

Thirty years into the livestock revolution

Since the late 1970s, increasing population, growth in per-capita GDP and urbanization have combined to boost demand for animal-source foods in developing countries – a phenomenon that has been termed the ‘livestock revolution’ (Delgado *et al.*, 1999). With livestock contributing to the livelihoods of some 42 percent of the world’s poor (Thornton *et al.*, 2002), this growth in demand has been widely attributed considerable potential for poverty reduction.

Delgado *et al.* (1999) described the transformation in demand for animal-source foods that occurred in the 1980s and early 1990s. They reported that during this period, the total amount of meat consumed in developing countries grew at three times the rate of that in the developed countries, and they predicted this growth to continue at a rate of 2.8 percent for meat and at 3.3 percent for milk in the developing countries up to 2020. During the past 10 years, much of the forecast increase in demand has occurred, but in a rather patchy manner. China and Brazil in particular have witnessed massive increases in demand for and production of livestock products, but sub-Saharan Africa has for the most part been virtually stagnant, with the possible exceptions of milk in Kenya and poultry in South Africa. It would appear that economic growth must accompany population growth if the ‘revolution’ is to occur.

WORLD POPULATION PROJECTIONS

The population of the world was estimated at 6.8 billion in 2009, with 5.6 billion (or 82 per cent of the world’s total) living in the less developed regions (UN, 2009). Current estimates are that the population will grow to 9.1 billion in 2050, with most of the growth occurring in developing countries (UN, 2009).

According to the United Nations (UN) long-term projections, the world population will reach its peak in 2075, at 9.2 billion, then decline slightly and increase again to reach a second peak of 9 billion by 2300 (UN, 2004). To project future population the UN Population Division makes assumptions regarding future trends in fertility, mortality and international migration. This pattern of rise, decline, and rise again results from these assumptions on vital rates: that, country by country, fertility will fall below replacement level and eventually return to replacement; and that, country by country, life expectancy will eventually follow a path of uninterrupted but slowing increase.

However, with alternative, plausible assumptions about fertility, long-range trends could be quite different, so a number of projection variants is produced, to deal with uncertainties of making projections into the future. For example, with long-range total fertility of 0.3 children above replacement, projected world population in 2300 is four times as large as the main projection; with total fertility of 0.2 children below replacement, world population in 2300 is one-quarter of the main projection (UN, 2004).

The projected population trends also depend on sustained progress in HIV/AIDS prevention and treatment. Although a growing number of the countries that are most affected by the epidemic is reaching and maintaining lower prevalence levels, in countries where the prevalence has been high the impact of the epidemic is still evident and, in these countries, the growth rate is expected to continue declining.

Based on these assumptions, the UN estimates that the populations of 30 countries, most of which are categorised as least developed, will at least double between 2010 and 2050, according to the medium variant. In contrast, the population of the more developed regions is expected to change minimally, passing from 1.23 billion to 1.28 billion, and would actually decline to 1.15 billion were it not for the projected net migration from developing to developed countries (UN, 2004).

An important issue in population growth is the distribution and the growth of urban areas. According to the 2007 *World Urbanization Prospect*, the population living in urban areas is projected to rise from 3.3 billion in 2007 to 6.4 billion in 2050. Globally, the level of urbanization is thus expected to rise from 50 percent in 2008 to 70 percent in 2050 (UN, 2008).

There is considerable diversity in the levels of urbanization in different regions. While 74 percent of the inhabitants of more developed regions lived in urban areas in 2007, just 44 percent of those in the less developed regions did so. Urbanization is expected to continue rising in both the more developed and the less developed regions so that, by 2050, urban dwellers will account for 86 percent of the population in the more developed regions and for 67 percent in the less developed regions (UN, 2008). Among the less developed regions, Latin America and the Caribbean have exceptionally high levels of urbanization (78 percent), while Africa and Asia retain larger shares of rural inhabitants. Over the coming decades, however, the level of urbanization is expected to increase in all major areas of the developing world, with Africa and Asia urbanising more rapidly than the rest.

Furthermore, the urban population is distributed unevenly among urban settlements of different size. Despite their visibility and dynamism, mega-cities (defined as a metropolis with a population greater than 10 millions) account for a small proportion of the world's urban population: about 9 percent in 2007. This proportion is expected to rise to almost 10 percent in 2025. Mega-cities account today for only 4 percent of the global population. In contrast, over half of the urban population lives and will continue to live in small urban centres, with fewer than half a million inhabitants (UN, 2008).

WORLD INCOME PROJECTIONS

Forecasting national incomes, in terms of GDP, presents even more challenges than projecting population, given the uncertainties and instabilities of markets and financial systems. The International Monetary Fund (IMF) regularly produces short-term future estimates of GDP and economic growth. Global growth, for example, is projected to reach 3.1 percent in 2010, following a contraction in activity of 1.1 percent in 2009. By 2014, global growth is forecast to have reached 4.5 percent (IMF, 2009).

The World Bank also regularly produces future estimates of national GDP and per-capita GDP over a 5-year period, along with poverty forecasts. For example, per-capita GDP in developing countries over the period from 2010 to 2015 is expected to expand at a relatively rapid annual pace of 4.6 percent, much faster than the 2.1 percent pace of the 1990s (World Bank, 2009). Producing robust forecasts of GDP and economic growth more than about 5 years into the future is challenging, however, due to the vagaries of markets and financial systems.

Notwithstanding these difficulties the World Bank has produced some medium-

to long-term projections of GDP. At assumed growth rates in per-capita GDP of 2 percent in high income countries (which is the average over the past 20 years) and 3.3 percent in low- and middle-income countries (an optimistic figure, representing the growth experienced in the 1960s and 1970s), world income in 2050 would be more than US\$ 135 trillion, up from US\$ 35 trillion today (World Bank, 2006b). At these rates, the total GDP in 2050 of today's developing countries will be twice that of industrial countries today. Whilst expected GDP growth in the developing regions may sound promising in terms of meeting basic human needs for food and shelter, poverty could still increase significantly in a number of developing economies; notably in sub-Saharan Africa, where per-capita GDP contracted in 2009 for the first time in a decade (IMF, 2009).

THE LIVESTOCK SECTOR

Overall growth in agricultural production is slowing down, and is expected to continue to do so as a consequence of the slowdown in population growth, in spite of the fact that levels of food consumption are likely to increase. Notwithstanding a slowing in the growth rate of the population, agricultural production will need to increase by 70 percent (nearly 100 percent in developing countries) by 2050 to cope with a 40 percent increase in world population and to raise average food consumption to 3 130¹ kcal per person per day. Bruinsma (2009) provides some estimates of the additional crop and livestock production that would be needed to meet this increase in demand for food; an additional billion tonnes of cereals, for example, and 200 million tonnes of meat would need to be produced annually by 2050, as compared with production in 2005/07.

For the livestock sector, this raises important questions: Where will that meat be consumed? Where and how will it be produced? What will be the economic, social, environmental and public health outcomes of that increased production?

Whilst overall production must increase to meet the increasing demand it is projected that there will be a deceleration in growth of meat production and consumption, though the milk sector is expected to continue to grow, mainly because of growth in demand in developing countries (FAO, 2006b). Meat consumption in China grew massively from an annual average of 9 kg per person to more than 50 kg per person in the space of 30 years. Consumption in the rest of the developing world, which now averages a modest 16 kg per person, still has considerable potential for growth, considering that per-capita consumption could easily double by 2050.

In developing countries, where most of the global growth in population occurs, meat consumption has grown at over 5 percent per annum during recent decades, and milk consumption at nearly 4 percent per annum – but these impressive growth figures have been driven largely by China and to some extent Brazil. FAO (2006b) reported the average meat consumption in industrial countries to be around 90 kg per person per year (in 2000); 26 developing countries had an average consumption rate under 10 kg, and a further 30 had average consumption rates of between 10 and 20 kg. Of these 56 countries, 23 consumed less meat per capita on average than they had 10 years before.

¹ 2 200 kcal per person per day is considered to be the minimum required food energy intake (SPHERE, 2004).

If the consumption figures for China are removed from the equation, the growth rate for world meat consumption of 2.9 percent per annum seen in the 1990s is halved. The livestock revolution described by Delgado *et al.* (1999) is not a ubiquitous phenomenon, largely because of the much slower development and income growth in many countries. On top of that, growth in meat consumption is and will continue to be moderated by cultural factors in some very large developing economies – for example the consumption of beef in India and pork in Muslim countries.

By far the largest proportion of livestock sector growth in recent years is attributable to the poultry sector, which has consistently grown at more than 5 percent per annum since the 1960s. Its share in world meat production doubled from 15 percent thirty years ago to 30 percent in 2000. Growth and an increased share in overall meat consumption have also been seen in pork, but ruminant meat consumption has actually been on the decline. Further details of the more recent trends in consumption and production of animal-source foods can be found in numerous publications: FAO (2008), Bruinsma (2009) and Rae and Nayga (2010), to name a few.

The Global Perspective Studies Unit at FAO has an on-going programme to estimate current demand for and production of agricultural commodities, and to project these into the future (Bruinsma, 2003; FAO, 2006b). In the next section we summarise how this is done and describe a methodology to map these estimates and projections.