Centre for World Food
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SOW-VU BRIEF

Can we feed the animals?

Introduction

According to the medium variant estimate of the United Nations' Population Division, between 2000 and 2030 world population will grow by approximately 35%, from about 6.1 billion to about 8.2 billion people. Just on the basis of this growth in world population, over this period world food supply will also have to increase by about 35%, assuming that global per capita food consumption will remain, at least, at the same level as it is now.

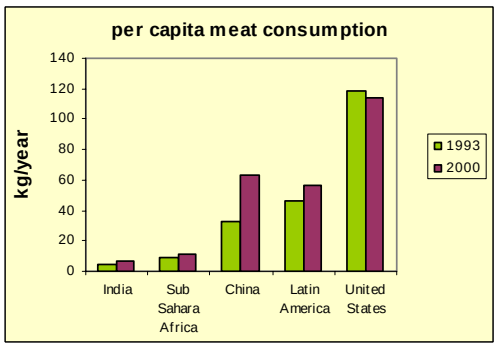


Figure 1 Meat consumption in the world (CAST, 1999)

Part of people's diet generally consists of meat. In high-income countries per capita meat consumption is in the order of magnitude of 80 to 120 kg capita per year, in low-income countries it is generally much lower, with for example meat consumption in Sub Sahara Africa at around 10 kg per capita per year. Animals, being raised for the production of meat, generally receive part of their food in the form of feed grains. Of course, animals are also raised by grazing, but the importance of feed grains can easily be illustrated by the fact that of the total global production of cereals (approximately 2000 million tons per year), about one third is being used for feeding animals. The large share of feed grains in the total global cereals production can be partially explained by the fact that for the production of 1 kg of meat at least about double the amount of feed is required. It is the so-called feed-meat ratio that indicates how many kgs of feed grain is required for the production of 1 kg of meat. This feed-meat ratio varies by the type of meat being produced, with generally more feed grains being used in the production of pork and chicken meat in comparison with the production of meat from cows, goats or sheep.

Thus, when also the global per capita meat consumption remains at its present level, not only the production of food for human consumption needs to increase by around 35% between 2000 and 2030, also the production of animal feeds requires an increase of such magnitude.

However, population growth is not the only cause of increasing food requirements in the world. In the first place, it is expected that, on average, per capita incomes in the world will continue to increase, and as a result total per capita food consumption, expressed in kilocalories per person per day, will also increase. While in low income countries per capita food supply can be as low as 1800 or 1900 kcal per capita per day, in high income countries a per capita food supply of 3500 kcal or even more, is not uncommon. In the second place, with increasing incomes also patterns of food consumption tend to change, and one characteristic of such change is an increased share of meat in people's average diet. In particular in low income countries increasing incomes will trigger increasing shares of animal products in the diet. In high-income countries, meat consumption appears to be at a more satiated level, and further income increases have limited effects on meat consumption.

Taking account of these various factors (population growth, increasing levels of income, and shifts towards higher meat consumption), international organizations

have made projections for global demands for food and feed in the next decades. For example, for the period 2000-2030 FAO estimates global food cereals demand to increase from approximately 1800 to 2800 million tons (up by 56%), including an increase in feedgrain demand from 600 to 1100 million tons (FAO, 2003).

Yet, with respect to these projections there are a number of questions that can be raised. These questions relate to the accuracy of current estimates with respect to the relationships between income and demand for meat, and with respect to current estimates on trends in feed/meat ratios, in particular for developing countries. On the basis of research undertaken at the Centre of World Food Studies, it will be argued that current estimates on global trends in meat demand, in particular for lower income population groups might well be too conservative, and that also the actual increases in demand for feed grains will be considerably larger than commonly estimated.

Trends in meat consumption

As already mentioned, when incomes increase, the share of meat in the diet will increase. In other words, when income goes up for example by 10%, meat consumption rises faster, possibly by 15%, or more. In most international projections, such as those by FAO and IFPRI, it is generally assumed that the income elasticity of meat demand is constant over a wide range of incomes, and levels off only at very high-income levels (FAO, 2000; IFPRI, 2001). Research at the Centre, however, suggests that also in the lower part of the income range, the relationship between total income and meat consumption is not a fixed value. Figure 2 shows, in a stylized way, that for people whose incomes are at the lower end of the per capita income range, the effect of an increasing income on meat demand is very modest. However, at a certain point (y) there is a strong increase in the effect of income on meat demand. On the basis of research at SOW-VU it is postulated that between 2000 and 2030 a considerable share of the people in low income countries will enter the middle part of figure 2, where the income elasticity for meat is steeper than average. As a result increases in meat consumption will be larger than commonly projected.

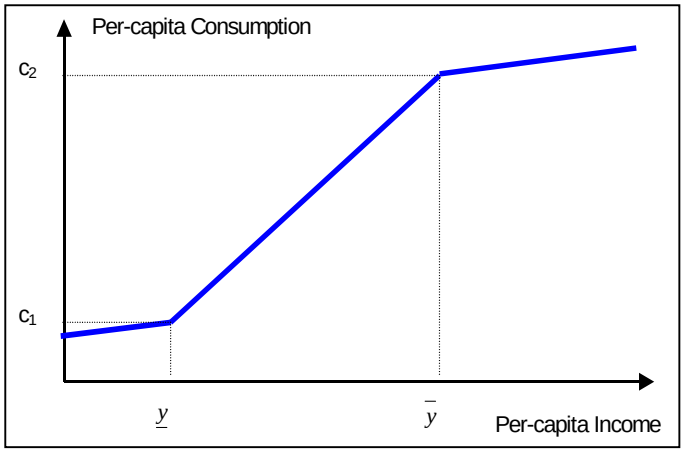
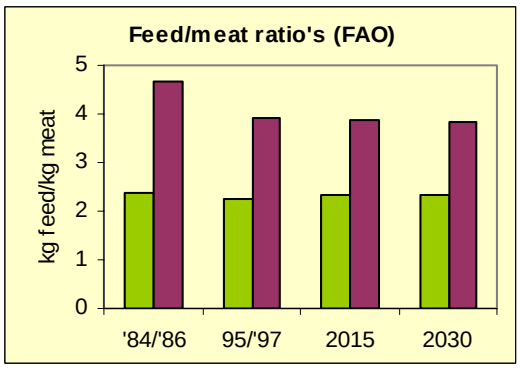


Figure 2 Relationship between per capita income and per capita meat consumption

Animal production systems

A second issue that has been addressed in research at SOW-VU is to what extent over the next decades the current feed/meat ratios will remain unchanged or whether important changes can be expected to occur. Figure 3 shows data and projections from FAO and IFPRI. It shows, in the first place, that in developed countries feed/meat ratios are about twice as high as in developing countries. The lower feed/meat ratio's in developing countries can largely be explained by three factors: 1) a larger share of animals being fed through grazing, 2) harvest by-products (crop-residuals) are an important component in animal feeding, and 3) household waste contributes significantly to animal feeding. In the second place, the figure shows that over the next 20-30 years, feed/meat ratio's are projected to remain practically unchanged, both in developed and in developing countries. For developed countries, this expectation appears to be realistic. Here, in past decades feed/meat ratio's declined considerably, which can be largely contributed to improving feeding efficiency (e.g. higher carcass weights, higher off-take rates, less animal diseases). However, this decreasing trend has come to a halt, and for the next decades further increases in feeding efficiency are less likely to occur.

For developing countries the expectation of unchanging feed/meat ratio's appears to be much less realistic. It implies that for an increased meat production, the feeding of



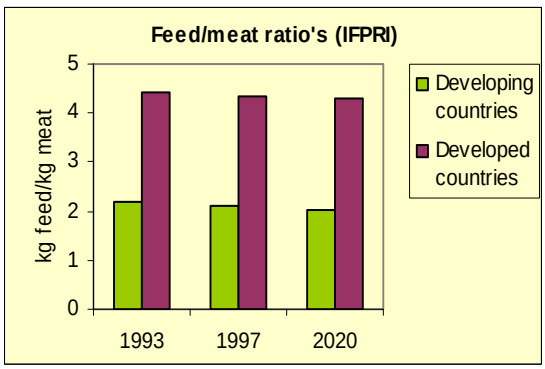


Figure 3 Feed/meat ratio's according to FAO and IFPRI

animals by grazing and by using crop residues and household waste will have to increase at the same rate as the use of feed grains. However, with respect to this availability of additional grazing land, and with respect to trends in the availability of crop residues and household waste a number of questions can be raised.

First, in many parts of the world, grazing area is already under severe pressure, and a linear expansion of available grazing land will be difficult to achieve. Second, on the basis of information on trends in agricultural crop production, it is considered unlikely that availability of crop residuals will continue to rise at a pace as

Figure 4 Pigs and household waste

assumed in current projections. And in the third place, there appears to be a bound on the availability of household waste, to be used for animal feeding. When households increase the numbers of animals that are being kept, it does not automatically mean that the availability of household waste increases at the same rate. In short, it is considered unrealistic to assume that developing countries can significantly increase their meat production, while maintaining feed/meat ratio's far below those, which are commonly observed in developed countries. In fact, for developing countries is, on the basis of SOW-VU's analysis, an increasing trend in feed/meat ratio's to be expected, and in the long run these ratio's are likely to approach those of the developed countries.

Conclusion

On the basis of research undertaken at SOW-VU, current estimates (e.g. by FAO and IFPRI) on global trends in meat consumption and on global trends in feed requirements for the production of meat are likely to be underestimates. The reason is that two important factors are inadequately taken into account. In the first place, on the basis of information on the relationships between income and meat consumption by low and middle income groups in developing countries, the increases in total meat consumption in developing countries will, most likely, be larger than currently projected. In the second place, assumptions on the availability of additional grazing land, and on trends in the availability of crop residuals and household waste are too optimistic. These factors together will cause the pressure on global food production systems to be higher than commonly assumed.

Source:
Keyzer, M.A., M.D. Merbis, I.F.P.W. Pavel and C.F.A. van Wesenbeeck, Diet shifts towards meat and the effects on cereal use: can we feed the animals in 2030? *Ecological Economics* (in press).

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The Centre for World Food Studies (Dutch acronym SOW-VU for Stichting Onderzoek Wereldvoedselvraagstukken van de Vrije Universiteit) is a research institute related to the Department of Economics and Econometrics of the Vrije Universiteit Amsterdam. It was established in 1977 and engages in quantitative analyses to support national and international policy formulation in the areas of food, agriculture and development cooperation.

SOW-VU's research is directed towards the theoretical and empirical assessment of the mechanisms, which determine food production, food consumption and nutritional status. Its main activities concern the design and application of regional and national models, which put special emphasis on the food and agricultural sector. An analysis of the behavior and options of socio-economic groups, including their response to price and investment policies and to externally induced changes, can contribute to the evaluation of alternative development strategies.

SOW-VU emphasizes the need to collaborate with local researchers and policy makers and to increase their planning capacity.

SOW-VU's research record consists of a series of staff working papers (for mainly internal use), research memoranda (refereed) and research reports (refereed, prepared through team work).

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