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Supply vs. Demand of Agri-industrial Meat and Fish Products: A Chicken and Egg Paradigm?

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Abstract. In this essay, I explore the driving forces behind the worldwide increase of meat and fish consumption. Emphasis is put on defining whether this increase is mainly a demand-driven or a supply-driven process. An increasing demand at the consumer side has been presented as an illustration of the power of consumers to determine the trends in food production. At the same time, this argument is used to justify efforts in increasing production and productivity through the intensification of animal and aquaculture production systems. This view has apparently convinced governments and development organizations, which provide funds and an appropriate legal environment to promote these production systems. I argue, however, that increased levels of demand are rather a supply-driven process resulting from a combination of supply increments and cost externalization, which afterwards have effects on both product prices and consumer habits. But supply-driven increased consumption may cause health, environmental and social problems, and ends up with the disempowerment of both producers and consumers. Since the power and freedom of choice attributed to consumers are questionable and changes in demand may be an effect of supply itself, they cannot be used to justify the intensification of animal husbandry and aquaculture.

Introduction

Among the historical moments that resulted in major changes in the way agriculture was understood, I would highlight those arising from the Industrial Revolution and its mechanization, and those arising from the Green Revolution and the use of high-selected seeds and animal breeds to increase production and productivity. Both events resulted in deep adjustments in the distribution of power within the food chain and favoured the present intensive production systems. These systems allow producing a lot of food at a cheap price. However, this is at the expense of serious social and environmental impacts, which are not computed in the final price. In that manner, intensive production systems within world-scale economies, together with

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a monetary economic system that does not account for environmental and social issues, allows energetically expensive food, such as meat and carnivorous fish, to be relatively cheap.

This trend is also linked to the paradox that global food policy has been facing until today: declining world food prices and a buoyant international trade coexisting with increasing malnutrition in much of the world (Rosegrant and Sombilla, 1997). For instance, since the end of the 1980s, despite increases in the number of unnourished people, the number of obese people has also increased alongside the production and consumption of meat and fish worldwide. The latter increases are known as the Livestock Revolution and the Blue Revolution respectively, in equivalence to the phenomenon that happened in agriculture previously.

Specifically, the Livestock Revolution is defined as the worldwide increase in consumption and production of animal products, mostly in developing countries (Delgado et al., 1999). This increase has been possible thanks to the promotion of intensive production systems, also called landless systems. Most authors analysing the Livestock Revolution indicate that it is a demand-driven process (Delgado et al., 1999; Steinfeld, 2004), and it is perceived as an unstoppable trend that can be very positive for the economy of developing countries. It is estimated that between 1997/1999 and 2030, meat consumption in these countries will increase from 25.5 to 37 kg per person (Steinfeld, 2004) and that global production and consumption of meat will continue to rise, from 233 million tonnes in 2000 to 300 million tonnes in 2020 (Speedy, 2003). From 1970 to now, worldwide meat production has suffered an annual growth of 2.8% (Lubchenco, 2003), with poultry and pig production growing at a double level than ruminants. More than half of the world's pork production originates currently from industrial systems, as does over 70% of poultry meat. About half of this originates from developing countries (Steinfeld et al., 2006a).

In the case of fish, the remarkable development suffered by the aquaculture sector is known as the Blue Revolution (Grain, 1997; Lubchenco, 2003). Figure 1 shows the evolution of world aquaculture from 1950 onwards. Nowadays aquaculture supplies 43% of world fish demand, in 1980 the supply made up 3% (Rivera-Ferre, 2007). Growth of the world's aquaculture is 11% (Muir, 2005), mainly originating from the Latin-American and Caribbean region, and mostly of high-value carnivorous species for the export market. The Blue Revolution is more related to the increase of fish production from intensive industrial aquaculture in developing countries (periphery) to satisfy the increasing demand in developed countries (centre), which in 2004 imported 33 million tonnes of fish. Projections for developing countries estimate that by 2020 developing countries will also increase their consumption (Delgado et al., 2003). In that manner, by 2030, 40 million tonnes of additional fish will be needed to satisfy the increasing demand. That means doubling production levels (FAO, 2006).

Therefore, the Livestock and the Blue Revolution are similar in essence, although their final target is different. In the former, meat production is increased to fulfil the demand of developing countries, although an important part is also export oriented, while in the latter, fish production is increased to fulfil the demand of developed ones. In this case, Southern countries would act as platforms for consumption of the Northern countries. Thus, their final justification is different since the Livestock Revolution satisfies the necessity of people to improve their diets with animal protein, while the Blue Revolution is directed to satisfy the caprice for luxury food products of wealthier societies. Still, in both cases the argument is that the demand is increasing and has to be satisfied through the development of intensive production systems,

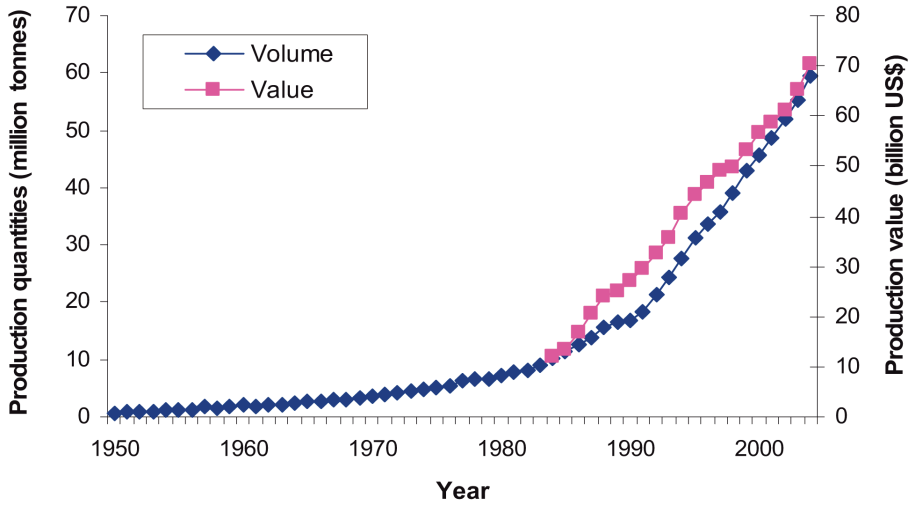

Figure 1. Production volume and production value of world aquaculture between 1950–2000.

being also a good opportunity for developing countries to participate in the lucrative international market, enhance economic growth and reduce hunger and poverty. In the case of aquaculture, another argument is its potential contribution to diminish overexploitation of world fisheries and to preserve the marine environment. According to Worm et al. (2006), world fisheries will collapse by 2048 if the current level of exploitation persists. According to the FAO (2006), since 'sustaining fish supplies from capture fisheries will not be able to meet the growing global demand for aquatic food, aquaculture appears to have the potential to make a significant contribution to this increasing demand for aquatic food'. Hence, it is assumed that in a situation of limited offer, the only possibility to satisfy demand is by developing the aquaculture sector.

In both cases, supporters of the Livestock and Blue Revolution defend a *consumer-focused market*, in which everything consumers want must be provided, conferring consumers the power to decide and define the market and trends within the food chain. In case negative consequences could result as an outcome of the production system (which most consumers would probably not know), then the objective would be to minimize them. Defenders of this argument present future scenarios and projections regarding world consumption of meat and fish by 2020 (Rosegrant and Sombilla, 1997; Delgado et al, 2003). These trends are presented as unavoidable and are assumed by the vast majority of development agencies and governments. According to Steinfeld (2004), considering that demand has to be satisfied and that it is also an opportunity for poor countries, the only thing we can do as citizens, researchers and governments is to find alternatives to minimize the environmental and societal impacts of the increasing demand. He argues that satisfying the increasing and changing demands for animal food products through intensive production systems, while at the same time sustaining the natural resource base, is one of the major challenges facing world agriculture today.

In the present article, I analyse other arguments to explain the increasing demand of meat and fish products and do not confer such a potential power to consumers. I

also aim to present some alternatives to decrease the unsustainable growing consumption of these products.

Driving Forces of Increasing Demand

A widely accepted theory to explain consumer behaviour with respect to the increasing demand of fish and meat is that urbanization changes lifestyle and dietary habits (Popkins, 1999). These changes in diet are related to changes in the economic structure that shifts from a pre-industrial agrarian economy to industrialization, after which the service sector increases rapidly and industrial production is dominated by capital-intensive processes (Popkins, 1999). Economic growth is then the argument selected by the followers of both the Livestock and the Blue Revolution to support present-day increasing consumption, which is satisfied through the development of industrial and intensive animal production systems.

The Livestock Revolution has been described as demand driven, a combined result of population growth, income growth and rising urbanization. Steinfeld (2004) and Delgado (1999) pointed out that in developing countries increasing income and urbanization have been the leading factors for the increase in meat demand – and the increasing fish demand by 2020 (Delgado et al., 2003) – and meat production and the reason why this production should grow even more. Steinfeld (2004) indicated that rapid increases in livestock production are the result of population growth, urbanization, changes in lifestyles and dietary habits, and increasing disposable incomes. The total demand for animal products in the developing countries is expected to more than double by 2030. Speedy (2003) related meat consumption to wealth. In the case of fish, Lubchenco (2003) claimed that increasing demand in developed countries is driven by increased consumer awareness of the health and nutrition benefits of seafood, increased standardization and availability of products and cheaper prices.

To a large extent, increases in quality of life and urbanization lead us to believe that consumers look for better quality products in order to improve their diet. According to Entrena (1999), once the basic needs are satisfied, food consumption is shifted to be experienced with a symbolic meaning, even as a hedonist action. Although this is an existing trend, it is not always the case. A study performed in Spain showed that the number of consumers preferring quality products, whether with protected designation of origin or other quality certifications, is higher in the rural areas than in the urban ones (Moreno Sánchez and Esparcia Pérez, 2000) and the main reason wielded is the price. Thus, we can find that for the urban consumer price is an important shopping decision factor, while for the rural consumer quality is more important. Probably, in developed countries and cities, ignorance about how food is produced and disengagement with rural areas limit urban consumers' decision capacity. Also, unawareness of the social, environmental and health impacts of their food consumption may have some relevance.

In my opinion, price has been in fact one of the most important factors favouring increasing consumption of meat in developing countries and of fish in developed ones. A deep analysis of the evolution of meat (Figure 2) and farmed fish prices (Figure 5) shows that prices have not increased with the standard of living, but on the contrary have decreased or have remained the same (which implies a relative decrease of the net value). In that manner, increasing meat and fish consumption could be more a supply-driven process than a demand-driven one. Actually, Delgado

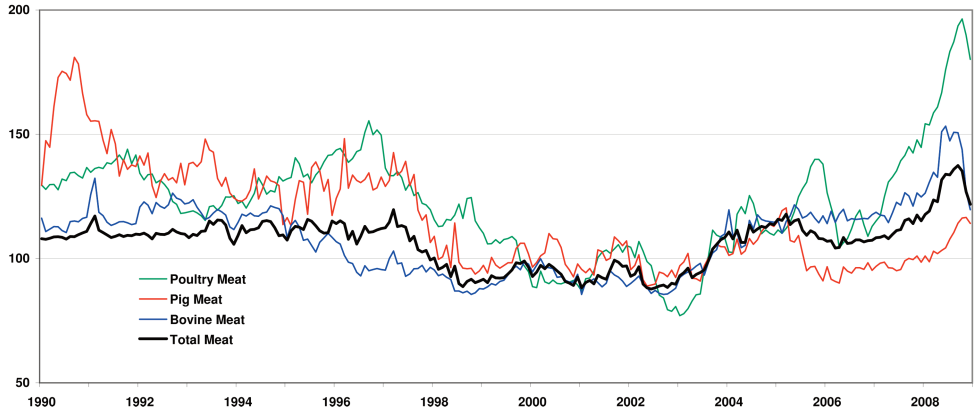

Figure 2. FAO meat prices index between 1990 and 2008 (1998–2000 = 100).
Source: FAO Meat Prices (2008)

and Narrod (2002) and Steinfeld (2003) pointed to that possibility suggesting that, looking at price trends of the major livestock products, it could be assumed that the Livestock Revolution is as much supply driven as demand driven. According to Steinfeld (2003), prices for livestock products have generally declined more than prices for food or feed grains, and the massive spread of improved technology in the intensive sector has triggered vast efficiency gains. However, he just mentions this possibility, but he does not delve into it and ends defending the *consumer-focused market*.

Analysing the case of international meat prices using data from the FAO meat prices index 2008 and FAOSTAT databases, it can be observed that prices from different types of meat (USD/tn) between 1990 and 2003 in selected countries[1] have fallen or have remained the same. For poultry (Brazil, USA and Japan; see Figure 3) prices ranged between US$ 950 and US$ 1,990 in 1990 and between US$ 469 and US$ 2,100 in 2003. For pig meat (USA, Japan, Spain and China), prices were between US$ 981 and US$ 3,681 in 1990 and between US$ 833 and US$ 3,965 in 2003. For bovine meat (Argentina, Australia, USA and Japan), prices were between US$ 1,500 and US$ 17290 in 1990 and between US$ 1,395 and US$ 13900 in 2003. By type of meat, the lowest prices are those for poultry, followed by pig meat. Bovine meat is the most expensive. This trend changed in 2008, and the results in meat consumption are still to be seen. For instance, during the year 2007, due to disease outbreaks and negative weather conditions in China, prices of pig meat increased and domestic consumption decreased in favour of chicken meat (USDA, 2008).

As regards meat consumption by type of meat, we can observe that those with lower prices are the ones that suffered a bigger rise of consumption, both in developing and developed countries. In that manner, Steinfeld (2003) pointed out that the biggest increments in meat consumption in developing countries were of poultry and pig meat. According to Sarmiento (2005), in the USA between 1955 and 1995, demand for beef and pork meat became quite price and income inelastic, while poultry had the largest elasticity. This means that demand for poultry meat was affected by price or by the income of the consumers, while the other two, which were more expensive, did not depend so much on these factors. In Germany, Becker et al. (2000) showed that from 1981 to 1995, meat price growth was well below the rest of food and con-

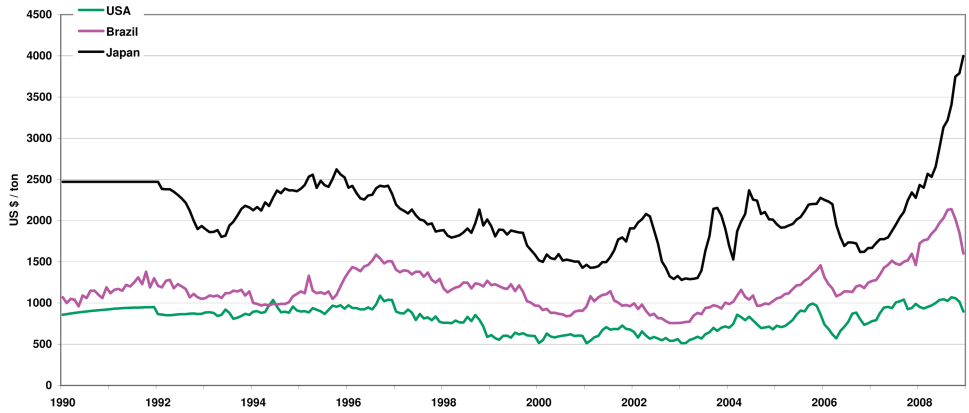

Figure 3. International prices for poultry meat between 1990 and 2008.
Source: FAO Meat Prices (2008).

cluded that there was a long-term relationship between the amount consumed of the different meats and price. Considering that poultry production costs decreased considerably in the last two decades due to the intensification of the production system, it results that prices decreased and consumption increased. However, beef prices increased (relative to other meats) and consumption decreased. In general terms, from the FAOSTAT database we can calculate worldwide meat consumption evolution by type of meat from 1990 and 2005. The increase has been of 38%, 70% and 121% for beef, pig and poultry, respectively. If we look at the least developed countries (according to the FAO classification), the change in consumption from 1991 to 2003 has been of –6%, 13% and 121% for beef, pig and poultry, respectively. In those countries, the evolution of prices for the same period was of –13%, –4% and –24%, respectively. Despite the fact that price reduction in this period was higher for bovine than for pig meat, it is important to consider the price of the different types of meat by the end of the period, which was 2,045, 1,838 and 1,789 USD/tn, respectively, i.e. bovine meat was still 11% and 14% more expensive than the other two types. The growth in pig and poultry production in developing countries between 1989 and 1999 has been remarkable at more than double the growth of ruminants (Steinfeld, 2003). In richer countries (UE, North America, Australia and New Zealand) the evolution of consumption for the period 1991–2003 calculated from FAOSTAT was of –11%, 6% and 39% for beef, pig and poultry, respectively.

Steinfeld (2003) emphasizes that, in the last few years, there has been a change in livestock production practices from a local multi-purpose activity into a market-oriented and increasingly integrated process (vertical integration) with more large-scale, industrial production located close to urban centres (geographical concentration), a decreasing importance of ruminants relative to monogastric livestock species, and a substantial rise in the use of cereal-based feed. Large food retailers have also had a major role in this transformation (Steinfeld et al., 2006b). In that manner, industrial livestock production, which was almost non existent 35 years ago, grew at twice the annual rate of the more traditional, mixed farming systems (4.3% against 2.2%), and at more than six times the annual growth rate of production based on grazing (0.7%; FAO, 1996). There are major regional differences. For example, growth in poultry

meat production has been particularly spectacular in East Asia (11.7% p.a.) and South Asia (7.2% p.a.) and reflects the rapid intensification of the poultry industry in the region. Latin America had annual growth rates of 9%. The biggest growth in pig production was in China at 2.3%.

These trends support the argument I defend here: price has been a major driving force for increasing meat consumption in developing countries, and this was possible thanks to the development of industrial ultra-intensive production systems, accompanied by a process of vertical and horizontal integration, geographical concentration, increasing scales of production, as well as the introduction of contract farming. This has major implications in the distribution of power in the meat sector, with a reduction in the number of self-reliant small producers and a concentration in the number of actors that control the production process (Jordan and Constance, 2008), mostly transnational corporations (TNC), in which producers sell their labour rather than products (Hinrichs and Welsh, 2003) and consumers suffer a reduction in the diversity of products they can buy. These actors controlling the production and distribution processes, favoured by other political and economical factors as explained below, are in fact some of the actors enabling the increase in meat consumption in developing countries.

In the case of meat, the price of the grain used for animal feed is a determinant factor in the final price. The prices of these grains also fell during the last few years or remained the same (Figure 4) until now. Animal feed is the higher cost in intensive animal production. In the case of poultry it can be up to 70% of direct costs (Walker and Gordon, 2003). In developing countries, 31% of cereals and 59% of roots and tubers are used as animal feed (Gill, 1999) and worldwide more than 40% of the production of these types of grain is for animal feed. If soy, maize or wheat reduce their price in the international market, then the meat price goes down. This has been the trend up to now, thanks to direct and indirect subsidies to these products. Thus, subsidizing these grains is also a political strategy to promote intensive animal production systems. However, this tendency changed during 2008, and we faced major increases in the price of the ingredients of animal feed due to several causes, such as the speculation and introduction of financial capital in the food chain, the production of biofuels or the prevision of a lack of land in the future, among others (García et al, 2008). The increase in the price of these grains is having and will have serious implications in the price of meat. Actually, in 2009, meat production is expected to decline because producers have already made decisions based on their 2007–2008 expectations of higher grain and energy prices. Per capita meat supplies are likely to fall, and consumers can expect to pay more for meat and dairy in 2009 (Stillman et al., 2009). This can result in a future reduction of the consumption trend, which would also support the argument I present here.

An interesting example that also shows the lack of analysis of the influence of intensive production systems on meat consumption is that of obesity, known as the 'epidemic of the 21st century'. Many authors point out that urbanization, industrialization and the increase of meat consumption results in an increase of obesity. Actually, the number of obese people is higher in cities than in rural areas (Popkins, 1999). However, it is remarkable to confirm that obesity indexes are increasing among the lowest layers of society and that people living in circumstances of low socioeconomic status may be more at the mercy of the obesogenic environment (WHO, 2003), so the relationship between meat consumption and buying power may not be so direct either. Evidence shows that only a few have the financial means to engage in

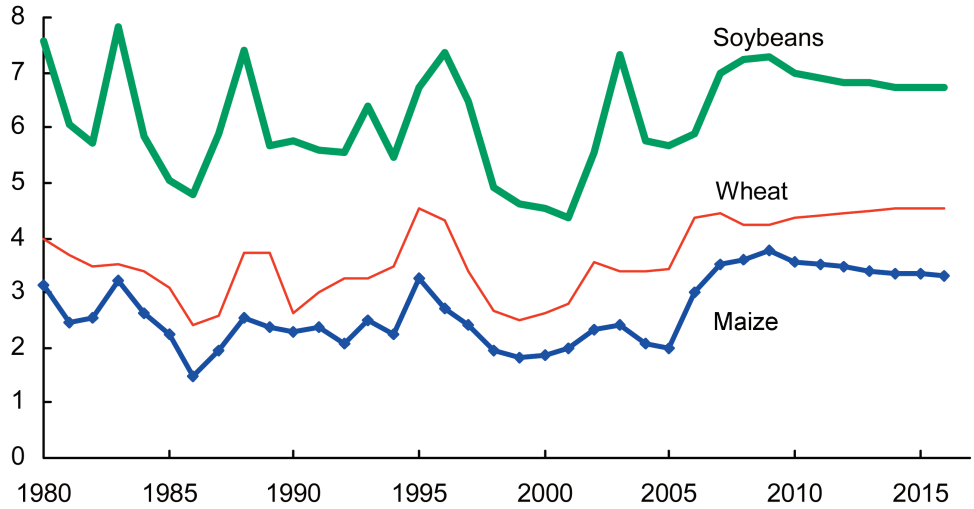

Figure 4. Price of soy, maize and wheat in the USA between 1981 and 2001 and projections for 2010 (in dollars per bushel).
Source: USDA (2007).
Note: Bushel: Maize: 56 lb ≈ 25.401 kg; Wheat and soybean: 60 lb ≈ 27.215 kg.

careful and aware consumption (Crewe, 2001). Harpham and Molyneux (2001) shows that in developing countries, problems associated with western diets and lifestyles are most serious amongst urban populations, and that low-income urban populations suffer the worst of both worlds as undernutrition, food insecurity, dietary excess and obesity often coexist. However, most authors do not relate obesity to intensive production systems and the low price of meat. Even in the brilliant description of the obesogenic environment of Young (2004) this key element is lacking: intensification of meat production, the price of meat and the decrease suffered with time.

In the case of fish, the increasing demand in developed countries has been mostly of high value species. According to Lubchenco (2003) although all forms of aquaculture are increasing, exceptionally high growth rates have occurred in salmon and shrimp farming, mostly in developing countries. To satisfy the demand producers have also fallen back on intensive production systems. Rivera-Ferre (2007) criticized the FAO State of World Aquaculture Report 2006 that promoted and justified aquaculture based on intensive production systems to satisfy demand, to decrease pressure on fish resources and as an opportunity for poor countries. These systems are based on high-value, mostly carnivorous species for export. As in the meat case, intensification and vertical integration has allowed the reduction of prices and thanks to industrial aquaculture luxury species, such as salmon and shrimp, have become a normal daily food in developed countries. To Delgado et al. (2003) a hypothetic scenario of general price reduction of cultured fish prices could be due to a rapid expansion of both scale and efficiency of aquaculture. According to the FAO database FISHSTAT Plus, the unit value for Atlantic salmon in 2004 has dropped by 20–40% of the unit value in 1986–1987 in Western Europe, North America and Latin America and the Caribbean, and the 2004 unit value for Whiteleg shrimp produced in the Latin America and Caribbean region is only 58% of the unit value in the peak year of 1987 (Figure 5). It should be noted that these prices and comparisons are not

adjusted for inflation. Thus, the actual decreases in real value are somewhat greater (FAO, 2006). As in the case of meat, these data and trends can be interpreted in the following manner: intensive industrial aquaculture has placed in the international market high-value fish species at a very competitive price and this has resulted in increased consumption.

Considering that changes in consumption patterns (if demand driven) will continue to result in an average net increase in the demand for animal products, supporters of the Livestock and Blue Revolutions point out that traditional mixed farming practices alone will no longer be capable of meeting requirements (Steinfeld, 2004). Their option is to increase production and productivity through further intensification, which according to FAO (2006) will be the future trend in global aquaculture. They assume there is not enough land to meet the demand using extensive systems, although they fail to consider the amount of land required to grow animal feed for intensive livestock production, or the social and environmental impacts of these systems.

Defenders of the *consumer-focused, demand-driven market* suggest that 'demand determines production and to satisfy this demand it is necessary to rely on intensive production systems'. However, they contradict themselves when they assure that research and development investments to increase productivity (by combining conventional breeding with wide-crossing, transgenic crosses and other tools resulting from biotechnology research) are needed in order to avoid price increases. According

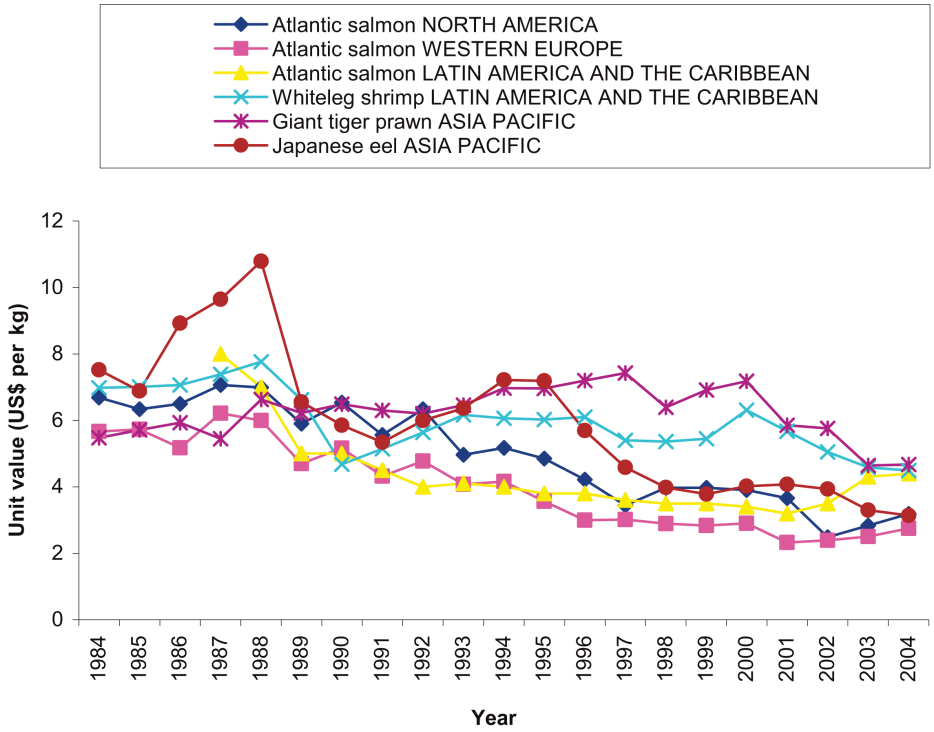

Figure 5. Trends in the unit value (USD/kg) of selected high-value species in selected top producing regions between 1984 and 2004.
Source: FAO (2006).

to them, this would lead to a reduction of demand and increasing malnutrition in developing countries (Rosegrant and Sombilla, 1997). Thus, on the one hand they assure that demand is determined by urbanization and higher acquisitive levels in developing countries, not by lower prices of products coming from industrial intensive production systems; however, they recognize that price increments would lead to reductions in demand.

If the argument I defend here is that previous to the increasing demand of meat and fish worldwide there has been an increase in production coming from intensive industrialized systems, then the question to answer would be: what encouraged intensive production systems in developing countries? An important driving-force has been the encouragement in those countries of the livestock and aquaculture industries by the institutions that support cooperation and development. These institutions have financed the industrialization and intensification of animal production systems and have promoted the privatization of other sectors such as of vaccination. Rivera-Ferre (2009) points out that one of the main factors for the increase in production and consumption of farmed shrimps has been the funding of intensive production systems by international development banks, governments and aid agencies to big producers, whether transnational corporations, local corporations (many of them subsidiaries of Northern companies) or wealthy individuals. In Tables 1 and 2, investments performed in the meat and shrimp sectors, respectively, by the International Finance Corporation (IFC) of the World Bank, are presented. All the projects funded are to big companies which usually have other businesses apart from meat production. If we check the projects financed by other branches of the World Bank directed to small and medium entrepreneurs, the projects are conducted towards the intensification of production processes (and the indebtedness of small producers). These institutions believe that the rising demand for livestock products could create employment opportunities and better incomes in poorer rural areas. However, such opportunities for the poor are unlikely. Poor farmers do not usually have access to these systems, which require an important financial capital to start the business (that is financed by development institutions), but if they could, commercialization is usually in hands of big TNCs (including food retailers). It is more likely that small-scale, multi-purpose farms end up being displaced by large-scale, specialized commercial livestock and aquaculture operations through integration, verticalization and contract farming, as it happened in developed countries during the twentieth century.

Table 1. Examples of projects for development of the meat sector financed by the IFC.

Company	Country	Type of meat
Suguna Poultry Farms Ltd	India	Poultry
Wadi Holdings Company	Egypt	Poultry
CJSC Myronivsky Khliboprodukt	Ukraine	Poultry
Banvit Bandirma Vitaminli Yem Sanayi A.S	Turkey	Poultry
Procesadora Nacional de Alimentos C.A. - PRONACA	Ecuador	Poultry and pig
Jilin Zhengye Agriculture Development Co.	China	Pig
Agropecuaria Sanfandila S.A. de C.V.	México	Pig
Belje d.d.	Croatia	Pig and cattle
Agrokor*	Croatia	Pig
Vicentin S.A.I.C	Argentina	Cattle
BERTIN LTDA	Brazil	Cattle

Source: IFC, <http://www.ifc.org/disclosure>.
Note: From 2005, Agrokor is the majority owner of Belje d.d.

Table 2. Shrimp aquaculture projects financed by the International Finance Corporation.

Company Name	Country	Subsidiary of	Approval Date
Central Petiwi Bahari	Indonesia	Charoen Pockhpand	Jan 19, 2006
Inter Sea Farms de Venezuela, C.A.	Venezuela	Joint venture Sea Farms International & Interaqua	Feb 9, 2005 June 5, 2000
Les Gambas De L'ankarana	Madagascar	Groupe Socota	Jan 16, 2004
Aquaculture De Crevettes De Besalampy	Madagascar		May 17, 2001
Grupo Granjas Marinas S.A.	Honduras	Sea Farms International	May 13, 1999
La Universal, S.A.	Ecuador		Jan 8, 1999
Nova Companies Ltd. & Ambergris Aquaculture Ltd.	Belize	Bluecadia Aquaculture Group	May 6, 1998
Empesca S.A. – Holding	Brazil		Oct 14, 1997
SEF Companhia de Pescas da Zambezia, Lda.	Mozambique	Finage-Mar and Mar-Azul	June 20, 1997

Source: Rivera-Ferre (2009)

The case of chicken production in the United States and the impact of industry concentration and contract farming on the communities has been widely analysed by Bonanno et al. (2002). Thus, meat and fish prices decrease at the same time as poor and small producers are normally excluded and cannot compete in prices. In this context, Delgado's (1999) suggestion is surprising that for the poor to get benefited from the increasing demand of meat, poverty policy could promote vertical integration of small producers with livestock food processors, normally big companies, through contract farming or participatory producer co-ops. As previously mentioned, this means more intensification for small farmers, more indebtedness, less number of small farms, less independence, more enrichment for feed companies and more market concentration.

In summary, explanations of advantages of intensive meat and fish production are given in a socioeconomic context in which development institutions promote export-oriented primary products, because their idea of development is linked to economic growth, driven by top-down approaches and external aid and investments (Rivera-Ferre, 2009). In the case of aquaculture, we are facing a typical case of mobility of capital,[2] global sourcing,[3] and geographical dislocation of production in connection to consumption. It is obvious then that the increasing demand of meat and fish is not an inevitable process simply associated to urbanization or higher incomes, but a political and economical process conducted largely by agencies and institutions (and supported by some researchers) promoting a global development model within the neoliberal capitalist paradigm in their search of maximizing monetary benefit. In the case of meat and fish, this is reflected in the promotion of the intensive production systems.

Impacts of the Increment of Intensive Animal Production Systems

Table 3 shows the most important social, environmental and health impacts of intensive livestock and fish production. It is clear that it is irresponsible to increase meat and fish production through intensification by way of the argument that demand must be satiisfied because it is increasing and is expected to continue increasing in the future. In fact, intensive systems are exclusive, market-oriented, with important and severe social, health and ecological costs. In the case of aquaculture, the higher

the trophic level of the species cultured, the greater the *fishprint* (Wolowicz, 2005) and thus the higher the impact on the environment.

It is not the aim of this article to review these impacts, which have been widely analysed by others (e.g. Cheeke, 1993; Walker et al., 2005; Steinfeld et al., 2006b; ADAS, 2007). In the case of social impacts, most of them are related to the system promoted by the globalization of agriculture and the food chain, and contains some of the transformations that big capital normally produces (displacements, concentration, integration). These impacts have also been analysed elsewhere (e.g. Barnes, 1971; Friedland et al., 1978; Goodman et al., 1987; Friedmann and McMichael, 1989; Molnar and Kinnucan, 1989; Bonanno, 1991; Bonanno et al., 1994; McMichael, 1994). From these impacts, I would like to highlight that intensive production systems have important implications for the quality of life of farmers. Jordan and Constance (2008) state that family-based systems with a strong middle class generate a higher quality of life in rural communities than large-scale systems where a few large landowners hire farm workers. They suggest that growing concentration in input and output markets combined with increases in contract farming result in marginalization of farmers in supply chains dominated by powerful agribusiness corporations. But it is also important to consider the present socioeconomic context. The effects of losses of rural employment and migration towards urban areas are completely different in developing countries nowadays than it was in developed countries during the mid-twentieth century, in the Fordist era. During those days, Keynesian policies promoted by the state favoured the appearance of a middle class in the cities, industry workers were relatively strong and the industrial sector was increasing. Nowadays, under the neoliberal paradigm, TNCs are among the most powerful agents in society. They are

Table 3. Social, environmental and health consequences of the increase of intensive meat and fish production to satisfy the increasing demand.

	Meat	Fish
Environmental	• Excessive use of water in a world where this element is scarce. • Use of land for grain production for animal feed. • Deforestation for grain production. • Direct and indirect contribution to global warming. • Pollution in the grain production areas and in the livestock concentration areas. • Decrease of biodiversity and disappearance of traditional livestock breeds.	• Overexploitation of fish resources to produce fishmeal. • Privatisation of the littoral. • Destruction of coast forest (e.g. mangrove for shrimp production). • Pollution of the coast due to residues and nutrients accumulation. • Soil and water salinization. • Decrease of biodiversity.
Social	• Expulsion of small farmers and fisherfolk from their land and coastal areas. • Increase of TNC power which control animal breeding, animal nutrition and trade. } Concentration • Disappearance of traditional livelihoods. • Direct competition with human being for grain or fish intended to animal feed. • Increase of poverty and food insecurity. • Loss of food sovereignty.	
Health	• Undernutrition. • Obesity. • Increase of animal diseases and zoonosis. • Increase of bacteria resistance to the antibiotics.	• Undernutrition. • Increase of bacteria resistance to the antibiotics.

entities endowed with powers that shape contemporary patterns of socioeconomic development (Bonanno and Constance, 2001). TNCs' hyper-mobility has weakened the ability of nation states to monitor and/or oppose the activities of corporate actors. Thus, the power of transnational corporations is higher than before at the same time as the state has reduced its intervention capacity and decision-making in the economical sphere. This situation has resulted in less power and more marginalization for those workers in the industry that live in the urban areas. In this context, farmers who abandon rural areas in developing countries to work in the cities find a situation not comparable to the situation in developed countries during the mid-twentieth century, and they usually end at the suburbs of these cities.

Obviously, under the present concept of development all these impacts are not accounted for but externalized and thus trade of these animal products, which are energetically expensive to produce, is profitable nowadays. In this manner, it is logical that these institutions promoting development support and finance these productions systems in developing countries. The point then is to reflect on the concept of development. Rivera-Ferre (2009) questions whether this concept of development should be reconsidered and other policies adopted to promote other types of production and distribution systems that would increase the sustainability of the whole food chain worldwide.

Additionally, I would like to remark some questionable issues in the line of reasoning of institutions promoting Livestock and Blue Revolutions. First, none of them mention the necessity to reduce the consumption of meat and fish in developed countries, which in the case of meat is far too high and in the case of fish a luxury. Second, their effort to highlight the benefits of the intensive systems to the poor population and also to the environment leads them to mix up both traditional and intensive production systems in their justification. The former is in fact essential for the livelihoods of millions of people all over the world, and frequently is in balance with the natural processes of the environment, whereas the latter destroys these livelihoods and the ecosystems through its requirement of more and more capital and a smaller labour force (which is also of uncertain quality).

Conclusions

In my opinion it is wrong to believe that the production systems are adapted to supply new markets driven by consumer demands. It is probably more plausible the other way around, that the production systems are the ones that determinate and create the market. Thus, consumers adjust themselves to the offer, and not the other way around. Food retailers and agricultural TNCs present the changes in patterns of production and consumption as 'efficient' and as a 'natural' consequence of individual choice, and then market expensive technological 'solutions' to alleviate the resultant environmental and/or health problems (Young, 2004). That same argument is used to justify the increase in meat and fish production and consumption and could also be used for the increasing supply and demand of exotic fruits or out-of-season vegetables. Companies argue that consumers demand them; however, I believe the offer has been presented to the consumer first and afterwards the demand starts. Nowadays, the consumer does not have the active and determinant role in food choice that some want to attribute to them. It is more a passive consumer lacking fundamental social, health and environmental information, and limited

possibilities to choose from out of the supermarkets distribution chain, guided by the preferences and convenience of a global development paradigm that has also arrived with the food system and is led by the food retailer companies, among others.

The development models that relate and promote urbanization and the abandonment of the agricultural sector and rural areas carry serious environmental, social and health problems. It would be desirable to elude situations where industrialization brings dangerous changes in feeding habits. It is obvious that in industrialized countries and more and more in developing countries consumer demand is not linked with the actual biological needs of the human organism but with prices that do not reflect the real social and environmental costs of production. Habits that promote excessive meat consumption may cause health problems, apart from having social and environmental consequences. This is not to say that livestock production should be stopped in developing countries, where in many cases there is a lack of animal protein. In those countries other solutions are required (Gill, 1999), at the same time that intake should decrease severely in developed countries. It would be necessary to develop policies to decrease meat demand in those countries in which meat consumption is excessive. One such alternative would be to develop policies directed at adding social, health and environmental impacts into the final cost of food. This option would allow a reduction of consumption and change the global food system towards a more sustainable production and distribution system and healthier consumption habits. Furthermore, consumers' lack of information about the consequences of their consumption (which is more evident in the case of intensive aquaculture products) indicates there exist some market failures that justify state intervention, as McCarthy (2004) indicated for the case of obesity. Only informed consumers can be critical and exigent consumers. This is a necessary step if we really want them to have an active role and if the *consumer-focused market* is to be fair. Considering all this, intensification of agriculture and aquaculture cannot be defended based on a false argument such as that demand is the main driving force.

Both alternatives to change the present trends of meat and fish consumption and production match well with some ecological and consumer movement lines of reasoning. In that manner, alternatives to decrease meat and fish consumption could focus on quality of life and consumption and thus would agree with Bonanno's (2004) suggestion that they offer a historical possibility to counter the power of TNCs and establish substantive forms of democracy within the food chain.

Notes

1. FAO selects the countries according to their relevance in the international market of the type of meat produced.
2. Hyper-mobility of capital is the term employed to refer to the expanded capacity of TNCs to move about the globe in search of more favorable factors of production and sociopolitical climates (Bonanno and Constance, 2001).
3. Global sourcing is the concept employed to describe TNCs' capacity to operate worldwide in search of less expensive labour and resources, friendly legislation and more accommodating social relations (Bonanno and Constance, 2001).

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