

## Invited commentary

# Biofuels – a new challenge for nutritional science?

Food is basically a net product of an ecosystem, however simplified. Food production starts with a natural material, however modified later. Injections of energy (and even brains) will carry us only so far. If the population cannot adjust its wants to the world in which it lives, there is little hope of solving the food problem for mankind. In that case the food shortage will solve our population problem.<sup>(1)</sup>

### Food crisis, energy crisis or water crisis?

Today the dominating global interest seems to be devoted to the energy situation, oil prices and their impact on the global financial situation. This may be why there is now so much interest in finding alternatives to oil as the main energy source.

Debate on the world's future is still dominated by people from the industrialised world, but the real priority from a global perspective still is food and water for survival and optimal health for humankind. Energy comes much lower on the priority list for human survival. Dependence on oil is essentially a recent problem in affluent societies. Energy from the petrochemical industry is a helper but is not the most essential component for food production.

During the last decades there has been more interest in global water resources and on the impact of human activities on the global water system<sup>(2)</sup>. The impact of the cost of water on food production and food availability is a fundamental challenge for nutritionists. The introduction of the 'virtual water' concept, and concern about the costs of water in export agriculture, indicate that environmental and socio-economic impacts of virtual water trade may well dominate political discussion in future.

### Optimal production of biofuels

The need to analyse energy efficiency in food production became more acute as a result of the energy crisis in the 1970s<sup>(1)</sup>. Now there is increased interest in the production and use of biofuels. But we need a more holistic view, balancing the use of primary resources in farming areas for production of biofuels and with that for food and feed production.

Efficiency in energy conversion should also be addressed during all stages, from production of crops and their conversion into various energy sources such as ethanol, methanol and diesel, to distribution of biofuels to the final consumer. For example, today most of the

ethanol used in Swedish cars comes from Brazil, because the ethanol in Sweden derived from wheat is much less cost-effective. But energy costs for transport from Brazil to Sweden and for distribution of ethanol in Sweden should also be taken into consideration.

We are still at the beginning of developing biofuel technology. Priority is now given to finding alternatives for power trains in vehicles, and to reduce the need for oil importation in the transport sector. So far the production of biofuels has been based on corn, wheat, soya, sugar cane and sugar beet, and (for diesel) from oil seeds such as rapeseed and palm oil. But these are all staple or common foods or ingredients. Interestingly although potato is one of the crops with highest energy yield, it is not much discussed as an energy source in biofuel production, and nor is cassava, another energy-rich crop. From the nutritional point of view this is just as well, for it reduces the risk of a conflict with their roles as staple foods.

It is not only foods that can be sources of biofuels. Waste products from rapeseed cakes and straw have great potential, as does sewage treatment and the forestry industry. These alternatives involve less conflict between production of biofuels and production of food crops. Hybrid and battery-powered electric vehicles and fuel cell vehicles are alternatives to conventional internal combustion engine vehicles using alternative biofuels such as ethanol, methanol and biodiesel<sup>(3)</sup>.

### Starving people are paying for the economic crisis

'The evidence now before us – of a world which can produce automobiles, television sets... at a greater speed than the increase in population, but is simultaneously menaced by mass starvation – is disturbing.'<sup>(4)</sup>

The global economic turmoil during the last two years demonstrates the incompetence of economists and policy makers to handle the socio-economic situation. The stage has been set for those who play vast pyramid or monopoly games. In many respects the economic crisis today is artificial, started by unethical gamblers on the stock market. It is not a result of a sudden and unforeseen crisis in the availability of primary resources for feeding a population. After all, it is food and water that represent our basic needs. We do not drink oil, nor do we eat dollar or euro notes. It is a luxury crisis. It means that we have to reduce our overconsumption of cars and luxury products,

and this leads to unemployment, malnutrition and public health problems.

But the price is not paid by the affluent societies or the rich. The chief executives who have led our companies into ruin and bankruptcy are overpaid, and in some cases even receive extra bonuses if they leave the job they did not manage to handle. Those who have to pay for their mismanagement are impoverished people in low-income countries, who face increased prices of food. Increased malnutrition is the result of economic mismanagement. Starving people usually do not dream of having a car.

Why are the food and drink and associated industries still considered as positive forces in policy making, whereas the interests of consumers and of health are regarded as burdens on society? When will human capital in the form of a healthy population be more valued than industrial production of luxury products, which may solve short-term economic problems but often include environmental problems? Why are ministers of industry, agriculture and trade ranked higher than ministers of social welfare? How can politicians discuss solutions to correct maldistribution of primary resources, when they do not know what the basic needs are?

### **Why have nutritionists failed to influence food policy?**

We nutritionists have failed to get our messages accepted by politicians. One reason may be that those involved in macroeconomic and international policy and trade are seldom undernourished. Undernutrition of protein or energy, or micronutrient deficiency, rarely afflicts politicians or UN personnel. On the contrary, they might have a problem of overnutrition, showing as obesity, CVD, type 2 diabetes and cancer. Interestingly these diseases are still not taken very seriously as major public health problems by policy makers, although they dominate the causes of death in the affluent societies and now increasingly in lower-income countries.

Since the Second World War our focus on major nutritional problems has changed from a focus on protein needs to energy needs. Such a change has had and still has an enormous impact on the direction of agricultural policy.

Better knowledge about the primary nutritional needs in relation to the potentials of agricultural production must be based on public health perspectives rather than on strict agro-economic aspects or farmers' income. Two crops, potato and cassava, imported from Latin America to Europe and Africa beginning in the 16th century, illustrate the role of nutrition for socio-economic development. They have probably saved more lives than any macroeconomic policy actions. It was the introduction of potato from the Alto Plana region in Latin America that helped the farmers of Ireland to solve their subsistence farming and also to some extent cash production. But

it was also monoculture of the highest-yielding potato crops as cash crops to solve short-term economic problems of the poor, in combination with crop failure, that resulted in the great Irish famine. Cassava, on the other hand, was blamed for its low protein content during the 1970s as aggravating protein malnutrition, until its great potential as a cheap and easily available energy source was revealed and cassava became recognised as a life saver in low-income countries and communities.

### **Nothing is new under the sun**

Nutrition science is often said to be a new discipline. Nothing could be more wrong. The burden of deficiency diseases was the primary focus of medicine for many centuries until the pharmacological era of the 20th century. The development of biochemistry during the 19th and 20th centuries focused on the metabolic processes in the body, including the roles of nutrients, trace elements and vitamins, and a number of scientists directly or indirectly engaged in the vitamin and nutrition sector won Nobel prizes.

### **Who can solve nutrition problems?**

In the 20th century nutritionists observed endemic and epidemic malnutrition in the countries now described as the low-income countries. Some realised that the cause was maldistribution of resources. However, nutritional problems are multifactorial and have to be approached in a transdisciplinary and intersectoral way. Nutritionists cannot solve global problems by themselves. Nor can those skilled in anthropology, political or cultural issues evaluate priorities in food production or public health, without help from the nutritional and agricultural sciences.

When people identified as policy and socio-economic experts entered the field, they started by discussing macroeconomic solutions, and relegated medical people and nutritionists to deal with marginal micro-problems. Some administrators within the UN system still argue that nutritionists have no role to play in solving the global nutrition problems, and call for socio-economic measures<sup>(5)</sup>. It has even been argued that knowledge of human nutrition simply is of no importance. Thus: 'Much more important is knowledge and experience in for example anthropological and cultural issues, political analysis, communication and mobilization skills'. This is an alarming and astonishingly short-sighted statement.

It was the nutritionists and physicians who called for a holistic view on prevention of malnutrition, and for help from anthropologists and socio-economic experts. Economic progress does not necessarily lead to improved nutritional status. Malnutrition persists even in apparently food-secure households. Physicians have shown the evil circle between malnutrition and infection, and also the long-term effect of malnutrition on mental and physical

development. The macroeconomists and the socio-anthropologists did not do this.

High infant mortality caused by introduction of breast milk substitutes in low-income countries as a result of marketing efforts from big multinational companies, was identified by doctors and nutritionists. It was they who led the battle against the marketing actions from multinational food companies, not the policy makers nor the socio-economic administrators.

### Time for nutritionists to engage in the debate on biofuels

The new interest in production of biofuels is a challenge to us all. In the enthusiasm to test new approaches to solve global energy problems, we must analyse long-term perspectives and indirect effects on other markets.

Just as we earlier got misled in evaluation of the role of cassava for human nutrition, there is now a great risk that the interest for production of biofuels may conflict with interest for optimal food production. Increased production of biofuels may be deleterious for food production if the wrong crops are chosen. But it could also increase economic power in agricultural production and thereby help to increase food security. Optimal use of production area thus calls for optimal selection of crops under prevailing circumstances, which can increase efficiency in food production, transport, food industry and food handling.

We need sustainable energy systems. But we also need increased cooperation between nutritionists and agricultural scientists, and those involved in the development of sustainable biofuel technology. Increase in energy resources must be combined with reduction of malnutrition and poverty. A systems approach is needed, whereby nutritionists, agronomists and those engaged in technical change and innovation within the bioenergy sphere, all work together.

Sustainable food production calls for sustainable energy resources. We must support increased cooperation between disciplines from all fields involved in optimal socio-economic development and also public health protection. Bridges need to be built by broad-minded scientists who are well established within their respective disciplines, and open-minded policy makers. This will stimulate interdisciplinary approaches to solve the future

problems of humankind regarding energy availability and access to food for everybody.

### So what is to be done?

- Defend the value of human capital for development of society against the dominant over-evaluation of industrial production by politicians and macroeconomists.
- Identify the dominant nutrition and public health problems in various societies, to support policies that help vulnerable groups and lead to optimal health for all.
- Find the best balance between dietary recommendations and the potential resources for food production, especially in respect of small and family farmers.
- Stimulate sustainable agricultural production by balancing production costs with costs for transport, distribution and storage, in small- as well as large-scale production.
- Engage with energy environmental scholars, to find the best balance between food crops, feed crops and energy crops for sustainable agricultural production.

With this ambition, and an innovative scientific approach to develop sustainable energy and food production, we can together solve the problems for feeding the world population with food and energy for tomorrow!

Leif Hambræus  
Unit for Public Health Nutrition  
Department of Bioscience and Nutrition  
Novum, Karolinska Institutet  
SE-141 57 Huddinge, Sweden  
Email: leif.hambræus@ki.se

### References

1. Steinhart CS & Steinhart CE (1974) Energy use in the U.S. Food System. *Science* **184**, 307–316.
2. Hoekstra AY & Hung PO (2004) Globalisation of water resources: international virtual water flows in relation to crop trade. *Global Environmental Change* **15**, 45–56.
3. Åhman M (2001) Primary energy efficiency of alternative powertrains in vehicles. *Energy* **26**, 973–989.
4. Georgescu-Roegen N (1971) *The Entropy Law and the Economic Process*. Cambridge, MA: Harvard University Press.
5. FSN Forum discussion (2009) Putting people first: nutrition, a key to integrated programming for poverty reduction? 1<sup>st</sup> December 2008 to 10<sup>th</sup> February 2009. [http://km.fao.org/fileadmin/user\\_upload/fsn/docs/PROCEEDINGS\\_Nutrition\\_Integrated\\_programming.doc](http://km.fao.org/fileadmin/user_upload/fsn/docs/PROCEEDINGS_Nutrition_Integrated_programming.doc)