CAP REFORM AFTER 2013: FOOD SECURITY VERSUS ENVIRONMENTAL SECURITY

JÓZSEF POPP, TAMÁS BÍRÓ[3]

Research Institute for Agricultural Economics
popp.jozsef@aki.gov.hu

INTRODUCTION

The sustained economic growth worldwide during the last two decades has shown the benefits of globalisation. However, with the current lower growth environment worldwide, unemployment rising and asset values deflating, etc, popular discontent will rise and may trigger nationalism, excessive self-interest and protectionism. Trade responsibility also means accepting special and differential treatment of developing countries in temporary trade protection so as to allow them to catch up with the more competitive industrialised and emerging count. Population growth (70 to 80 million more people a year, close to 9 billion by 2050) creates a rapidly growing demand for crop products including feed arising from increasing meat and dairy consumption. Moving production to the most competitive regions causes the food trade to become more liberalized and also more concentrated.

Climate change (and growing energy demand) will also influence food production; agriculture will contribute to emissions into the environment and also suffer or benefit from climate change, depending on climatic zones. Can we stop excessive borrowing from future generations in ecological and financial terms? The current crisis has shown that governments can act decisively and even effectively if extraordinary circumstances so dictate: we are not short of medicine (i.e solutions, capacity, funds), but we need the political will to apply it, which we usually only have when the crisis has manifested itself. Evidently, "the costs of earlier inaction" are much higher at that stage. Finally we face the question of who will pay for agricultural public services provided by land managers that the market does not pay for, such as rural landscape maintenance, environmental protection biodiversity, and animal welfare. These challenges are aggravated by global irresponsibility related to food security, water and environmental sustainability (and energy security).

Food security

The food crisis caught the world by surprise. Do we expect a new policy paradigm from open markets to protectionism, from food security to self sufficiency, from imports to outsourcing (land acquisition) and from private to public market intervention? More recent transnational land deals are partly a consequence of the larger changing economic valuation of land and water. Higher agricultural prices generally result in higher land prices because the expected returns to land increase when profits per unit of land increase. Given that the food price crisis has increased competition for land and water resources for agriculture, it is not surprising that farmland prices have risen throughout the world in recent years.

---

[3] Research Institute for Agricultural Economics, Budapest, Hungary (József Popp)
Ministry of Agriculture and Rural Development, Budapest, Hungary (Tamás Bíró)

An increasing number of countries are leasing and purchasing land abroad to sustain and secure their food production. Food-importing countries with land and water constraints but rich in capital are at the forefront of new investments in farmland abroad. Some agreements do not involve direct land acquisition, but seek to secure food supplies through contract farming and investment in rural and agricultural infrastructure, including irrigation systems and roads (BRAUN AND MEINZEN-DICK, 2009).

These include the acquisition of 690 000 hectares of land in Sudan by South Korea, and 324 000 ha of Pakistani land by the United Arab Emirates, as well as a pending Saudi request for 500 000 ha of Tanzanian land and Chinese attempts to secure more than one million hectares in the Philippines. A major evolution from past patterns is the transition from overseas profit oriented investments for tropical cash crops to farmland acqusition for growing basic staples, with an eye to bolstering a country's food security (Table 1).

Although additional investments in agriculture in developing countries by the private and the public sector should be welcome in principle, the scale, the terms and the speed of land acquisition have provoked opposition in some target countries (the Philippines, Madagascar). Well-documented examples on these developments are scarce and the lack of transparency limits the involvement of civil society in negotiating and implementing deals and the ability of local stakeholders to respond to new challenges and opportunities.

Table 1 **Transnational land acquisition, 2006-2009**

Country investor	Country	Plot size (hectares)
Bahrain	Philippines	10 000
China (with private entities)	Philippines	1 240 000
Jordan	Sudan	25 000
Libya	Ukraine	250 000
Qatar	Kenya	40 000
Saudi Arabia	Tanzania	500 000
South Korea (with private entities)	Sudan	690 000
United Arab Emirates (with private entities)	Pakistan	324 000

Source: Braun, von J., Meinzen-Dick, R. (2009). IFPRI has compiled this table from media reports. The responsibility for the accuracy of the information presented here, however, lies with the reporting media

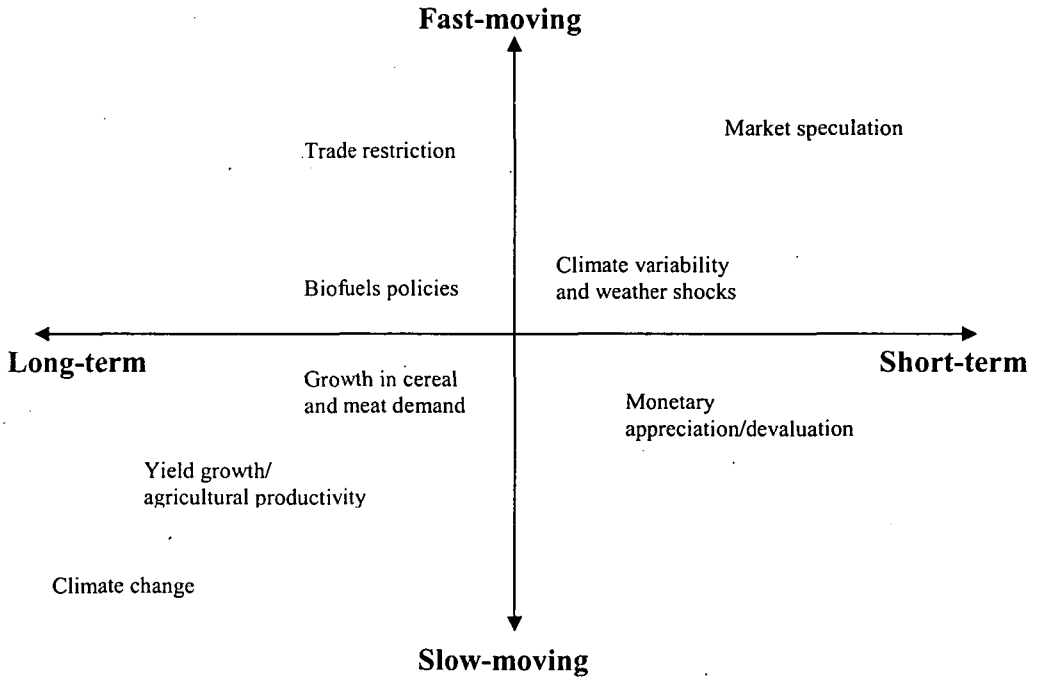
The main concerns today are the declining rate of food self-sufficiency and a growing sense of the potential for disruption to domestic food supplies in an uncertain world (climate change, energy security, -safety concerns over imported food, geopolitical tensions and the food price spike in 2008). There are long and short term factors and fast and slow-moving drivers leading to food crisis (Figure 1). There will always be risks associated with food supply and thus a need to manage these risks. European consumers are well placed to cope with price risk and well-functioning markets can help to reduce this risk. Domestic food supplies are not less risky than imports (energy) but it is sensible to plan for systemic risks (such as nuclear fallout, port strikes, etc.). We experience food poverty due to a lack of entitlements, not lack of food availability.

We face a future of food scarcity, with high, albeit very volatile prices both for inputs and outputs. Food scarcity is aggravated by managed trade and lack of finance and eventually also by environmental degradation. The market has lost its magic. Recent events have shown that markets can fail as deregulation has backfired. But open trade and related financing depend on it so a new financial architecture is urgent. We also need greater responsibility in budgetary and financial affairs. However, increased

government spending through stimulus packages poses a risk of plunging the world into a new crisis and sparking a return of inflation.

If there is going to be enough food at affordable prices for the global population we may also have to change our food habits and decrease food waste. Field losses amount to 20-40% due to pests and diseases. Food waste in the field pre-processing (broken grains, excessive dehulling), transport (spillage, leakage), storage (insects, bacteria) and processing and packaging (excessive peeling, trimming and inefficiency) goes up to 10-15% in quantity and 25-50% in value (quality). Marketing (retailing) and plate (by consumers and retailers) waste adds another 5-30% in developed and 2-20% in developing countries to the losses in the food chain (IWMI, 2007). We can save also water by reducing losses in the food chain.

Figure 1 **Relationships between the long/short term factors and fast/slow-moving drivers**



Source: International Food Policy Research Institute (2008)

By 2050 global food output needs to increase by about 70% due to higher food demand changing diets and urbanization. Urbanization will double domestic and industrial water use (not to mention climate change and bioenergy production). Without water productivity gains, crop water consumption will double by 2050. The water 'bubble' is unsustainable and fragile because 6.7 billion people have to share the same quantity as the 300 million global inhabitants of Roman times (Table 2). About 80% of water for food comes directly from rain but an increasing part is met by irrigation (IWMI, 2007).

A quarter of the world's population lives in closed or closing basins which are over-allocated with less environmental flows and more pollution. New development means taking water from current users downstream and new entitlements require re-negotiation of rights and reallocation of water. It means that no water is left for more development (Yellow River, Colorado, Amu/Syr Darya, Egypt's Nile, Lerma-Chapala, Jordan, Indus,

Krishna etc.). Another issue is how to reduce diversions? In India, 55-60% of farmers are dependent on groundwater irrigation. We need new governance in order to tame the anarchy ((IWMI, 2007).

Table 2 **Water use**

Use	Liters of water
Drinking water	2-5 litres per person per day
Household use	20-500 litres per person per day
Wheat	500-4,000 litres per kilo
Meat	5,000-15,000 litres per kilo
Biofuel	1,000-3,500 litres per litre
Cotton t-shirt	2,000-3,000 litres
Agriculture	3,000 litres per person per day 1 litre per calorie

Source: IWMI (2007) and Charlotte de Fraiture and David Molden: Balancing global water supply and demand. Presentation. Challenges for Agricultural Research, OECD, 6-8 April 2009 Prague, Czeh Republic

What are the challenges? We have to increase both the physical water productivity (more crop per drop) and economic water productivity (more value per drop) by investing in rainfed agriculture and irrigation. Water productivity improvement is feasible but farmers optimize land productivity rather than returns to water particularly where water is subsidized. We do not know what are adequate incentives but farmers in the EU are fighting for a higher irrigation water subsidy without impact analysis of water productivity improvement. Promoting food trade from water rich highly productive areas to water scarce areas contributes to global water productivity improvement.

There is good potential for new land cultivation in Latin America, Africa and Eastern Europe (Ukraine and Russia). However, new land is insufficient, and either inappropriate because of poor or polluted soils, or difficult to use for food production (due to doubtful property rights and/or poor finance and/or due to government mismanagement and lack of transportation infrastructure). Moreover, cultivated land is diminishing fast due to expanding deserts and urbanization. Global population growth (70-80 million people every year) claims nearly 3 million hectares for housing, roads, highways and car parks each year. The main reasons why world food supply is tightening are population growth and accelerated[4] urbanization, changes in lifestyles, falling water tables and diversion of irrigated water towards the cities (THE EARTH INSTITUTE, 2005).

To meet world demand, the necessary production growth will to a large extent have to be met by a rise in the productivity of land already farmed today. However, this will be difficult to accomplish because global agricultural productivity growth has been in decline since the Green Revolution of the 1960s and 1970s. Global crop yield increases plummeted from 4% per annum in the 1960s to 1980s to 2% in the 1990s and barely 1% in forecasts for 2000 to 2030. Despite substantial expected yield increases in India, United States, Russia, and the Ukraine, Europe's role as provider of food to the world is diminishing. The net crop trade position of the EU 27 can be expected to deteriorate. The EU's capacity to help fight world starvation will be reduced at a time when food production will decline

[4] An estimated 40,000 ha of land are needed for basic living space for every 1 million people added.

steeply in countries that already face increasing food import needs. Nevertheless, Europe will become a more secure production location in comparison to other world regions and higher food prices will boost deforestation there.

The discussion of food crisis has faded into the background-overshadowed by the global macroeconomic crisis and the financial crisis. The sharp rise in prices of basic foodstuffs created extreme difficulties for a large part of the world's population. The food crisis affected more people more severely than the macroeconomic issue because the populations most affected by sharply rising food prices spend larger shares of their income on food. The global food crisis produced an extraordinary human impact, larger and more adverse than the global financial crisis. One indication of the severity is the remarkable amount of recent civil unrest and political instability in dozens of countries (Ethiopia, Egypt, Mexico, Thailand) because people were unable to afford basic nutrition. Despite sharp falls in food prices since their peak in early 2008, prices of basic foodstuffs are still higher than they were in 2000. Along with the continuing upward trend of food prices, volatility is a clear problem. People do not eat at long intervals; they eat every day. Should high prices from 2008 return, the problem will be very serious because people are very vulnerable to high prices.

Environmental security

Many people are unaware of the speed with which we are consuming our natural resources. We are producing waste far faster than it can be recycled. It is important to compare the needs for public goods and services with arguments whether or not market failures are linked to the provision of services. We now know that the [over] exploitation of our entire ecosystem and the depletion of natural resources (the reserve-to-production ratio of oil reserves is rapidly declining) carry a price that must be paid today to compensate future generations for the losses (or costs of substitution) they will face tomorrow. Moreover, world population growth by 50% during the next 50 years, causing new scarcities (water) and pollution (CO_2 emission rights) is accelerating these issues. Corporations in energy-intensive sectors must start taking future CO_2 prices into account in their investment decisions and public disclosure policies now. Because the scarcity of emission rights has been recognized, an active market has been created in the EU. CO_2 emission rights now have a price; more regional cap and trade markets for CO_2 have been created in the U.S. and are in the process of development elsewhere.

The consensus about the importance of incorporating these "ecosystem services" into resource management decisions is increasing, but quantifying the levels and values of these services has proven difficult. Ecosystems markets will change the present, economics-only value paradigm that requires winners and losers. As an example, countries and companies with significant carbon-sink potential would benefit. Conversely applying the polluter pays principle, CO_2 emitters would pay to continue their emitting activities. The concept of limiting (capping), auctioning, and trading emission, access, and user rights must be further developed beyond CO_2, to include water and other resources on a worldwide scale. Valuing our ecosystems and regulating the access thereto will create a market for payment for ecosystem access entitlements and services. We must upgrade our performance metrics. The values of human and social capital, education, culture, social cohesion, and other factors should be established and more prominently involved in investment and development decisions.

Joseph Stiglitz and Nicholas Stern have made a joint appeal to use the financial crisis as an opportunity to lay the foundations for a new wave of growth based on the technologies for a low carbon economy (Financial Times, 2009). The investments would drive growth over the next two or three decades, ensuring it becomes sustainable. They added that "providing a strong, stable carbon price is the single policy action that is likely to have the biggest effect in improving economic efficiency and tackeling the climate crisis." Lord Stern calculated that governments should spend at least 20% of their stimulus on green measures to achieve the emission targets (STERN, 2006).

Mankind is directly influenced by the loss of biodiversity. Through the extinction of species we lose possibly crucial opportunities and solutions to problems of our society. Biodiversity provides us directly with essentials like clean water and air, fertile soil, and protects us from floods and avalanches. These aspects can all be economically valuated. It is a difficult and complex task, but through this valuation it becomes clear how important they are for human well being and economic development (Table 3).

Table 3 **Scenario of the future: 2050**

Actual	2000	2010	2050	Difference	Difference	Difference
Area	million km^2	million km^2	million km^2	2000 to 2010	2010 to 2050	2000 to 2050
Natural areas	65.5	62.8	58.0	-4%	-8%	-11%
Bare natural	3.3	3.1	3.0	-6%	-4%	-9%
Forest managed	4.2	4.4	7.0	5%	62%	70%
Extensive agriculture	5.0	4.5	3.0	-9%	-33%	-39%
Intensive agriculture	11.0	12.9	15.8	17%	23%	44%
Woody biofuels	0.1	0.1	0.5	35%	437%	626%
Cultivated grazing	19.1	20.3	20.8	6%	2%	9%
Artificial surfaces	0.2	0.2	0.2	0%	0%	0%
World Total	108.4	108.4	108.4	0%	0%	0%

Source: Cost of Policy Inaction, Braat et al., (2008)

Market failure is crucially important justification for taking measures to protect our landscapes. Corrections in market failures could also be achieved through investments and the provision of payments to reward land managers who provide public goods and services. It is important to demonstrate the economic value of ecosystem goods and services. We not only need to know costs, but also to be assured that the benefits are greater. There is increasing consensus about the importance of incorporating these "ecosystem services" into resource management decisions, but quantifying the levels and values of these services has proven difficult (EUROPEAN COMMISSION, 2008).

Our searches have revealed a disappointingly small set of attempts to measure and value these services. The first chronologically is the quantification of global ecosystem services by CONSTANZA ET AL (1997). Estimates were extracted from the literature of values based on willingness to pay for a hectare's worth of each of the services. These were all expressed in 1994 USD per hectare, there was some attempt to adjust these values across regions by purchasing power. The results were that the central estimate of the total value of annual global flows of ecosystem services in the mid 1990s was USD 33 trillion (ie 10^{12}) the range was thought to be USD 16-54 trillion. To put their figure into some kind of context, their central estimate was 1.8 times bigger than global Gross Domestic Product (GDP) at that time. We should take the figures only as the roughest of approximations – indeed the authors warn of the huge uncertainties involved in making calculations of this kind.

The "Stern Review" parallels the TEEB (see later) study into the economics of climate change (STERN, 2006). Climate change could have very serious impacts on growth and development. The costs of stabilising the climate are significant but manageable; delay would be dangerous and much more costly. The review estimates that if we do not act, the overall costs and risks of climate change will be equivalent to losing at least 5% of global GDP each year, now and forever. In contrast, the costs of action – reducing greenhouse gas emissions to avoid the worst impacts of climate change – can be limited to around 1% of global GDP each year. Key to understanding the conclusions is that as forests decline, nature stops providing services which it used to provide essentially for free. So the human economy either has to provide them instead, perhaps through building reservoirs, building facilities to sequester carbon dioxide, or farming foods that were once naturally available.

World Wildlife Fund's Living Planet Report" demonstrates that mankind is living way beyond the capacity of the environment to supply us with services and to absorb our waste (WWF 2008). They express this using the concepts of ecological footprints and biocapacity, each expressed per hectare per person[5]. Humanity's footprint first exceeded global biocapacity in 1980 and the overshoot has been increasing ever since. In 2005 they calculated the global footprint on average across the world was 2.7 global hectares (gha) per person[6] compared to a biocapacity they calculated as 2.1 gha/person, a difference of 30%. That is each person on earth, on average is consuming 30% more resources and waste absorption capacity than the world can provide. We are therefore destroying the earth's capacity and compromising future generations.

The study on "The Economics of Ecosystems and Biodiversity" (TEEB) is fundamentally about the struggle to find the value of nature. There are about 100,000 terrestrial protected areas on Earth, covering 11% of the land mass of our planet. These protected areas provide ecosystem services and biodiversity benefits to people valued at USD 4.4 trillion to USD 5.2 trillion (that is a million millions) per annum. That is more than the revenues of the global automobile sector, steel sector and IT services sector combined! Calculations show that the global economy is losing more money from the disappearance of forests than through the current banking crisis as forest decline could be costing about 7% of global GDP. It puts the annual cost of forest loss at between USD 2 trillion and USD 5 trillion. The figure comes from adding the value of the various services that forests perform, such as providing clean water and absorbing carbon dioxide. But the cost falls disproportionately on the poor, because a greater part of their livelihood depends directly on the forest, especially in tropical regions. The greatest cost to western nations would initially come through losing a natural absorber of the most important greenhouse gas (EUROPEAN COMMISSION, 2008).

The study shows that diversity is crucial for survival and the importance of biodiversity for economic development. It might be possible to substitute some of the ecosystem services by human-made technologies, but the study results clearly show that it is often cheaper to invest in the conservation of biodiversity than to invest into new technologies to substitute the services nature provides for us. Therefore it is essential for the safeguarding of our

[5] The Ecological Footprint "measures the amount of biologically productive land and water area required to produce the resources an individual, population or activity consumes and to absorb the waste it generates, given prevailing technology and resource management." (WWF, 2008)

[6] A global hectare is a hectare with a global average ability to produce resources and absorb wastes

natural resources to jointly create a coordination of economic interests. We need to give the ecosystem services of biodiversity a market value to create incentives for developing countries to conserve their biodiversity.

Market-based instruments are helpful to give the peoples of the world a chance to secure the natural resources and secure their livelihood simultaneously. In this context the inclusion of the private sector into the process of conservation and sustainable use of biodiversity has high priority. The goals of conservation and sustainability will only be achieved if the main drivers of ecosystem and biodiversity loss are actually addressed through appropriate intervention and response based on credible valuations. Businesses have to accept biodiversity as the indispensable resource which it is and to treat this resource with respect and care.

The Global Canopy Programme's report concludes: "If we lose forests, we lose the fight against climate change". International demand has driven intensive agriculture, logging and ranching leading to deforestation. Standing forest was not included in the original Kyoto protocols and stands outside the carbon markets. The inclusion of standing forests in internationally regulated carbon markets could provide cash incentives to halt this disastrous process. Marketing these ecosystem services could provide the added value forests need and help dampen the effects of industrial emissions. Those countries wise enough to have kept their forests could find themselves the owners of a new billion-dollar industry (PARKER ET AL., 2008).

Currently, there are two paradigms for generating ecosystem service assessments that are meant to influence policy decisions. Under the first paradigm, researchers use broad-scale assessments of multiple services to extrapolate a few estimates of values, based on habitat types, to entire regions or the entire planet (CONSTANZA ET AL., 1997). This "benefits transfer" approach incorrectly assumes that every hectare of a given habitat type is of equal value – regardless of its quality, rarity, spatial configuration, size, proximity to population centres, or the prevailing social practices and values. Furthermore, this approach does not allow for analyses of service provision and changes in value under new conditions. In contrast, under the second paradigm for generating policy-relevant ecosystem service assessments, researchers carefully model the production of a single service in a small area with an "ecological production function" – how provision of that service depends on local ecological variables (KAISER AND ROUMASSET, 2002). These methods lack both the scope (number of services) and scale (geographic and temporal) to be relevant for most policy questions (NELSON ET AL., 2009).

Spatially explicit values of services across landscapes that might inform land-use and management decisions are still lacking. Quantifying ecosystem services in a spatially explicit manner, and analyzing tradeoffs between them, can help to make natural resource decisions more effective, efficient, and defensible (NELSON AT AL., 2009). Both the costs and the benefits of biodiversity-enhancing land-use measures are subject to spatial variation, and the criterion of cost-effectiveness calls for spatially heterogeneous compensation payments (DRECHSLER AND WAETZOLD, 2005). Cost-effectiveness may also be achieved by paying compensation for results rather than measures. We have to ensure that all the possibilities to create markets to provide environmental services are fully exploited to minimise the public costs (and the extent of government bureaucracy etc).

Creating markets for environmental services could encourage the adoption of farming practices that provide cleaner air and water, and other conservation benefits. Products expected to generate the greatest net returns are the ones generally selected for production. Since environmental services generally do not have markets, they have little or no value when the farmer makes land-use or production decisions. As a result, environmental services are under-provided by farmers. The biggest reason that markets for environmental services do not develop naturally is that the services themselves have characteristics that defy ownership. Once they are produced, people can "consume" them without paying a price. Most consumers are unwilling to pay for a good that they can obtain for free, so markets cannot develop. Can anything be done other than relying on government programmes to provide publicly funded investments in environmental services?

Creating markets for environmental services is not an entirely novel idea. Governments play a central role in setting them up as has been done for markets in water quality trading, carbon trading and wetland damage mitigation. These markets would not exist without government programmes that require regulated business firms (such as industrial plants and land developers) to meet strict environmental standards. In essence, legally binding caps on emissions (water and carbon) or mandatory replacement of lost biodiversity (wetland damage mitigation) create the demand needed to support a market for environmental services. So-called cap and trade programs create a tradable good related to an environmental service (RIBAUDO ET AL., 2008).

Mandatory reduction pledges can be experienced in all developed nations apart from the USA. The same is true for project-level reductions in developing countries. Mandatory cap-and-trade programmes have been introduced in the Northeastern USA and the EU. The United States and Australian governments will also institute a mandatory cap and trade programme to create financial incentives to limit energy use or reduce emissions. In the case of water quality, it is necessary to establish caps on total pollutant discharges from regulated firms in some watersheds, and issue discharge allowances to each firm specifying how much pollution the firm can legally discharge. In markets for greenhouse gases, carbon credits are exchanged. Contracts also include renewable energy credits and voluntary carbon credits. No-net-loss requirements for new housing and commercial development require that damaged/lost wetland services be replaced, creating demand for mitigation credits, which are produced by creating new wetlands. In all of these cases, the managing or regulatory entity defines the tradable good and enforces the transactions.

Simply creating demand for an environmental service does not guarantee that a market for services from agricultural sources will actually develop. A number of impediments affect agricultural producers' ability to participate in markets for environmental services. Purchasers may be unwilling to enter into a contract with a farmer who cannot guarantee delivery of the agreed-upon quantity of pollution abatement, wetlands services or other environmental service. Some markets prevent uncertain services from being sold. For example the Chicago Climate Exchange does not certify credits from soil types for which scientific evidence is lacking on the soil's ability to sequester carbon. Transaction costs can also undermine the development of markets for environmental services (RIBAUDO ET AL. 2008).

If markets are to become important tools for generating resources for conservation on farms, government or other organizations may have to help emerging markets overcome uncertainty and transaction costs. Government can reduce uncertainty by setting standards

for environmental services. Government can play a major role in reducing uncertainty by providing research on the level of environmental services from different conservation practices. For example, the government can develop an online Nitrogen Trading Tool to help farmers determine how many potential nitrogen credits they can generate on their farms for sale in a water quality trading programme.

While markets have many desirable properties, they are limited in what they can accomplish, even with government assistance. Public good characteristics that defy ownership discourage markets for environmental services from developing – and prevent the full value of environmental services from being reflected in prices. The prices of credits in water, carbon, and wetland markets also may not reflect their full social value, only their value to the regulated community. A national cap-and-trade programme could establish a national market for carbon credits. Others, such as water quality trading or wetland damage/loss mitigation, may be limited to a few specific geographic areas.

A significant role should be given for EU policy and budget in the appropriate land and environmental management. The EU needs regulation defining its policy on markets for environmental services. This policy would cooperate with MS and local governments to establish a role for agriculture in environmental markets. We have to find ways to make EU policies and programmes support producers wanting to participate in such markets. Conducting research and developing tools for quantifying environmental impacts of farming practices is of great importance as well. Requirements are needed to establish technical guidelines for measuring environmental services from conservation and other land management activities, with priority given to participation in carbon markets. Guidelines are also to be established for a registry to record and maintain information on measured environmental service benefits, and a process for verifying that a farmer has implemented the conservation or land management activities reported in the registry.

"Ecosystems" markets will change the present, economics-only value-paradigm, with winners and losers. As an example, countries and companies with significant carbon-sink potential will benefit. On the other hand, applying the "polluter-must-pay" principle, CO_2 emitters must a pay a price for continuing to be able to do so. The concept of limiting (capping), auctioning and trading emission/access/user rights must be further developed beyond CO_2, in scope (e.g. water) and scale (worldwide). On the basis of valuing our ecosystems and regulating the access thereto a market will be created for payment for ecosystem-access entitlements and for ecosystem services. We really need to upgrade our performance metrics. The same is true with respect to Human/Social Capital: also here the metrics, the value of education, culture, social cohesion, etc. should be established and more prominently included in investment/development decisions.

Energy security

Energy prices have seen a decline (in constant dollars) over the past 200 years. The latest energy price hikes have not even brought us back to the price levels of some 30 years ago. The tragic reality is that political zeal led governments to keep energy prices as low as possible, thus frustrating most attempts to increase energy productivity. Energy price elasticity is very much a long-term affair, and return on infrastructure investments crucial to the creation of an energy-efficient society requires time. Creating a long-term trajectory of energy prices that slowly, steadily and predictably rise in parallel with energy productivity would give a clear signal to investors and infrastructure planners that energy efficiency and productivity are both necessary and profitable.

Much debate surrounds the potential contribution of agriculture to renewable energies. Unfortunately, existing technologies produce energies that may be renewable, but most are not green. Whether second generation biofuels may eliminate most of the pitfalls of the first generation is open to doubt, although they include saving food components of plants. Biofuel policy is a major aggravating factor even if it is now in the background because of the decline in oil prices that reduced the demand and the drops in food prices. The current economic crisis is now the focus of attention, but renewable energy will return as a problem with increasing oil prices when the crisis ends (KRUGMAN, 2009).

CONCLUSIONS

In 2008, the issue of sharply rising food prices was at the top of the agenda. International trade in commodities futures has expanded enormously and food prices went up very sharply, commodity prices went up very sharply and then fell a great deal. The discussion of the food crisis has faded in to the background because it has been overshadowed by the global macroeconomic and the financial crisis. With an economic slump, the real price of commodities always falls and vice versa. The current fall in prices is the consequence of a global recession. With the end of the crisis, resource constraints plus bad polices are creating a major problem for the supply of food in the world. Despite the sharp fall in food prices since their peak in early 2008, prices of basic foodstuffs are still higher than the beginning of this decade. Aside from the level of food prices still on an upward trend, the volatility is a clear problem as people are very vulnerable to such high prices.

We face three global crises. They concern the food, energy, environment (and finance). At present the sharpest of them is the current financial collapse but the most frightening is the looming food crisis. With the end of recession we are back in a world that has growing population, growing purchasing power, and growing consumption of foods that are very intensive in the use of cereals, for example meat uses a lot more basic agricultural production than the consumption of grain. Water is a concern and so too is the use of potential arable land. To the extent climate changes, most agricultural patterns may become disrupted. The environmental resource scarcity issue is also a real challenge. Climate change is alarming because of its different and greater scale of risk. They are interconnected. For instance, without a greater and more stable food economy meeting the Kyoto goals against climate change is impossible. Much debate surrounds the potential contribution of agriculture to renewable energies. Biofuel policy is a major aggravating factor even if it is now in the background because of the decline in oil prices that reduced the demand and the drops in food prices. The current economic crisis is now the focus of attention, but renewable energy will return as a problem with increasing oil prices when the crisis ends.

The traditional Common Agricultural Policy objective of food security will remain in place, although there is an increasing acknowledgement of the need to address social and environmental values too. In the future, agricultural policy will need to respond to public demands linked to the maintenance of landscapes, the conservation of natural resources and biodiversity, food safety and sustainability. However, more suitable strategies are needed to achieve greater social legitimacy, as well as international recognition, for the system of support.

REFERENCES

Braat, L. and **Brink,** ten P. (eds.). Contribution of different pressures to the global biodiversity loss between 2000 and 2050 in the OECD baseline. Brussels: The Economics of ecosystems and biodiversity (TEEB): an interim report. Resources.

Constanza, R; d'Arge, R; and de Groot, R. (1997): The value of the world's ecosystem services and natural capital. Nature 387: 253–60.

Drechsler, M. and **Waetzold,** F. (2005): Spatially uniform versus spatially heterogeneous compensation payments for biodiversity-enhancing land-use measures, Environmental & Resource Economics (2005) 31: 73–93.

European Communities (2008): The Economics of ecosystems and biodiversity (TEEB). Brussels: an interim report. Resources. http://ec.europa.eu/environment/nature/biodiversity/economics/index_en.htm.

FAO (2003): World Agriculture: Towards 2015/2030. Rome: Food and Agriculture Organisation of the United Nations.

FAO (2008): The State of Food Insecurity in the World. Rome: Food and Agriculture Organization of the United Nations.

Financial Times (2009): Obama's chance to lead the green recovery. Financial Times, 3 March, 2009.

F. O. Licht (2009): World ethanol & biofuel report (Jan.-Apr. 2009). U.K. Agra Informa Ltd.

Fraiture, Ch. de and **Molden,** D. (2009): Balancing global water supply and demand. Presentation. Challenges for Agricultural Research, OECD, 6-8 April 2009 Prague, Czeh Republic.

IEA (2008): World Energy Outlook 2008. Paris: International Energy Agency.

IWMI (2007): Water for Food, Water for Life: A Comprehensive Assessment of Water Management in Agriculture. London: Earthscan, and Colombo: International Water Management Institute.

Kaiser, B. and **Roumasset,** J. (2002): Valuing indirect ecosystem services: the case of tropical watersheds. Environ Dev Econ 7: 701–14.

Krugman, P (2009): Is a new architecture required for financing food and environmental security? Paul Krugman, Professor of Economics and International Affairs, Princeton University. (Summary of the speech made during the launching event of the 2nd Forum for the Future of Agriculture, 17th of March in Brussels). http://www.elo.org (accessed April 15, 2009).

Nelson, E.; **Mendoza,** G.; **Regetz,** J.; **Polasky,** S.; **Tallis,** H., **Cameron,** D R.; **Chan,** KM.; **Daily,** GC.; **Goldstein,** J.; **Kareiva,** PM., **Lonsdorf,** E.; **Naidoo,** R., **Ricketts,** TH. and **Shaw,** MR. (2009): Modelling multiple ecosystem services, biodiversity conservation, commodity production, and tradeoffs at landscape scales. Front Ecol Environ; 7(1): 4–11.

Parker, Ch.; **Mitchell,** A.; **Trivedi,** M; and Mardas, N. (2008): The Little Reed Book. (Reducing Emissions from Deforestation and (Forest) Degradation: Reed). Global Canopy Programme, Oxford: John Krebs Field Station.

Reid, W. V.; **Mooney,** H. A.; **Cropper,** A.; **Capistrano,** D.; **Carpenter,** S.R.; **Chopra,** K.; **Dasgupta,** P.; **Dietz,** T.; **Kumar,** D. A.; **Hassan,** R.; **Kasperson,** R.; **Leemans,** R.; **May,** R. M.; **McMichael,** T. (A.J.); **Pingali,** P.; **Samper,** C.; **Scholes,** R.; **Watson,** R. T.; **Zakri,** A.H.; **Shidong,** Z.; **Ash,** J. N.; **Bennett,** E.; **Kumar,** P.; **Lee,** M. J.; **Raudsepp-Hearne,** C.; **Simons,** H.; **Thonell,** J.; and **Zurek,** M. B. (2005): Millennium Ecosystem Assessment: Ecosystems and human well-being - biodiversity

synthesis. Washington D.C.: World Resources Institute.

RFA (2008): The Gallagher Review of the indirect effects of biofuels production, UK: The Renewable Fuels Agency.

Ribaudo, M; **LeRoy,** H; **Hellerstein,** D. and **Greene,** C. (2008): The use of market to increase private investment in environmental stewardship, Washinton D. C.: USDA-ERS.

The Earth Institute of Columbia University (2005): The Growing Urbanization of the World. New York: Columbia University.

Stern, N. (2006): Stern Review: The Economics of Climate Change. Cambridge, UK: Cambridge University Press.

UNEP/GRID-Arendal and UNEP-WCMC (2009): The Environmental Food Crisis. Published 2009, Edited by Joel Benoit. United Nations Environment Programme (UNEP). Link to web-site http://www.grida.no/publications/rr/food-crisis/.

United Nations (2003): Millennium Ecosystem Assessment: Ecosystems and Human Wellbeing. Washington D.C.: Island Press.

WWF (2008): Living Planet Report, Gland, Switzerland: World Wildlife Fund.