# Causes and Ways Out for the Global Food Crisis

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*After years of decline in food prices, the prices of several basic food commodities have gone up sharply since 2005. This caused severe problems in the South: less possibilities for schooling, health care and other basic commodities. Although the prices are currently under control due to the financial crisis, this article deals with the long term trends that are visible. The diverse causes of the price increases are studied and some beginnings to structural solutions are being looked at.*

## Introduction

Food is today no longer the guaranteed basic good that it is supposed to be. After years of sharp decline in food prices, the prices of the basic food products have risen sharply since 2005. These price increases are quite general. In the period of 2005 until 2007 maize increased in price by 80%, milk powder by 90%, wheat by 70% and rice by 25%.[1] In the first half of 2008, these price increases have even increased, especially for rice. On several markets shortages appeared in the basic products. Where higher food prices in the West can cause problems with the least well off consumers, in the global South this is a true catastrophe. In the West food is just a limited part of the household budget, but for many people in the

1. M. Ivanic, W. Martin, "World Bank, Implications of Higher Global Food Prices for Poverty in Low-Income Countries," in *Policy Research Working Paper*, 4594 (April 2008), 1.

south, this relation is entirely different. Higher food prices mean for these people lesser possibilities in the field of education, health care and other basic goods. The financial crisis of the second half of 2008 has of course caused a downward pressure on the prices of several commodities, amongst others oil[2] and food. In this article we are especially interested in the long-term trends that show themselves. And in this field the situation is quite clear: as soon as the economy starts to grow again, food prices will rise again.[3] This means that the food riots at the beginning of 2008 were just a sample of what we could expect in the future. In this contribution we look for the different causes of the rises in prices. We also look at certain attempts to structural solutions.

## Five Causes for the Price Rises of Food

### Oil is Getting More Expensive

One of the most fundamental causes of the rises in food prices (cf. the period of 2005 until the middle of 2008) is the structural rise in oil prices. Oil is determining for the price of the whole life cycle of agricultural crops: agricultural machines run on oil, fertilizers requires energy during their production phase, cattle fodder and food products must be transported.

At the base of the rise of the oil price – again seen on the long term, void of ( even sharp) short term fluctuations – are several factors. The biggest factor is the fast rise of energy hungry countries (the so called BRIC countries: Brazil, Russia, India, China). Especially the Asian superpowers China and India show a staggering growth. More than in India, the economic growth in China is focused on industrial production, which makes this country extremely dependent on imported oil. On top of that, the production in Chinese industry

2. The fact that the oil price has lowered since July 2008 due to the financial crisis, changes little about the long term trend that becomes clear. Oil is getting more expensive because the supply will be less and less able to follow the demand.

3. The decrease of the oil price since the beginning of the second half of 2008 clearly shows the correlation with the food prices, where the increase has come to an abrupt ending. This is, however, in view of a wider global economic downturn. When the economy recovers on the longer term, the demand will increase again and the products will once again become more expensive.

is (still) generally less energy efficient than that of the western companies. Per produced unit of output they need more oil. That despite this relative inefficiency, they still grow so strongly, is due mainly to the huge wage difference between China and the West. The Indian growth is more directed towards the services sector (for example I. T.) and is a bit less strong than the Chinese. All in all the economic growth in these countries causes the rise of a richer middle class, which generally takes over the Western consumption pattern, including a strongly increased possession of cars, the making of a fuel intensive plane travels and a rapidly rising meat consumption.

A second cause of the rising prices of oil is the rigid supply. The organization of oil producing countries, the OPEC, has executed the last years very few production increases. On the one hand, this is due to the fact that the production in many OPEC countries has already reached its ceiling; on the other hand, the price rises are beneficial to them, especially for those countries who export nearly only oil. The current production ceiling is partially a consequence of the fact that few new oil supplies are being found. The end of an era of cheap oil is in sight. In professional terms we talk about peak oil. This refers to the fact that the supply of oil from a certain pivotal year will decline structurally, which has as a consequence the rapid price rise. Although specialists disagree about the precise location of the pivotal point, it seems that, even with insiders of the oil industry, a consensus is growing more or less that the moment is between now and 2015[4].

Together with the production ceiling, there are also tensions in the oil producing areas. With a tense relation between supply and demand, a small change in supply will lead to a strong increase in price. Because of geopolitical tensions in the oil areas, the fear exists that the supply will be in danger and so will lead to a shortage on the markets. Because of this, the price will rise on speculative basis.

Because of the structural increase in the price of oil, the possibility exists that the economically less profitable supplies (which are for example deeper in the ground and therefore harder to exploit) will be exploited as well. The same goes for oil which is located in the North Pole region and which is slowly becoming more accessible.

4. L. Elliot et al, *A Green New Deal* (London: New Economics Foundation, 2008), 19.

This is very cynical as you think about the fact that the road to these fossil supplies is literally being opened through the effect of global warming. This is in turn (also) created through the historical use of fossil fuels. Besides this, unconventional stocks like shale oil are being looked at more and more. This is oil which is captured in large sand banks, mainly in Canada. Some are already hoping that Alberta will become the new Saudi Arabia. The harvesting of oil from these sand banks is dramatic on an environmental level. Despite the higher exploitation cost, these supplies are suddenly becoming interesting because of the structurally high oil price. Yet these remain just futile efforts. The point is that oil will become in the future an almost unaffordable product. A transition towards an economy which is not dependent on fossil fuel becomes necessary, as it is being recognized in the World Energy Outlook Report of the International Energy Agency which appeared in November 2008[5].

## The Percentage of Bio-fuels Increases

A second factor in this story is the relatively recent evolution in bio-fuels. This has to do amongst others with the policy choices which are pleading for a radical increase in the share of liquid bio-fuels in the gasoline or diesel which is being used at the petrol station. The European Commission hopes to arrive at a situation in 2020 where this share is at least 10%. The reasons for these choices are twofold: to counter the oil dependency and the battle against the approaching climatic changes. It is being presupposed that bio-fuels are climate neutral: this means that they do not cause a net CO2 contribution. In reality the situation is, however, quite different. The bio-fuels which are commercially available today ('first generation'), which are being produced from food crops like sugar cane, corn, soy or oil palms, do not score very well in their CO2 balance. This showed amongst others from an often cited study which appeared in the professional journal *Science*[6]. The climate neutrality is especially

5. IEA, *World Energy Outlook 2008*, IEA/OECD, Paris, 2008.

6. J. Fargione e.a., "Land Clearing and the Biofuel Carbon Debt," in *Science* 319, 2008, 1235-1238. see also H.K. Gibbs et. al., "Carbon Payback Times for Crop-Based Biofuel Expansion in the Tropics: The Effects of Changing Yield and Technology," in *Environmental Research Letters* 3, 2008, 034001, 10

bad if agricultural land has to be created first for the growing of energy crops through the transformation of tropical forest or other original ecosystems. Especially in countries like Brazil, India and Malaysia this process is happening fully today. When tropical forest or savannah is being destroyed for the growing of energy crops, this goes hand in hand with considerable greenhouse emissions, through which a huge carbon debt is being accumulated. The limited, direct, profit in CO2 of those bio-fuels compared with the immediate combustion of gasoline or diesel is only slowly being repaid.

Despite the fact that the burden of scientific proof against the currently available bio-fuels is overwhelming, in practice we cannot see yet a real change in policy. To meet with the growing demand in bio-fuels, there are two possibilities, either new agricultural soil is being created out of previously virgin ecosystems; or bio-fuels are being produced from food crops cultivated on existing agricultural land. Because of this less food can be produced. The link with the food prices is then evident. The agricultural area on our planet is limited. If we will use this more and more for the production of bio-fuels, the food prices will be increased ever more. The current first generation of bio-fuels is already usurping a lot of agricultural area. The global grain production is about 2 billion tons per year. 100 million tons of this go to the production of bio-fuels. This share only threatens to increase. If you know that about 800 million people in the world are suffering chronically from hunger, this certainly poses an ethical problem: fuel for cars or food for starving people?

## Meat Consumption Increases

The third cause for the increase in food prices finds its origin in the ever increasing meat consumption. In 2005 the global meat production was more than 269 million tons[7]. That is five times as much as half a century ago. With an unchanged policy, official projections suggest that the demand in meat will increase another 55% the coming two decades[8]. The increase would mainly occur in

7. See Table 8 (*World meat markets at a glance) in* FAO, *Food Outlook*, November 2007. See: http://www.fao.org/docrep/010/ah876e/ah876e08.htm (accessed April 22, 2007).

8. H. Steinfeld et. al., *Livestock's Long Shadow*, FAO, 2006.

the countries in the South, where a growing class of 'new consumers' arises. Higher average incomes correlate reasonably well with higher meat consumption levels. This means that in the rapidly growing countries like China and India the food pattern of a substantial part of the population is momentarily shifting from a largely vegetarian diet to a typical Western pattern based on beef, poultry and pork.

Why is the increase in meat consumption such a problem? Sustainability requires in principle that the 'natural capital' (land, water, energy…) is being handled efficiently in the production of food. The increasing meat consumption is however only deteriorating the efficiency of this use of nature, as is documented scientifically in the mean time. On average 6 kilos of grain are needed for the production of 1 kilo of meat protein (poultry and pork are less burdening than beef). A significant fraction (40%) of the world grain harvest is being reserved for the cattle sector (compare this with the part for bio-fuels, which accounts today for about 5% of the global grain production). Through the detour of the production of fodder, a huge waste of land use and energy occurs. The production of meat and derivatives like milk requires today a lot of soya, a crop rich in protein. In 2004 the global production of soy was 233 million tons. Only 15 million tons of this was consumed as meat substitute, 33 million was used for the production of soya oil and the remaining 143 million was being fed to the fish and cattle stock under the form of soya flour[9]. The production of one kilo of meat requires however 7 kilos of soy[10]. Again, this is a huge waste of precious agricultural soil and energy.

Added to this, high meat consumption creates a wide range of other problems. In a revealing report of 2007, the UN agricultural organization (FAO) estimated that the global cattle stock is responsible today for no less than 18% of global greenhouse gas emissions. This is more than the contribution of the global road transport. Meat consumption is therefore an important factor in global warming,

9. L. Brown, "The Soybean Factor," in *Outgrowing the Earth: The Food Security Challenge in an Age of Falling Water Tables and Rising Temperatures* (Earth Policy Institute, 2004).

10. Nederlandse Sojacoalitie, "Soja doorgelicht. De schaduwzijde van een wonderboon," (February 2006).

which can in turn have dire effects on the current and especially the future agricultural harvests (cf. infra). Furthermore, cattle breeding, according to the FAO, is one of the three main causes of *every* important environmental problem, so also for air pollution, land degradation, loss of biodiversity and shortage of water. Finally the overconsumption of (especially red) meat increases the risk of heart and vascular diseases, obesity, diabetes and certain cancers[11].

Especially the link between red meat and heart and vascular diseases is being stressed more and more. Heart and vascular diseases are the major cause of death in the EU. The health costs related to heart and vascular diseases in the EU is being estimated at 192 billion dollars[12]. Besides smoking, the main risk factors are formed by excessive intake of cholesterol and an increased blood pressure. Food patterns play an important role in the originating or prevention of these conditions. In a recent study of British scientists in a report of the World Health Organization, it was concluded that the explicit stimulation of dairy and meat production by the EU leads to thousands of deaths per year[13]. The research pointed out that yearly at least 12800 deaths are due to the European agricultural policy. Because the scientists worked in this first study as a precautionary measure with conservative data, they suspect that the size of the problem is in reality significantly higher. The scientists indicate that the EU agricultural policy came into being previously based on among others concerns of national health, but in the mean time can be described as "a system which is intent on killing Europeans through heart and vascular diseases". The continuation of the current patterns is unsustainable.

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11. See A. J. McMichael et. al., "Food, livestock production, energy, climate change, and health," in *The Lancet* 370 (2007): 1253-1263.

12. The number comes from the *European Society of Cardiology* (ESC) and the *European Heart Network* (EHN). See http://ec.europa.eu/research/infocentre/article_en.cfm?id=/research/headlines/news/article_08_03_13_ en. html &item=Infocentre&artid=6813.

13. F. Lloyd-Williams et. al., "Estimating the Cardiovascular Mortality Burden Attributable to the European Common Agricultural Policy on Dietary Saturated Fats," in *Bulletin of the World Health Organization* 86, No. 7 (2008): 535-541.

## Climate Changes

A fourth factor in this story concerns the impact of climatic changes and the correlating evolutions in water availability. Although the full effect of global warming on the food harvests still has to manifest itself, the first effects are already being observed today. The frequency of 'natural disasters', including large concentrations of rain, heat waves and extreme droughts, is rising considerably today. This has large consequences for the grain harvests. Some examples demonstrate this. In Australia the last years they have been facing a terrible five year long drought, through which the grain harvests significantly declined[14]. On the other side of the climate spectrum, severe floods in Mexico resulted in dramatic failed harvests, with rising food prices as a consequence[15]. The climatic changes have in other words very concrete consequences. As we will describe further in this article, the expected impact of this factor on the total increase in price will become only bigger in the future.

## Speculation

The role of speculation on the food prices is a controversial factor. When we look for example to the communication of the World Bank, we see that no significant mention of speculation as a determining factor is being made, while on the other hand this is the case with the Food and Agricultural Organization (FAO). How strong the influence is, is hard to determine. Everything points at the fact however that speculators do play a significant part in the story. The major markets on which the food products are traded, serve according to the economic theories for an efficient price setting between the parties, which find each other on these exchanges. The biggest market for commodities is the Chicago Futures Exchange. On these markets professional players are active who trade commodities on a large scale. The trade is being organized by the *traders*. Thanks to a broad range of complex constructions, it is,

14. S. Pincock, "Showdown in a Sunburnt Country," *Nature* 450 (2007): 336-338.

15. L. Elliot et. al., *A Green New Deal* (London: New Economics Foundation, 2008).

certainly for a novice, very difficult to determine the influence of the different derivatives on the price setting. The *traders* usually have specialized software at hand which keeps track of changes in prices by the second and shows the influence of this on different tradable indicators with weird names like 'gamma', 'delta' or 'vega'. Based on these changes, the *traders* will then, purely technically, 'take positions'. This means, to purchase or sell, unconnected to fundamental factors. Where the original – economically useful-function of these *traders* concerns the efficient processing of the trade and the elimination of small differences in price ('arbitrage'), we can now observe that all these complex operations see to it that a profit can be made which is completely disconnected from the basic trade.

Thanks to these instruments, market participants can purchase and sell commodities without physically possessing the goods. Commodity markets change *de facto* into financial markets. This way it also becomes possible for different actors to enter these markets based on so called investment opportunities. Both for professional investors (hedge funds and others) as for retail investors (through investment funds and other instruments like trackers) it now becomes possible to take a purely speculative position. Investing in hunger is being made accessible for all parties with a bit of money on the side. With commodities they mainly work with *future* contracts, where for a future delivery of a certain product (e.g. a ton of wheat) a fixed price is being arranged which will be paid at the moment of delivery. These *futures* are often being traded, disconnected from the physical transactions, on specialized markets. A cargo of oil on board of a ship for example can have been bought and sold hundreds of time during its journey even before the oil has been delivered. On these *futures* several other derivatives are being made.

The degree to which this speculation adds to the increases in prices is an important question. If this factor were essential, as is being said by José Graziano da Silva[16] for example (representative of Latin America and the Caribbean at the FAO), then attacking this 'virtual inflator' would have a strong effect on the real sector. An

16. M. Osava, "What Is Really Causing 'Agflation'?" *Inter Press Service*, 25 April 2008. See: http://ipsnews.net/news.asp?idnews=42134 (accessed April 22, 2007).

article in *Der Spiegel* suggested that the influence of speculators does weigh on the price of commodities. The speculative demand for commodities increases the price; investors are either ignorant about this effect or they don't care about it[17]. One thing is beyond doubt in this story: with the increases in prices, huge profits are being made by the investors. This is even commercialized by most of the investment companies, and of course these profits have to come from somewhere, namely the price increases in the underlying products.

## The Relative Weight of the Five Factors

In practice it is virtually impossible to assert a relative importance to the five described factors. There are different reasons for this. First of all commentators disagree about the impact of the diverse causes. Added to that is the fact that the scale of the different factors can be quite different according to the food product involved. Finally it is also beyond doubt that the different factors largely influence each other: in mathematical terms one would say that there are no independent variables. All of this does not imply that one cannot try to make a qualitative estimate of the current and future importance of the different factors on the supply as well as on the demand side.

### Supply Side

The structural increase of the oil price (as seen in the long term) is an important factor on the supply side which has an impact on the food prices with a delayed effect. Higher oil prices will be fully calculated in the prices of food products. In the view of the phenomenon of *peak oil*, this factor will certainly increase in importance.

On the supply side it is being presupposed that the failed harvests will also be a deciding factor[18]. If the grain harvests should increase again structurally, this would allow the food prices to go down again.

17. B. Balzli, F. Hornig, "Deadly Greed: The Role of Speculators in the Global Food Crisis," in *Der Spiegel*, 23 April 2008.

18. For a deeper analysis of these factors, see: FAO, "Growing Demand on Agriculture and Rising Prices of Commodities," Round Table, Thirty-first session of IFAD's Governing Council, 14 February 2008.

Given the fact that the full effect of global warming still has to manifest itself, it can be asked whether the failed harvests are a cyclical or a structural phenomenon. In its Fourth Evaluation Report, the UN climate panel has indicated that climate changes will have a complex influence in the near future on the food production[19]. While food production in the tropical and subtropical regions will decline sharply, in the temperate regions they expect a slightly higher harvest than today. There are different reasons for that: the higher average temperature, the prolongation of the growth season and the higher concentrations of CO2 (the so called 'fertilizer effect'). What certainly catches the eye is the extremely unequal geographical distribution of the impact of the climate changes. In the Human Development Report 2007/2008 the UN developmental program confirms this unequal distribution, certainly on the field of food availability: the countries which are not responsible for the climate problem, suffer the largest damage. The term 'climate injustice' is certainly a valid one. Especially black Africa is due for a major impact. Harvests based on rain dependent agriculture could drop there by 2020 up to 50%[20]. In the longer term it is, according to the UN climate panel, very probable that the food harvests will decline everywhere in the world: also the agriculture in the temperate regions would run into trouble. It is evident that this, in combination with a growing global population, will influence food prices.

## Demand Side

On the demand side, the change in consumption patterns in China and India is the major factor. This factor will still increase in importance with the big growth which these countries are currently witnessing and the heavy pressure linked to that on the broad commodity market. Besides the ever increasing commodity consumption, including the impact originating from this on the oil price, the increase of the meat consumption plays a crucial role. The

19. IPCC, *Fourth Assessment Report (AR4)*, WMO/UNEP, Geneva, 2007 [4 parts, available via www.ipcc.ch].

20. UNDP, *Human Development Report 2007/2008* (New York, Palgrave Macmillan 2007).

massive transition from a diet poor in meat to a food pattern rich in meat will further increase the pressure on the available agricultural area.

Bio-fuels are still the subject of heavy discussions concerning their actual weight. According to some analysts, this is limited[21]. On the other hand, a leaked World Bank report claims that the production of bio-fuels is responsible for no less than 75% of the recent food price increases (period of 2002-2008)[22]. As long as bio-fuels are based on food crops, this implies that there is less space for direct food production, with as effect that the food prices rise. A moratorium on bio-fuels of the first generation does not seem to be a luxury. Bio-fuels of the second and third generation, which do not compete with food production, could bring relief. In practice we have to admit however that these new types are not yet commercially available.

For the speculation factor it is not known how strong the influence is at the moment. In the leaked World Bank report they say that the speculation in food is not so much the cause, but rather the consequence of increased food prices (which are mainly ascribed to the fast growth in bio-fuel production).

## Ways Out

The reasons for the food crisis are multiple and interdependent. With unchanged policies we are heading for a systemic food crisis, which is part of the general social-ecological crisis in which humanity is involved today. This is about the climate changes, the decreasing availability of affordable fossil fuels, geopolitical conflicts about resource shortages, shortages of potable water, etc. An adequate approach of the food crisis must take into account the systemic character of this problem.

To arrive to a situation of ecological sustainability and global justice, there is an urgent need for a transition towards a new

21. J. D. van der Ploeg, "Het gevaar van bio-energie en andere ficties rondom de voedselcrisis," in *NRC Handelsblad*, 10 May 2008.

22. D. Mitchell, "A Note on Rising Food Prices," non-published report ordered by the World Bank, April 2008.

(ecological) economic model, which will be able to link a high quality of life to a low environmental impact. In jargon we talk about "Factor 10." This means that in the Western countries the environmental impact (materials, resources, fossil fuels) during the coming decades has to decrease with approximately 90% and this in the field of food, mobility, living and traveling.[23] In the context of 'sustainable production and consumption' (SCP) it is of vital importance to use a systemic approach. The sustainabilisation of the *demand* may not be decoupled from the greening of the *offer*.

What does this mean for the food crisis? First of all, we have to realize that the biggest structural and cultural barriers for a transition to a sustainable production and consumption present themselves in the field of mobility and food, exactly the two sectors which directly and/or indirectly contribute to the food price problem. Cars and meat are the two holy cows for the globalizing consumer class, a term which we use here in the scientific meaning. On the supply side it will be important to find methods which, even in a changing climate, still can bring improvements in grain yields. As we will see later, it is at least as important to also get the demand side under control. This means not only a decrease in the demand for meat, but also in the number of food and car kilometers.

## Supply Side

All available data show that a business as usual production policy can not suffice to feed the growing world population in a healthy way. The UN climate panel has made, just like many other official instances, a whole layer of policy recommendations, which should lead on a technical level to an increase in food production[24]. The problem lies in our opinion even deeper. The inseparable twin formed by the agro-industrial agriculture and the international free trade has arrived in a dead end street. Things must change. That was also the clear conclusion of the prestigious study *International Assessment*

23. A. Tukker et al (ed.), *System Innovations for Sustainability 1: Perspectives on Radical Changes to Sustainable Consumption and Production* (Sheffield: Greenleaf Publishing, 2008).

24. See for example p. 15 of the AR4 *Summary Report* of the IPCC. IPCC, *Fourth Assessment Report (AR4)*, WMO/UNEP, Geneva, 2007.

*of Agricultural Sciences and Technology for Development* (IAASTD), ordered by the UN, the World Bank, UNESCO and the FAO[25]. 400 scientists argue in this report that the ecological and social costs of the current agro-industrial model are intolerably high. The report calls for no less than a new agricultural revolution. This implies that globally they have to invest again finally in the agricultural sector. The IAASTD pleads for an agriculture which is much less dependent on fossil fuels and which mainly relies on family agriculture and locally available resources.

The open plea for family agro-ecological agriculture instead of the classical agro-industrial approach sounds probably surprising to many. Yet it is sufficiently documented that the best family agricultural enterprises are more productive (in yield per hectare) than the industrial counterparts[26]. Added to that, well performing family agriculture brings along as well a much better local economic development and scores better on the field of environment (less imported fodder, less pesticides and herbicides, a better energy balance and less water use). The fact that industrial agriculture gets the upper hand today is mainly due to their *economies of scale*. Because of their size they still have a higher profitability per unit of fixed costs, despite a lower productivity. A policy that puts production increase first – and not profitability increase – would do well to invest in family agriculture.

To allow for the development of family agriculture, many things will have to change in the international policy. Food is not a commodity like other products. The free trade policy that is being advocated by the World Trade Organization is absolutely problematic to attack the food crisis ecologically and socially. Regions deserve the right and chances to take the agricultural policy into their own hands. Sustainable economic development demands attention for local and regional market functioning combined with fair global trade. There is a need for international mechanisms that assure viable

25. N. Beintema et. al., "International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD)," Global Summary for Decision Makers, 2008.

26. D. Barrez and J. Aertsen, "Wie zorgt er voor een échte groene revolutie?" in *MO*-Paper*, June 2008.

prices and manage food stocks (just as it happens with oil stocks). Also the inequality to soil, water, seed, credits and infrastructure must be overturned. This will supply oxygen to small farmers. Only then the fruits of performing family agriculture will be truly harvested. Diversification combats the negative consequences of the current specialization in one or some export products. To make a transition towards such a sustainable agricultural model, it will be essential to involve all stakeholders – farmers, companies, governments, civil society and consumers – in this process. The concrete working out of a transition model for agriculture is however out of the scope of this article. We like to refer to specialized literature for this.

## Demand Side

If we want to supply the entire global population with enough food without endangering the ecosystem Earth, it will no longer be sufficient to have a policy of higher production, not even if it is of agro-ecological origin. Combating waste and consuming more efficiently will be part of a sustainable strategy. Also the demand for environmentally burdening products – meat and fish, non-seasonal products, bio-fuels for car miles – must be reduced. For ecological as well as health reasons a drastic moderation of the Western meat and fish consumption poses itself. Rachendra Pachauri, Nobel price laureate and president of the UN climate panel, shares this concern: *"Please, eat less meat!"* is his urgent message. Also in the medical journal The Lancet an appeal is made to drastically reduce the meat consumption. An extra advantage is that this can also reduce the oil dependency of the food sector, according to the American biologist David Pimentel.[27] This would have on its turn positive consequences for the food prices (cf. supra).

To arrive at a moderation of Western food consumption and to switch more easily biological, local and/or fair trade products, one will have to be original. A successful policy starts from a good

27. D. Pimentel et. al., "Reducing Energy Inputs in the US Food System," in *Human Ecology*, 2008 [available on-line via DOI 10.1007/s10745-008-9184 3]

knowledge of the problem, from the interdependency between the different aspects of it and from the complexity of the human behavior and the different cultural and structural barriers. In scientific circles the British 4E model is rising in popularity. This is an integral model that employs a series of instruments: Enable changes, Encourage them, Exemplify and Engage all concerned actors[28]. A similar policy will also have to be worked out to steer mobility in a new, sustainable way. This will be less dependent of classical fossil fuels and the now increasingly popular bio-fuels, which will have in turn positive consequences for the food prices.

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28. See P. T. Jones, V. De Meyere, E. Keytsman, "Terra Reversa: Bouwstenen voor een duurzaamheidtransitie," in *Oikos* 44 (2008): 12-29.