 and 2014, the rates of growth of production came down considerably, and became negative for legumes and

oilseed crops, for both of which the country has become increasingly dependent on imports (Table 3). From 2011–14, there was an alarming reduction in the production of cereals, though the growth of oilseed crops increased considerably through the exploitation of transgenic soybean. In sum, the data indicate lower food self-sufficiency, coinciding with a 9.7 per cent reduction in GDP per capita in this sector over the last 44 years (see Table 4).

Data for the main farm products point to a decrease in production, which can be attributed to the lack of competitiveness of Mexican agricultural producers. In six of the twelve products or groups of products in Table 4, per capita production decreased between 1980 and 2015, with rice, wheat, beans, pork, and honey registering the greatest reductions. In fact, per capita production of all grains and beans, which are important food items in Mexico, has come down in the period between 1996 and 2015. This has made the country more dependent on imports and has increased food vulnerability.

At the same time, the increased per capita production of fruit and vegetables reflects the growing strengths of Mexican agriculture, as these are products in which the country has definite advantages in terms of climate and labour.

Many farmers and livestock-rearers have been displaced from their livelihoods by the import of products that enter the country either legally or illegally and are sold at low prices. Dependence on foreign countries for basic food items makes Mexico vulnerable

Table 3 *Production of principal groups of farm products in Mexico, 1981–2014* in '000 tonnes, '000 litres, and per cent

Period	Average production (in thousand tonnes)						
	Cereals	Fruit	Vegetables	Legumes	Oilseed crops	Meat	Milk
1981—85	23,722	8,945	4,709	1,418	1,092	2,928	7,339
1986—90	22,901	9,455	6,071	1,270	968	2,902	6,413
1991—95	25,891	10,630	6,556	1,491	683	3,366	7,303
1996—2000	28,387	12,562	9,360	1,445	532	4,102	8,514
2001—05	30,510	14,728	11,036	1,528	418	4,954	9,882
2006—10	33,759	15,838	12,077	1,430	417	5,627	10,615
2011—14	32,940	16,911	13,331	1,386	678	6,107	11,081
	Comparison of rates of growth (in per cent)						
1986—90/1981—85	−3.5	5.7	28.9	−10.4	−11.3	−0.9	−12.6
1991—95/1986—90	13.1	12.4	8	17.4	−29.5	16	13.9
1996—2000/1991—95	9.6	18.2	42.8	−3.1	−22.1	21.8	16.6
2001—05/1996—2000	7.5	17.2	17.9	5.8	−21.4	20.8	16.1
2006—10/2001—05	10.7	7.5	9.4	−6.4	−0.3	13.6	7.4
2011—14/2006—10	−2.4	6.8	10.4	−3.1	62.9	8.5	4.4

Source: Based on FAO, Faostat (http://www.fao.org/faostat/en/#home).

Table 4 *Average per capita agricultural GDP and average per capita production of selected farm products in Mexico* in pesos, kg, and litres

	Average over each period							Rate of change (in per cent)		
	1981—85	1986—90	1991—95	1996—2000	2001—05	2006—10	2011—15			
	1	2	3	4	5	6	7	3/1	7/3	7/1
Per capita agricultural GDP (in pesos)[1]	3836.3	3428.6	3273.4	3329.7	3407.2	3411.2	3462.6	−14.7	5.8	−9.7
Maize[2]	177.2	144.2	187.3	181.7	193.3	200.3	186.2	5.7	−0.6	5.1
Beans[2]	15.6	12.3	13.4	11.2	11.5	8.3	8.7	−13.6	−34.9	−43.8
Wheat[2]	57.1	51.3	41.3	34.1	27.8	33.4	29.8	−27.7	−27.8	−47.8
Rice[2]	8.1	6.1	3.9	4.1	2.5	2.4	1.7	−52.4	−56.3	−79.2
Fruit[2]	123.5	114.4	115.9	127.6	140.2	140.2	143.4	−6.1	23.7	16.1
Vegetables[2]	64.8	73.3	71.6	89.4	96.8	106.8	120.7	10.5	68.6	86.2
Milk[3]	99.6	75.4	79.7	86.4	93.7	92.3	93.6	−20	17.4	−6
Bovine meat[2]	14.8	14.6	14.1	13.9	14.3	14.8	15.4	−4.6	9	4
Pork meat[2]	19.1	10.2	9.3	9.8	10.2	10.2	10.7	−51.4	15.5	−43.9
Chicken meat[2]	6.7	8.0	11.5	15.9	20.7	22.8	24.0	72.6	108.4	259.7
Eggs[2]	10	12.4	13.2	15.1	18.5	20.6	21.1	31.2	60.7	110.9
Honey[2]	0.8	0.8	0.7	0.6	0.5	0.5	0.5	−14.4	−24.2	−35.2

Notes: [1] Based on 2008 prices.
[2] Based on kg/person.
[3] Based on litres/person.
Source: Elaborated on the basis of the following: GDP, INEGI, Banco de Información Económica; population figures, Consejo Nacional de Población; and agricultural production, SIAP/SAGARPA.

to external shocks (the availability of food in world markets at prices that may fluctuate) and internal pressures (availability of financial resources to obtain food in sufficient quantities and at the right time). Torres and Ortega (2003, pp. 33–34) note that even when importing cheap food is beneficial, any advantage is soon lost because the domestic agricultural sector is damaged. Further, the country has increasingly been transformed into a net importer. This harms the national economy as variations in international food prices have repercussions on the purchasing power of wages, especially among low-income sections of the population.

The Balance of Agricultural and Food Trade

Mexico adopted an open trade economic policy after its entry into GATT and the signing of NAFTA. Following this, its domestic market was opened to imports of products from the USA and Canada. Maize and beans, as basic food crops that were mostly grown by small-scale producers, were however protected until 2007. This "opening up of trade" was justified on the premise that small-scale producers would be given 15 years to "re-convert" and become internationally competitive with state support. Domestic demand for food would thus be met and producers would be able to export.

In the period between 1991 and 2016 (Table 5), the prediction of a positive trade balance in the agriculture and livestock sector was not fulfilled. There has been a negative trade balance in several years, with small surpluses resulting from the reduction in imports caused by sudden devaluations of the peso against the dollar (in 1995, 2015, and 2016). The amount that Mexico has had to spend on purchase of food since NAFTA came into effect (1994–2016) is almost USD 37.4 billion more than the value of its exports.

After NAFTA came into effect, from January 1994 till December 2016, the average deficit in Mexico's agricultural and food trade with other countries has accounted for 26.7 per cent of its total national trade deficit (deficit in the agrifood sector as a proportion of national trade balance), as against 13.4 per cent in 1991. As a percentage of GDP, the deficit in the agrifood sector has come down from 0.34 per cent in 1991 to an average of 0.23 per cent between 1994 and 2015 (Table 5). This trade deficit continues to be a problem as one of the assumptions behind the opening up of trade was that the agrifood sector would be able to finance other sectors of the economy and not the other way round, as has happened (Table 5). Another problem is the balance of trade in agriculture and livestock, which showed a surplus in 1991 but has declined since 1993, and showed a 54 per cent larger deficit in 2015 than in 1993 (in 2016 there was a surplus due to a reduction in imports following devaluation of the peso against the dollar).

Examining the relation between domestic production and imports of basic food items consumed by the Mexican population (wheat, rice, and maize), we find a growing dependence on imports to safeguard domestic consumption (Table 6). A similar

Table 5 *Agrifood trade balance in Mexico, its share in national trade balance and GDP* in million USD and per cent

Year	Agrifood sector			National balance of trade	Share of agrifood sector in balance of trade deficit (in per cent)	GDP	Share of agrifood sector in GDP (in per cent)
	Exports	Imports	Balance				
	1	2	3 = 1−2	4	5	6	7 = 3/6
1991	3,794	4,766	−972	−7,279	13.4	284,855	0.34
1992	3,477	6,194	−2,717	−15,934	17.1	327,513	0.83
1993	3,943	5,559	−1,616	−13,481	12	481,989	0.34
1994	4,403	6,896	−2,493	−18,464	13.5	521,821	0.48
1995	6,236	4,856	1,380	7,088	n.a.	334,367	n.a.
1996	6,298	7,129	−832	6,531	n.a.	394,522	0.21
1997	6,980	6,942	38	623	n.a.	473,863	n.a.
1998	7,241	7,701	−460	−7,834	5.9	491,280	0.09
1999	7,499	7,915	−417	−5,613	7.4	571,787	0.07
2000	8,255	8,941	−686	−8,337	8.2	673,389	0.10
2001	8,110	10,282	−2,171	−9,617	22.6	719,105	0.30
2002	8,246	10,766	−2,519	−7,633	33	725,803	0.35
2003	9,207	11,690	−2,483	−5,779	43	701,298	0.35
2004	10,341	12,977	−2,636	−8,811	29.9	760,747	0.35
2005	11,680	13,919	−2,239	−7,587	29.5	860,368	0.26
2006	13,655	15,584	−1,930	−6,133	31.5	954,869	0.20
2007	14,728	18,952	−4,224	−10,074	41.9	1,033,672	0.41
2008	16,283	22,684	−6,401	−17,261	37.1	1,092,357	0.59
2009	16,024	17,971	−1,946	−4,681	41.6	886,821	0.22
2010	18,108	20,302	−2,195	−3,009	72.9	1,043,359	0.21
2011	21,716	25,414	−3,698	−1,409	262.4	1,157,575	0.32
2012	22,481	26,486	−4,005	18	n.a.	1,179,252	0.34
2013	24,112	26,053	−1,942	−1,195	162.5	1,237,018	0.16
2014	25,503	26,815	−1,312	−3,066	42.8	1,282,913	0.10
2015	26,618	24,584	2,034	−14,609	n.a.	1,128,692	n.a.
2016	26,300	22,569	3,731	−13,163	n.a.	n.a.	n.a.

Note: n.a. = not applicable. The figure is not calculated when the agrifood trade balance or overall trade balance is in surplus.
Source: INEGI, Banco de Información Económica (http://www.inegi.org.mx/sistemas/bie/default.aspx).

conclusion was reached by authors evaluating the NAFTA (Puyana 2012; Weisbrot *et al.* 2014).

The fact that the country does not have a surplus in the food sector implies that other sectors of the economy have to finance the deficit. Moreover, this transfer of profit from one sector to another adversely affects national producers and those who work in the fields as they find their opportunities limited. As further discussed later in the article,

Table 6 *Growth of production, apparent consumption, and imports of principal food items in Mexico* in per cent

Period	Wheat	Rice	Maize	Beans
Imports as a proportion of consumption (in per cent)				
1981—85	12.5	14	13.6	18.4
1986—90	11.2	12	17.7	12.6
1991—95	24.6	40	7.2	2.1
1996—00	43.4	46	18.3	10.4
2001—05	58.5	73	16.6	7.2
2006—10	52.5	76	19.3	9.8
2011—15	61.9	82	22.3	11.4
Growth of production (average over 1991—95 to 2011—15)	−6.6	−44	60.5	−13.8
Growth of apparent consumption (average over 1991—95 to 2011—15)	43	85	89.1	−4.9

Source: FAO, Faostat (http://www.fao.org/faostat/es/#data/TP); for exports and imports from 2001 to 2015, see Trade Map (http://www.trademap.org/Country_SelProductCountry_TS.aspx).

the decrease in labour employed in agriculture is much greater than the decrease in employment in the rest of the economy.

Concentration of Imports and Exports

A serious problem of Mexican foreign trade is its growing geographical concentration, and the concentration of trade across firms and products exported. As Torres and Ortega (2003, pp. 99–122) point out, concentrating trade in a single country increases vulnerability. For example, Mexico imports basic food items such as maize, beans, sorghum, wheat, beef, and pork from the United States, and exports fruit and vegetables, even though Mexico has had diversified sources of supply for milk, butter, oilseeds, and prepared food products since 1970.

On average, between 2011 and 2015, 75 per cent of Mexican agrifood exports and 78 per cent of imports were to and from the United States. Although the percentage of exports was lower on average in these years than in 1991–93 (when it was 84 per cent), in the case of imports it was higher (74 per cent in 1991–93).

Historically, the Government of the United States of America has established guidelines for and sanctions on the sale of its food products for reasons of strategic interest, and economic and military dominance. A striking example of the latter is the economic embargo against Cuba since the 1960s, which violates international trading laws, and has negatively affected the health and nutrition of the Cuban people (Barry 2000).

The concentration of Mexico's agrifood trade in the United States is aggravated by an increasing trade deficit for Mexico, with the average deficit for 2011–15 being

45 per cent higher than the average for 1989–93 (in 2006–10 the deficit had reached 368 per cent of the average in 1989–93) (Table 7). Deficits were striking for basic food products such as grains and oilseed crops, and livestock.

Mexico has a trade surplus with the United States in fruit and vegetables; this surplus grew 672 per cent in 2011–15 over the average for 1989–93 (Table 7). Growth was achieved amid high-risk conditions in agriculture and related sectors, and may be considered a success of government policy – especially as the export of fruit and vegetables is subject to constant price fluctuations in the international market, and to increasingly stringent sanitary regulations imposed by the United States and other importing nations. Fruit and vegetable exports have assumed increasing importance as a proportion of the total value of agricultural and livestock exports, comprising 66 per cent of the total between 1994 and 2015 (INEGI-BIE 2016). Any variation in the volume of exports will have repercussions for the agricultural balance of trade, direct employment (as these are labour-intensive crops), and indirect employment.

H. González (2014) has evaluated the implications of the growth of fruit and vegetable exports on agri-economic vulnerability in Mexico. First, he suggests that the country incurs an opportunity cost by ceasing to produce food for domestic demand in the most productive regions, which have a humid climate and adequate irrigation facilities. This would not be very serious if water were not a scarce resource for food production in Mexico. Sixty-seven per cent of the country's territory suffers from a shortage of water. Water resources are unevenly distributed, with the most populated and industrialised parts receiving only 36 per cent of total rainfall (INEGI 1994). Fruit and vegetable crops require larger quantities of water than basic food items, and they are exported in the dry season (December to May) when rainfall is at its lowest and evapo-transpiration rates of plants are at their highest, thus requiring more water.

Secondly, commercial integration has led to a growing convergence of fruit and vegetable prices in North America, which has affected Mexican consumers, whose per capita GDP is much lower than that of their northern neighbours. Between 2011 and 2015, the average annual GDP per capita in Mexico was USD 10,326, while in Canada it was USD 50,235 and USD 54,360 in the United States (World Bank 2015). This discrepancy can be better appreciated whenever there is a natural disaster (drought, flood, cyclone, hailstorm, etc.) in North America or an economic event (for example, increased demand for avocados and tomatoes) that affects the availability of perishable food items in the form of continuous price variations. When this happens, producers channel their production to consumers with larger incomes who are prepared to pay extra. Consumers in Mexico with low incomes stop eating or refuse to spend more on tomato, onion, courgette, avocado, etc., which are a part of the basic food basket and widely consumed by the Mexican population.

Table 7 *Volume of trade between Mexico and the United States for principal groups of agricultural and livestock products* in million USD

Period	Kind of trade	Total	Grain	Oilseed crops	Livestock products	Fresh and frozen fruit and vegetables
1989—93	Exports	3,113.7	47.5	28.4	399.8	1,562.2
	Imports	3,635.8	887	591.5	1,066.8	294
	Balance	−522.1	−839.4	−563	−666.9	1,268.1
1994—2000	Exports	5,087.3	140.3	61	356	2,836.9
	Imports	6,125.2	1,441.8	1,112	1,767.5	617.0
	Balance	−1,037.9	−1,301.4	−1,051	−1,411.5	2,219.9
2001—05	Exports	7,395.7	264.6	78.7	633.9	4,889.3
	Imports	9,272.9	2,187.4	1,445.6	2,937.2	1,200.8
	Balance	−1,877.1	−1,922.8	−1,366.9	−2,303.3	3,688.4
2006—10	Exports	11,973.5	588.4	157.9	853.7	7,960.4
	Imports	14,417.2	3,850.8	2,489	4,150.6	1,841.1
	Balance	−2,443.7	−3,262.3	−2,331.1	−3,296.8	6,119.3
2011—15	Exports	19,115.7	981.1	264	1,713.4	12,337.9
	Imports	19,873.4	5,055.1	3,246.2	6,216.1	2,545.6
	Balance	−757.6	−4,074	−2,982.2	−4,502.7	9,792.2
Growth in deficit/surplus, 1989—93 to 2011—15 (in per cent)		45.1	385.3	429.6	575.1	672.2

Source: US Department of Commerce (2015).

Competitive Capacity of Cereal Growers: The Case of Maize

The production of food in a competitive market has been a central aim of Mexico's agricultural policy in recent years, and it is worth evaluating it with regard to maize, the country's main crop. Maize has formed a part of the staple diet of the Mexican population since before the Spanish conquest, and has great social and cultural significance, especially in areas of peasant and indigenous populations. In 2015, the area under maize was 8.2 million hectares, amounting to 37 per cent of the agricultural cropland and employing around 3.2 million people (SAGARPA 2016). Of this number, 92 per cent were working on plots of less than 5 hectares and on poor-quality land dependent on rainfall (Anzaldo *et al.* 2008). Eighty per cent of the area sown with maize in 2015 was rainfall-dependent (SAGARPA-SIAP 2017), with low access to technological inputs, credit, and market channels. While small producers used 52 per cent of the maize they produced for their own consumption, producers with over 5 hectares under maize cultivation, accounting for 7.9 per cent of the total number of producers and 43.6 per cent of the maize produced in the country, sent 86.5 per cent of their produce to the market (Anzaldo *et al.* 2008).

Of the 8.19 million hectares under maize in 2015, 92.8 per cent was under white maize used for human consumption and 6.9 per cent was under yellow maize. The remaining area, which grew to 21,000 hectares between 1994 and 2015, was used for producing hybrid maize seed. In 2015, the production of white maize stood at 24.7 million tonnes and yellow maize grown for forage at 13.6 million tonnes. The area under yellow maize increased by 389,172 hectares between 1994 and 2015, while the area under white maize decreased by 1,596,025 hectares in the same period.

In spite of the fact that production of maize increased by almost 19 million tonnes from the average in 1981–85 to the average in 2011–15 (an increase of 119 per cent) – mainly due to improved yield, as the area sown with maize fell by 4.5 per cent in the same period – this has not been enough to provide for domestic consumption, which increased by 25.5 million tonnes (SAGARPA-SIAP 2017). Between 2011 and 2015, 78 per cent of maize consumption was from domestic production, whereas from 1981 to 1985 it had been 86 per cent (FAO-Faostat 2017; Trade Map 2017). Imports of maize have increased from 2.5 million tonnes a year between 1981 and 1985 to 9.7 million tonnes a year between 2011 and 2015 (FAO-Faostat; Trade Map 2017), costing the national economy USD 12.9 billion in the last period (INEGI-BIE 2017).

Although the productivity of maize increased by 112 per cent from the average in 1980–85 to the average in 2011–15 (SAGARPA-SIAP 2017), the differences between productivity in Mexico and in Canada and the United States are large and have, in fact, tended to increase, rather than decrease, since the ratification of NAFTA. In 2014, the yield per hectare for maize in Mexico was 4.9 tonnes on average, while in Canada it was 9.4 tonnes and 10.7 tonnes in the USA (FAO-Faostat 2017). It should be noted that the yield of white maize grown in Mexico was only 3.2 tonnes per

hectare on average from 2011 to 2015, while the yield of yellow maize reached 24.8 tonnes per hectare.

The future is uncertain for maize producers in Mexico because liberalisation of the Mexican maize market was carried out without considering asymmetries in productivity or taking into account the large subsidies that the Government of the United States provided its maize producers (Wise 2009). It was agreed in NAFTA that from 1994 to 2007 Mexico could charge a duty on maize and beans imported from the United States that exceeded a certain quota. However, no duty was charged, which led to inflationary pressures, a fall in national production, and excess supply (Nadal 2000; Nadal and Wise 2004; SAGARPA-SIAP 2007). The harmful effects of this measure included losses in customs duty (USD 2,800 million for maize and USD 77 million for beans between 1994 and 2001), and, notably, a fall of 49.5 per cent in the real price paid to maize producers between 1993 and 2007 (OECD 2007). Moreover, the production costs of yellow maize imported from the United States were much lower than that of white maize produced in Mexico. In the Mexican market, as each type of maize can substitute for the other, small producers were affected the most (Henriques and Patel 2004).

Agri-economic vulnerability in Mexico is due to a combination of factors, including inadequate production of basic food items, increased dependence on food imports for basic consumption, and concentration of trade with the United States. The concentration of trade, moreover, is with a country that unilaterally imposes non-tariff barriers on food imports and formulates agricultural policy according to geopolitical criteria to ensure its economic and military pre-eminence. Abrupt liberalisation of the Mexican economy combined with competition from higher subsidy rates for food production and exports in the United States and Canada have made small-scale maize producers especially vulnerable. In response, they have reduced the area under cultivation of maize, thus affecting food supply and living conditions.

Environmental Vulnerability

Industrial agriculture, based on non-renewable energy sources and bio-technological developments that are the property of transnational corporations, has received great support from the Mexican government. This model of agricultural production was deemed to be the most viable alternative for providing food to a population that grew from 25.8 million in 1950 to 121 million in 2015, of which 77 per cent lived in urban areas (INEGI 1960–2010). Adopting this model did not take into account the loss of biodiversity, the degradation and contamination of ecosystems, and the harmful effects of pesticides on the health of agricultural workers and consumers. A brief discussion of this problem highlights those elements of the Mexican government's economic and agricultural policies that damaged the productive capacity of agri-systems, and the health of present and future generations.

Loss of Genetic Diversity

Maize is a good example as it has immense genetic diversity, and the deposits of germplasm in Mexico have contributed to production worldwide. Mexico has 60 racial complexes of maize, and thousands of sub-races and local varieties (Álvarez-Buylla 2004, p. 181). Their care has been in the hands of small farmers who every year select seeds that are best adapted to the physical conditions of their soils and the local climate. This has allowed for the conservation of genetic wealth in Mexico's ecosystems. At the same time, the maize germplasm bank at the International Maize and Wheat Improvement Centre (CIMMYT)

> contains 28,000 samples of seed, including the world's largest collection of maize landraces – varieties developed by farmers over decades, centuries or even millennia – along with samples of maize's wild relatives, teosinte and tripsacum, and of improved varieties (http://www.cimmyt.org/; see also CIMMYT 2017; Lascuráin *et al.* 2009, p. 52).

The Maize Network (Red Maíz), comprising 35 research institutions and non-governmental organisations, has been working with other national and international organisations since 2002 to protect, conserve, and sustainably use the original strains of maize in Mexico, and currently covers 52 races (Sinarefi 2017).

Hybrid varieties have started replacing native strains. Although the new varieties make it possible to increase agricultural production, there are only a few of them in comparison to the traditional strains. Moreover, these seeds have to be bought every year from a limited choice of transnational firms.

Conserving centres of biodiversity as fundamental agricultural resources makes it possible to resort to them to find genes that can address crop disease and improve upon existing strains. In this sense crop diversity "is considered essential for *world food security*" (*ibid.*, our emphasis).

Planting transgenic seeds, except and only for purposes of research, was prohibited in Mexico in 1998. Despite the prohibition, their presence was detected in 2001 in fields in Oaxaca and other places (Quist and Chapela 2001). Transgenic varieties of maize sown mostly in the United States, Bt-maize, and another variety resistant to a wide range of herbicide ingredients were found in these fields (Nadal and Wise 2004, p. 14). The bio-security law of 2005 (Ley de Bioseguridad de Organismos Genéticamente Modificados) and its by-law, approved in 2008 and modified in March 2009, eliminate the special protection regime, rendering doubtful as to whether it intends to protect the biodiversity of Mexican maize (Peralta and Marielle 2013). Additionally, there are no clear demarcations to define responsibilities in case of any damage to ecosystems or public health (Freese and Schubert 2004; McAfee 2008).

At present, a potential threat to the genetic wealth of maize comes from a reduction in the number of small producers who have knowledge of selecting seeds, thus maintaining biodiversity *in situ*. Nadal and Wise (2004) note that a reduction in the real price of maize in Mexico, which occurred before 2006 and is connected to changes in government economic policy, led maize-growing peasants to seek alternative sources of income and employment outside agricultural activity by abandoning the production of maize. Urbanisation and cultural changes have also contributed to the loss of the tradition of growing maize, while there is a growing preference for buying tortillas (instead of using maize), even in rural areas.

Environmental Degradation as a Result of Cultivation of Export Crops

Mexico has a comparative advantage in fruit and vegetable production. Nevertheless, as H. González (2004) points out, four critical environmental problems have severely degraded areas of production in the country, in many cases irreversibly. These include giving up the practice of crop rotation that allows land to recover its fertility and arrest consequent soil degradation; pollution and exhaustion of water basins, especially in semi-arid areas; spread of disease in monocultures that later led productive regions to be abandoned as uneconomical; and, lastly, intensive use of agri-chemicals that polluted and caused deterioration of agri-systems, and affected the health of workers and populations living near the fields.

There is detailed evidence on how these problems occurred in places where fruit and vegetables were intensively cultivated for the export market, turning them into what Macías (2006) terms "zones of juncture agriculture." In such zones, crops are grown for a particular period and when the firms perceive that the problems of environmental degradation have become critical, and require further investment for productivity to sustain, they either slash production or leave the area to start a new cycle in virgin territory. We find examples of such "juncture agriculture" in Autlán, Jalisco; in the valley of Arista, San Luis Potosí; in the drylands of Michoacán and Guerrero; in the valley of San Quintín, Baja California; in the valley of Zamora, Michoacán; in Hermosillo, Sonora; and in the valley of Sayula, Jalisco (H. González 2004; Macías 2006).

Several groups of mainly small farmers have resisted the imposition of predatory agro-industrial models and promoted alternative forms of production. There is growing scientific and empirical evidence (Altieri and Toledo 2011; Morales 2011; Rosset and Martínez-Torres 2012) to show that agro-ecological production methods used by small- and medium-sized growers are an alternative to certain forms of the industrial model of agriculture, as the former may allow farmers to conserve biodiversity and allow heavily degraded agri-systems to recover (H. González 2012). Toledo (2012, p. 42) estimates that around 2,000 communities are involved in agro-ecological and sustainable projects. They contributed to an annual growth of 17.3 per cent in the number of organic producers between 1996 and 2012

(Schwentesius *et al.* 2013). Finally, producer organisations working for alternative agriculture have helped develop systems for the commercialisation of safe and healthy food through urban markets or organic *tianguis* that form links with consumers, and establish new relations between the countryside and the city. In Mexico, there are over 50 initiatives of this type (TyMO 2015).

Agro-ecological and organic producers can be more resilient and adaptable than capitalist companies in the face of economic and natural disasters, and risks from climate change (Altieri and Nicholls 2009). This kind of production can be an alternative to deal with issues of vulnerability.

Climate Change

One of the greatest risks for the future of agriculture, especially rainfall-dependent agriculture, is climate change induced by CO_2 emissions from industry and from fossil fuel-based economic activities. Researchers such as Mendelsohn *et al.* (2010) point out that this phenomenon may bring benefits to agriculture in countries located in polar regions and smaller benefits to temperate countries. Most developing nations that are tropical or sub-tropical will face significant risks to their agricultural, livestock, and forest systems, and may be affected by a significant reduction in crop yield and water supply, alongside an increase in disease and increased risks of flooding (ETC Group 2009; Greenpeace 2010; IPCC 2014; SAGARPA and FAO 2012).

In Mexico, 67 per cent of the territory is in arid or semi-arid zones, 28 per cent is forest or scrub, and about 80 per cent of the soil shows some erosion, mostly due to deforestation of plots with steep gradients (CONAGUA 2014, pp. 13–14). Under these circumstances, it has been estimated that in 50 to 57 per cent of the territory, temperatures and the amount of precipitation will change (Villers-Ruiz and Trejo-Vázquez 1997). Areas with a mild climate will shrink and regions of dry climate will increase (SAGARPA and FAO 2012). There will be desertification, deforestation, erosion, and a loss of biodiversity, with extreme drought in the north-western region and flooding in the south-east. The area potentially at severe risk of hydric erosion may increase from the current 57 per cent to 70 per cent, while 48 per cent of the land area, mainly in the north, will be prone to desertification and meteorological drought. Hydraulic resources would be particularly vulnerable in the Pánuco river basin, the Lerma–Chapala–Santiago basin, and in the peninsula of Baja California (Gay *et al.* 2006).

It is estimated that a temperature increase of 2.5 to 3 degrees Celsius from 1980–90 levels will cause value losses to agriculture of an estimated 42 to 54 per cent, and make the land in Mexico unfit for rainfed production of maize (Mendelsohn *et al.* 2010, pp. 14–15). Area under rainfed maize will increase from 60 per cent at present to 75 per cent, with significantly reduced yield as a result of diminished summer

rainfall (Gay *et al.* 2006). Another predictive study developed by the Ministry of Agriculture and the FAO (González-Cambero 2014) shows that by 2050, most regions of the country will see a fall in the value of production, and profits from crops and livestock. Price volatility will accompany risks to producers.

Environmental degradation and loss of biodiversity are signs of unsustainable agriculture, and when added to the possible effects of climate change, they limit opportunities to produce food in the medium and the long term, thereby making society more vulnerable.

Social Vulnerability

Neoliberal policies have led to a number of disadvantages for several sections of Mexico's population, obstructing their capacity to recover from adverse economic, environmental, and social situations. We address this complex situation by considering five indicators: concentration of investment in food production and distribution; decrease in employment and precarious conditions of labour in agriculture; rising food prices and poverty; growth of harmful eating habits; and poverty indices. All these indicators point to the high social costs of the global agrifood regime in Mexico.

Concentration of Investment in Food Production and Distribution

There are 5.5 million production units in Mexico, of which 4 million are dedicated to agricultural production across a land area of 68.4 million hectares (INEGI-SAGARPA 2007). Nearly three-quarters (73 per cent) of the production units operate on an area of less than five hectares and are found mainly in rainfed areas that have little mechanisation. They produce for local and regional markets, and family food supplies (*ibid.*).

In the last three decades, there has been an increase in and a concentration of domestic and foreign private investment in agricultural production. According to Robles (2012), 54 big companies are involved in direct productive investment, industrial processing of food, and marketing. These companies control 3.9 million hectares of high-value cropland, where production is for the domestic and foreign markets. Similar levels of concentration are found in maize cultivation, and in the dairy and poultry industries. In the case of fruit and vegetables, there were 100,000 registered producers at the end of the previous decade (R. Martínez 2009), but very few enjoyed conditions enabling export.

At present, depending on the product and the process of production, big corporations use different means – contract agriculture being the most common – to gain access to land and labour, and obtain maximum benefit from production (Echánove 2015; Macias 2014). Similarly, the larger share of the national market for inputs has been

taken over by global producers of seeds and agri-chemicals, such as Monsanto, Pioneer, Syngenta, Limagrain, Land O'Lakes, KWS, Bayer, and Sakata, to name some (Barker *et al.* 2013). These companies have taken advantage of the dismantling of parastatal companies and face only limited competition from Mexican companies. The market in Mexico, therefore, reflects similar levels of industrial concentration in agriculture as in many other parts of the world.

Transnational corporations dominate the commercialisation of important crops. Around 60 per cent of the grain market is controlled by 11 companies: Maseca, Cargill, Archer Daniels Midland, Bimbo, Minsa, Molinos de México, Gamesa, Altex, Bachoco, Lala, and Malta de México (Rudillo 2010). For maize specifically, most of the production is dominated by four companies: Cargill, Archer Daniels Midland, Gruma, and Arancia. These are also the most important sellers of grain in the United States. Three large national companies control 78 per cent of the market in milk production. These are Lala (46 per cent), Alpura (25 per cent), and Lechera Guadalajara (8 per cent) (Arteaga 2013). However, the dairy product derivatives segment is dominated by transnational companies like Nestlé, Danone, and Sigma Alimentos (Secretaría de Economía 2012). Finally, 55 per cent of poultry production in Mexico is controlled by three big companies, namely, Bachoco, Pilgrim's Pride, and Tyson – two of these are foreign-owned (M. Hernández and Vázquez 2009). A similar trend can be seen in retail, where three big supermarket chains control 70 per cent of food sales (Bocanegra and Vazquez 2012). Wal-Mart handles half the retail sales in Mexico, followed by Soriana and Costco (Iacovone *et al.* 2011).

The growth and concentration of transnational corporations in the agrifood system prove that the objectives of the neoliberal reforms and the changes made to the agrarian law in 1992 have failed (Robles 2008, pp. 134–5). The number of small holdings did not decrease, but the average size of plots went down from 9.1 hectares to 7.5 hectares between 1991 and 2007. Neither was there any increase in the number of organisations and associations of producers to develop economies of scale.

Neoliberal policies have not succeeded in creating a reserve of food for a growing population. Such policies have removed protection for small- and medium-sized producers, and reduced their numbers. However, despite the adverse conditions they operate in, small producers continue to play a significant role in the supply of basic foods. They have the potential for producing food in changing climate conditions. Indeed, they provide most of the white maize consumed in Mexico and maintain a great diversity of maize varieties, thereby allowing the rich culinary culture of the country to flourish (Turrent *et al.* 2012). Finally, they supply regional and national markets with a variety of agricultural and livestock products (Fletes *et al.* 2014).

Decline in Rural Employment and Precarious Conditions of Labour

Rural employment in Mexico has been on the decline in recent years. While the number of employed persons in the country increased by 54 per cent between 1995 and 2015, the number of people employed in the agriculture and livestock sector decreased by 13.7 per cent, from 7.7 million to 6.7 million (INEGI 2015). Moreover, while the number of rural workers registered at the Mexican Social Security Institute (IMSS) increased by 43 per cent between 2005 and 2015, the growth was only 12 per cent for permanent workers (IMSS 2016). This implies that not only has there been a loss of work opportunities in rural areas, but also that the little employment that was generated was for casual workers. These workers have very little labour security as their jobs tend to be of a lower quality with lower wages.

The increasingly precarious conditions of work in the agriculture and livestock sector can be understood from the fact that over 1 million jobs in agriculture were lost between 1995 and 2015 (INEGI 2015). Although 455,697 agricultural jobs were created between 2005 and 2015 in the least urbanised areas of Mexico, these were not enough for the 5.3 million people who joined the economically active population in these areas, even though the industrial, commercial, and services sectors created 3.9 million jobs. The shortage of jobs in rural and less-urbanised areas of Mexico has risen in the last ten years. Though the population employed in these territories has grown more than in the most urbanised zones (21 per cent against 18 per cent), so has the number of unemployed persons (67 per cent against 39 per cent). Lack of employment has had significant economic and social repercussions, as seen in the increase in levels of delinquency and violence in various parts of the country. Weisbrot *et al.* (2014) estimate that 4.9 million people were displaced from family agriculture between 1991 and 2007, and of these, only 3 million found temporary work.

In Mexico, industrial agriculture directed at the domestic and export markets is located in regions that require irrigation, where the technology used in developed countries is used to produce similar yields. The presence of abundant migrant labour has been important for the capitalisation and competitiveness of industrial agriculture. Migrant workers journey from regions of low job opportunities where agricultural output is low. Workers travel with their families to the agro-industrial regions for a part of the year, and live in unhygienic and overcrowded barracks built by contractor firms beside cropland.

A longitudinal study notes that the agro-industrial companies succeeded in increasing the productivity of "unskilled" workers by 65 per cent but without a corresponding increase in their real income, which actually declined by 50 per cent (Grammont 2007). The economic and social inequality between south-eastern Mexico, i.e. the region where migrant workers mostly come from, and the agro-industrial regions in central and north-western Mexico continues till today, with persistent poverty and a

lack of economic dynamism being marked features of the former (Barrón and Rello 1999).

Agricultural day-labourers and their families who live in insecure conditions form one of the most vulnerable sections of Mexico's population. Their income is inadequate, the nature of their work is temporary and itinerant, their working days are excessively long, and the workers do not have any protection against exposure to pesticides. Gender inequality is prevalent as women receive lower wages than men, social protection is inadequate and of poor quality, and few workers belong to any union (Díaz *et al.* 2002; Lara 2008; Seefoo 2005).

One of the ways in which the rural population (small-scale producers and farm workers) and, increasingly, an urban population lacking suitable employment opportunities have dealt with vulnerability has been through migration to the United States of America; the Mexican population in the United States increased from 2.2 million in 1980 to 11.9 million in 2010, and fell only slightly to 11.8 million in 2015. The number of Mexican immigrants entering the United States between 1990 and 2015 increased at a rate of 4.2 per cent annually, while the annual rate of growth of population in Mexico was 1.3 per cent.

International migration has come to assume increasing importance for the survival of many rural and urban families, because of remittances received from abroad. In the period 2011–15, these remittances amounted to USD 115,552 million, comprising the third largest source of foreign exchange for Mexico (Banco de México) (Table 8). If we compare the period 2011–15 to the period 1995–2000, remittances increased by 274 per cent, while oil exports increased by 244 per cent, Foreign Direct Investment (FDI) by 74 per cent, and international tourism by 67 per cent.

The conditions of migration to the USA, however, make Mexican workers and their families vulnerable, especially while crossing the border. As illegal workers with no employment security, they are engaged in badly remunerated jobs with limited social security benefits.

Table 8 *Foreign currency income in Mexico in selected sectors* in million USD

Period	Sectors of the economy			
	Remittances	Tourism	Oil	Foreign direct investment
1995—2000	30,870	43,321	65,290	75,964
2001—05	73,868	49,219	102,163	122,657
2006—10	119,381	61,970	205,191	122,113
2011—15	115,552	72,236	224,911	131,908
Growth in 2011—15 as against 1995—2000 (in per cent)	274	67	244	74

Source: Banco de México.

Mexico stands out for receiving more remittances than any other country in the world except India, China, and the Philippines, and as the largest recipient of remittances in Latin America (World Bank 2014). This is not accidental; it is the result of an economic policy that makes vulnerable wide sections of the rural and urban populations, who then have to look for jobs in other countries.

Rising Food Prices and Poverty

One of the assumptions underlying the opening up of trade was that the removal of trade barriers and "free" competition would cause the relative prices of merchandise (including food) to come down and settle at the level of international prices. However, the results in the food sector have been the opposite of those expected. By February 2016, food prices in Mexico had increased to 715 per cent of what they were before NAFTA came into effect. The increase in the national consumer price index (INPC) from 1993 to 2016 was 549 per cent (Table 9).

It can be argued that the price increase includes all foods, including luxury items, alcoholic beverages, and tobacco derivatives. However, the accumulated inflation in the basic food basket was 674 per cent. The point to be noted is the performance of the prices of staple foods of the population, which the removal of trade barriers was supposed to have reduced. In the case of maize, the real prices paid to the producer have indeed come down during the NAFTA years, but in the case of its principal derivative, tortilla, the retail price has increased by 779 per cent in the period between December 1993 and February 2016. This is 230 points higher than the rate of inflation. While the increase in the price paid by the customer is partly due to the removal of a subsidy on its consumption, it now costs much more in real terms than it did 15 years ago. Further, maize can hardly be replaced by another product, especially as the cost of a potential equivalent, white bread, has increased by 636 per cent. Nadal (2000, p. 39) suggests that the reduction in the real price of maize production is not reflected in the price of tortilla due to the presence of an oligopoly that controls the market for maize flour, the principal ingredient in tortilla. Four firms control the market for maize flour and one company alone, Maseca, has a 71 per cent share of the market (SAGARPA-SIAP 2007, pp. 57–8).

There is a stark difference between the increase in food prices and the increase in wages. The general minimum wage increased by 412 per cent between December 1993 and February 2016, and the average wage by 452 per cent, which is less than the increase in the cost of living. The opening up of trade has made access to food less secure and the conditions of the working population more vulnerable.

Changes in Poverty Indices

In Mexico, the National Council for the Evaluation of Social Development Policy defines a person as being poor if he or she experiences

Table 9 *Increase in food prices, and the difference between rates of growth of food items and minimum wage, December 1993 to February 2016* in per cent

Item	Percentage increase	Difference between rate of growth of prices of food items and rate of growth of minimum wages[3]
National consumer price index	549	137
National consumer price: food, beverages, and snuff	715	303
Tortilla	779	367
White bread	636	225
Beans[1]	429	17
Chilli[1]	1,424	1,012
Rice	408	−3
Eggs	481	69
Fruit and vegetables	495	83
Chicken[2]	354	−58
Pork[2]	319	−93
Fish and seafood	474	62
Minimum wage	412	0
Minimum professional wage	452	40

Notes: [1] For chilli and beans, the increase is from December 1994 to February 2016.
[2] For pork and chicken, the increase is from the average in 1994 to February 2016.
[3] Difference between the rate of growth of each variable and the rate of growth of minimum wage in the study period.
Source: For minimum wages, see CONASAMI (2016). For data on beans and chilli from December 1994 to November 2000, see Juárez (2004). For the rest of the information, see Banco de Mexico (2016a) and INEGI-BIE (2016b).

> at least one indicator of social deprivation (the six indicators are educational backwardness, access to health services, access to social security, quality of living spaces, basic services in housing, and access to food) plus insufficient income to purchase goods and services that are required to meet their food and non-food needs. (CONEVAL 2015)

In 2014, the poor accounted for 53.2 per cent of the population of Mexico, of which 20.6 per cent suffered from food poverty (Figure 1). This means that the income of this population was insufficient "to obtain a basic food basket, even if they used all the income available at home to purchase only the goods of that basket" (*ibid.*). If we compare these indicators with those for 1992, we observe that poverty in the country has not declined at all. Neither has food poverty reduced. Food poverty fell from 21.4 per cent in 1992 to 14 per cent in 2006, but increased again to 20.6 per cent in 2014.

Although poverty occurs in urban as well as rural areas of Mexico, it is more severe in the latter. The percentage of people below the nutritional poverty line in 2014 was 6.2 per cent in urban areas and 20.6 per cent in rural areas (*ibid.*).

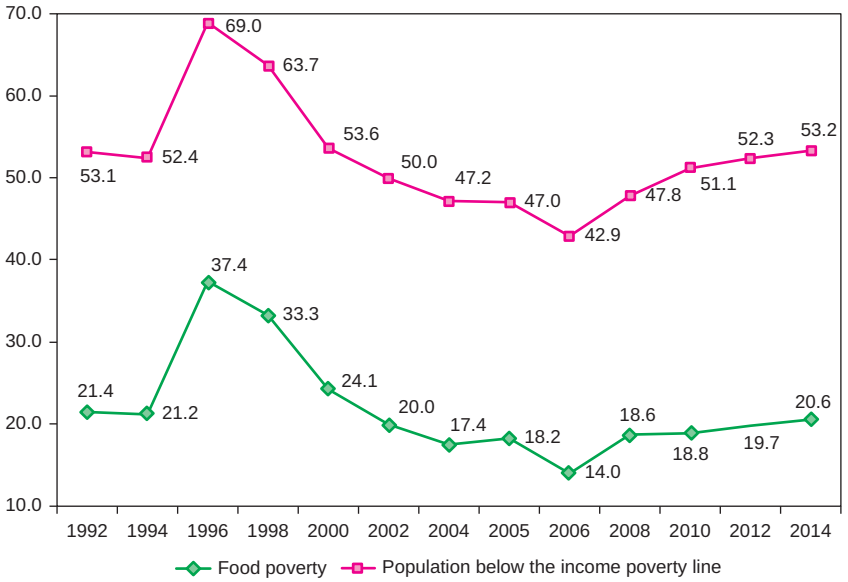

Figure 1 *Share of the population in poverty, 1992–2014*
Notes: Food poverty is defined as the inability to obtain a basic food basket even after using the available income to buy only the goods comprising this basket.
The population below the income poverty line has insufficient income to obtain the food basket, and spend on health, clothing, housing, transport, and education, even if all the household income is used exclusively for the purchase of these goods and services.
Source: CONEVAL (2015).

This leads to the conclusion that changes in Mexican economic policy from the end of the 1980s have not solved the problem of poverty; on the contrary, they have aggravated poverty among those who are involved in agricultural production and livestock-rearing. In rural areas, six out of 10 Mexicans living in poverty in 2014 earned their living from agriculture and livestock, as did four out of 10 among those living in poverty in urban areas.

Finally, it should be noted that changes in poverty levels depend on two factors: changes in the real income of the population, and levels of inequality in income distribution. With respect to changes in real income, we have seen that the increase in minimum wage in Mexico in recent years has actually meant a decrease in real terms on account of an increase in the costs of products of basic household consumption. The prices of a large majority of food items have been well above the general rate of inflation. Inequality in income distribution as measured by the Gini coefficient (where zero is perfect equality and one is maximum inequality) is particularly high in Mexico. Although it has fallen from 0.538 in 1992 (Cortés 2013) to 0.503 in 2014 (CONEVAL 2015), it is higher than it was in 1984 (0.492), when Mexico was in the midst of an economic crisis.

Pattern of Nutrient Intake in Mexico

One of the shortcomings of the agrifood policy of the previous decades has been the difficulty it has posed for the general population in gaining access to a healthy and nutritious diet. The consumption of nutritious food has grown at a slow rate in recent years. There was an increase in the daily per capita consumption of protein and calories between 1961 and 1990 that was greater than the averages for Latin American countries in general, but this trend has reversed since 1991, indicating a regression in terms of access to a healthy and safe diet.

Rivera *et al.* (2004) and Rivera-Dommarco *et al.* (2013) point out that though there has been an improvement in malnutrition figures for Mexico and Latin America since 1980, this does not mean that it is no longer a public health problem. Although indicators such as proportion of underweight children under five years registered a decline from 10.8 per cent to 2.8 per cent between 1988 and 2012, and the incidence of stunted growth among children under five years fell from 26.9 per cent in 1988 to 13.6 per cent in 2012 (Rivera-Dommarco *et al.* 2013, p. 163), there has been an increase in the number of those who are overweight or suffering from obesity. The prevalence of obesity in adults increased from 34.5 per cent in 1988 (Secretaría de Salud 1988) to 71.3 per cent in 2012 (Gutierrez *et al.* 2012). This is associated with an increasing number of diseases such as diabetes mellitus, high blood pressure, and heart attacks, and has as much to do with inactivity, stress, alcohol consumption, and tobacco addiction as it does with food consumption. Although the problem of obesity is common among all sections of the population, Hernández-Licona (2012) and Barrera-Cruz *et al.* (2013) indicate that it is more prevalent among lower-income groups.

Conclusions

This article studies how neoliberal policies implemented by the Government of Mexico from the 1980s onwards have put the food-base of the country at risk, and made the living conditions of large sections of the population precarious. The concept of agrifood vulnerability has been used to historically analyse the hegemonic food regime that prevails on a national and global scale, and to make a multi-scale and multi-factor analysis of the agrifood system as a whole. This concept allows us to determine the combination of economic, environmental, and social disadvantages of neoliberal policies that makes it difficult for individuals and groups to have access to a diet that is sufficient, healthy, nutritious, and culturally acceptable. This failure puts at risk the sustainable production of and secure access to food for present and future generations.

In the case of Mexico, the government's neoliberal agrifood policy has concentrated on increasing the production and competitiveness of primary activities, without taking into account their specific importance in comparison with other sectors of the

economy. Little consideration was given to the historical and socio-cultural contexts of national producers, or to the unequal position they hold vis-à-vis producers from other countries against whom they compete. Finally, the government has not considered the imbalance in and degradation to the environment following the application of its programmes.

The agrifood policy, applied in an authoritarian manner by the Mexican state, has led to concentration of the production and distribution of food in a small number of national and foreign companies that direct their efforts to the production of high-value commercial crops in the domestic market and especially the foreign market. The reduction of opportunities for small-scale producers has led to polarisation of the primary sector in Mexico. For these producers, the only alternative to unemployment and low prices has been migration to regions of export agriculture in Mexico and to the United States.

Food consumed by lower-income sections of the population is more expensive, whereas their wages are inadequate due to a loss in the real value of wages and increasing unemployment. This provides an explanation for the decrease in the intake of nutritious food and increase in poverty rates, despite an improvement in the indices of extreme poverty.

The United States is the largest importer of food to Mexico, and nearly all of Mexico's agricultural and livestock exports are to the United States – a country with an aggressively nationalist foreign policy and a history of political manipulation of its food exports. The Government of Mexico has lost sovereignty over the management of its agrifood policy. Today, Mexico depends more than ever on the world market and transnational corporations to attend to its growing demand for food, thereby experiencing greater agrifood vulnerability.

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