



BRIEFING

AUGUST  
2010

A Peruvian farmer  
with his sustainable  
Brazil nut harvest.



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Sustainability

# SUSTAINABLE AGRICULTURE

## Links to international development

### Summary

This WWF briefing paper highlights the links between agriculture, international development and natural systems, and responds to increasing interest in agriculture in the development sector. We argue that natural systems and biodiversity are the platform for agriculture and we discuss the links between sustainable agriculture and food security, water security and climate change.

Sustainable agriculture requires new approaches to land and water use planning, maximising the potential of small holders and sustaining ecosystem services which underpin agriculture and food security. It is also critical to address unsustainable consumption and production patterns.

Ruth Fuller

Any food and farming strategy should ultimately be based on securing the basic human rights of adequate food and good health, and on reducing the global environmental impacts of the food we produce and consume.

# Introduction

Globally two people out of five depend on agriculture for their livelihood, and agriculture uses almost half of the global land surface.<sup>1</sup> Population growth, climate change, environmental degradation, increasing demand for agricultural products and changes in global consumption are putting increasing strain on food production systems. By 2050 it is predicted that demand for food could increase by 70%\* with major implications for land use and environmental sustainability.

Natural resources and systems provide the platform for agricultural production, supplying the genetic material for crops and livestock, and other vital services such as pollination, water regulation, pest control and soil fertility.<sup>2</sup> The World Bank found that 'natural capital' constitutes a quarter of total wealth in low-income countries.<sup>3</sup> At a household level natural resources are often the 'wealth of the poor', and under the right circumstances the rural poor can use their natural asset base for creating wealth and moving out of poverty.<sup>4</sup> However, the Millennium Ecosystem Assessment reports that over 60% of ecosystem services are degraded and used unsustainably, with the natural resources critical for livelihood security for the world's poorest in rapid decline.<sup>5</sup> It is estimated that each year we lose ecosystem services worth ~€50 billion; by 2050 the cumulative loss of ecosystem services could amount to €14 trillion - and this only includes land-based, not marine ecosystems.<sup>6</sup>

Biodiversity loss is disrupting agriculture and decreasing the availability of fish stocks, both of which are vital food supplies. In many areas agriculture has become increasingly

precarious as soil erosion has increased and soil fertility declined, while productivity has been affected by changes in rainfall. Agriculture is also a key driver of habitat destruction,<sup>7</sup> and declines in wildlife, over abstraction of water for irrigation, soil erosion and water pollution are just some of the problems associated with modern agriculture. Climate change brings a new challenge; agriculture will need to adapt to a changing climate but could also offer some solutions.

Setting agriculture on a more sustainable footing is a challenge for all of us at the beginning of the 21st century. We need to ensure that the production of food and energy does not damage irretrievably the essential 'natural capital' on which human life depends. Sustainable agriculture means meeting the food, fuel, and fibre needs of humans while ensuring the maintenance of ecosystems and the protection of biodiversity.

Agriculture is central to international development, not least because of the importance of small scale agriculture in the lives of the poor and its contribution to wealth creation at the national and household level. Increased investment in sustainable agriculture, which supports ecosystem services and natural capital, is vital to long-term poverty reduction and development.

This paper outlines key issues around the complex topic of sustainable agriculture, and makes broad policy recommendations.

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\* This figure is based on the UK Government's interpretation of the FAO 2006 report *World agriculture: towards 2030/2050* in 'Government response to the Committees fourth report of session 2008-9, Securing food supplies up to 2050: the challenges faced by the UK' [www.publications.parliament.uk/pa/cm200809/cmselect/cmenvfru/1022/1022.pdf](http://www.publications.parliament.uk/pa/cm200809/cmselect/cmenvfru/1022/1022.pdf) Note that this figure does not mean that food production will necessarily need to increase by the same amount.

# 1. NATURAL RESOURCES AND BIODIVERSITY STRUCTURES

## The basis for agriculture

‘The natural environment comprises the entire basis for food production through water, nutrients, soils, climate, weather and insects for pollination and controlling infestations.’<sup>8</sup> Technological interventions that replace specific natural services (for example artificial pollination) are more expensive and do not have the co-benefits associated with natural systems, and are not sustainable in the long term. The protection, management and governance of the environment are therefore fundamental to sustainable agriculture. Biodiversity provides the genetic stock for crop and livestock breeds as well as for many other products (such as timber, medicines, fisheries, textiles). Agriculture is inextricably linked with our natural world but the risks from climate change, overexploitation and overuse, as well direct loss of habitat and of species, place future agriculture productivity at risk.

The last 50 years have witnessed a faster decline of natural resources than at any other time in human history due to increased demand and/or degradation. This decline has implications for the sustainability and resilience of agricultural systems.<sup>9</sup> For example it is estimated that about three-quarters of the genetic diversity found in agricultural crops has been lost in the last century alone.<sup>10</sup>

Agriculture drives changes in land use and biodiversity. Inappropriate agriculture has contributed to



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Organic passion fruits in an orchard developed along sustainable lines in Columbia.

underground water depletion, agrochemical pollution, soil exhaustion, and global climate change.<sup>11</sup> Conversion of natural habitats for production of food, timber, fibre, feed and fuel has been a main driver of biodiversity loss.<sup>12</sup>

Degraded natural resources threaten the productive capacity of agricultural systems. Forest loss can increase erosion and also has impacts on aquatic systems and fisheries.<sup>13</sup> Depletion of natural resources and systems also impacts on the human populations who rely on them, either in the immediate vicinity or ‘downstream’.



## 50 YEARS

**THE LAST 50 YEARS HAVE WITNESSED A FASTER DECLINE OF NATURAL RESOURCES THAN AT ANY OTHER TIME IN HUMAN HISTORY DUE TO INCREASED DEMAND AND/OR DEGRADATION**

## 2. FOOD SECURITY

Access, availability and use of food are the three pillars of food security.<sup>14</sup> Food security impacts on all areas of human wellbeing, particularly health. Currently there are 1.6 billion people who are overweight or obese<sup>15</sup> and in the United States and UK approximately 30% of all food ends up as waste.<sup>16</sup> At the same time, more than one billion people are undernourished worldwide.<sup>17</sup> Policy frameworks, weak governance, agricultural subsidy systems, trade regulations and incentives all contribute to the inequities in the current food system. Significant amounts of food produced in developing countries are lost after harvest which also contributes to food insecurity.

With the world population predicted to rise from six billion to over nine billion by 2050, population growth is a driver of increased demand for agricultural products. Economic growth also has an impact: as people's incomes increase so too does their demand for energy, livestock products and processed food. Diets that are high in livestock products and processed foods have a larger environmental impact as they require higher inputs of resources. One kilogram of meat takes about 16,000 litres of water to produce<sup>18</sup> and between 3 and 10kg of grain. Increased demand for meat results in higher demands for water, crop and rangeland area.

Increasing human demands for food, water, energy and land has led to a new phenomenon of 'land-grabbing'. Land is purchased or leased to grow food or energy crops by states concerned about their food security or by agricultural investment funds speculating on fluctuating food prices



Shanti and Sharita with a goat bought by taking out a loan from the local co-operative.

and increasing land value. These 'land grabs' tend to happen in emerging markets or developing countries, such as Sudan and Ethiopia, but have also taken place in Australia and the former Soviet Union countries. They can have significant implications within the host state: on local food security and local water use, as well as causing environmental degradation, and the loss of livelihoods and land access for local communities.

Sustainable agriculture has an important role in eliminating hunger and malnutrition.<sup>19</sup> However, the underlying causes of poor access, availability and use of food must also be addressed.

**1.6 BILLION**  
PEOPLE ARE OVERWEIGHT  
OR OBESE WHILE MORE  
THAN ONE BILLION PEOPLE  
ARE UNDERNOURISHED



## 3. WATER SECURITY

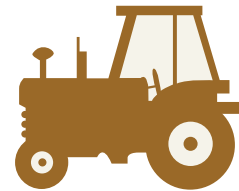
Rivers, lakes and aquifers are the sources of all our freshwater. If, as is increasingly common, these sources are over-exploited, agriculture suffers more than any other sector. Reliable, safe and sufficient water is vital for food production and poverty reduction. Already agriculture uses approximately 70% of global water supplies, while the world's demand for fresh water is projected to increase by over 30% by 2030.<sup>20</sup> In developing countries 85% of freshwater withdrawals are for agriculture, mainly for irrigation.<sup>21</sup> Lack of water is already a threat to farmers' livelihoods and contributes to political instability.

Global food production will have to increase in a context where water resources are increasingly constrained. The Green Revolution of the 1970s which doubled production of many food crops was accompanied by a trebling of water consumption – a pattern that cannot be replicated in future drives to increase food production.<sup>22</sup>

Patterns of international trade and consumption also influence the use and availability of water. Water is used to produce goods (agricultural and non agricultural) which are traded internationally. This has been termed 'virtual water'.<sup>23</sup> Developed countries, including the UK, import many products with a high 'virtual water' content or water footprint, often produced in water-scarce developing countries.<sup>24</sup> Agriculture cannot therefore be seen purely as a localised

issue; patterns of global trade and consumption are connected with the impacts of agriculture on ecosystems and poorer populations. The UK's own food security partly depends on better water management in developing countries from which we source food imports.

At the same time climate change is exacerbating pressure on water resources by changing patterns of rainfall. Poor communities are frequently those left most exposed to the effects of climate change through increasing water problems – water scarcity, floods and droughts.<sup>25</sup>



**70%**  
**AGRICULTURE USES  
 APPROXIMATELY 70%  
 OF GLOBAL WATER  
 SUPPLIES**



Soybean irrigation, Brasilia in the Upper Tocantins Basin

## 4. CLIMATE CHANGE AND AGRICULTURE

Climate change influences, and is influenced by, agricultural systems. Already it is impacting on water, food and ecosystems in all regions of the world. It is, however, the poorest people and the poorest countries that are experiencing the earliest and most severe impacts from climate change. Climate change threatens to undermine, and even reverse, progress made to date on poverty reduction and development.<sup>26</sup>

Many poor people live in regions that are particularly vulnerable to changes in climate, for example drought-prone sub-Saharan Africa, or in marginal areas such as floodplains or unstable hillsides. Poor people also tend to rely heavily on climate sensitive livelihood activities such as rain-fed

agriculture, fishing and collecting natural resources.<sup>27</sup> Additionally poor people have the least capacity and fewest choices available to be able to cope with climate change-related shocks. All these factors mean that the poor are the most exposed to climate change impacts and have the least resilience.

Climate change is impacting on food security, particularly in poor countries. For example, food production and availability is being impacted by altered hydrological cycles and rainfall patterns. Rising sea levels, increasing temperatures, soil acidification or salinity and flooding will hit hardest in the mega-deltas, which are important areas for food production.<sup>28</sup> Climate change is changing the areas

suitable for rain-fed agriculture, and conflicts over land use will increase.

The increasingly rapid movement of both plant and animal diseases is also linked to climate change. Examples include: viruses such as foot and mouth, bluetongue, avian influenza; plant diseases such as those spread by whiteflies; and pests such as diamond-back moth.<sup>29</sup>

Agriculture currently accounts for up to 30% of greenhouse-gas emissions worldwide; this includes emissions from deforestation caused by agricultural encroachment.<sup>30</sup> The livestock sector in particular is a major contributor to climate change.<sup>31</sup> Agricultural enterprises need to adapt to climate change as well as reduce their own emissions.<sup>32</sup>

### IMPACT OF CLIMATE CHANGE ON FOOD SECURITY

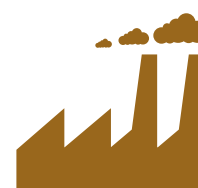
#### Biophysical impacts:

- physiological effects on crops, pasture, forests and livestock (quantity, quality);
- changes in land, soil and water resources (quantity, quality);
- increased weed and pest challenges;
- shifts in spatial and temporal distribution of impacts;
- sea level rise, changes to ocean salinity;
- sea temperature rise causing fish to inhabit different ranges.

#### Socio-economic impacts:

- decline in yields and production;
- reduced marginal GDP from agriculture;
- fluctuations in world market prices;
- changes in geographical distribution of trade regimes;
- increased number of people at risk of hunger and food insecurity;
- migration and civil unrest.

Source: FAO (2007)  
<http://ftp.fao.org/docrep/fao/009/j9271e/j9271e.pdf>



## CLIMATE CHANGE

THREATENS TO UNDERMINE, AND EVEN REVERSE, PROGRESS MADE TO DATE ON POVERTY REDUCTION AND DEVELOPMENT

## 5. FARMING FOR ENERGY

Over recent years there has been a major expansion of biofuel production, and projections indicate that this trend will continue. Biofuels can have an important role in reducing dependency on fossil fuels. However there are implications for food security, water availability and biodiversity, as land is converted from food production or natural habitats to biofuels. The 2008 *Gallagher Review* highlighted concerns over the role of biofuels in rising food prices, accelerating deforestation and raised doubts about the climate benefits and sustainability of biofuel production.<sup>33</sup>

The relationship between biofuels, food security and poverty has been a topic of debate among researchers, NGOs and the media.<sup>34</sup> Increased food prices associated with biofuel expansion have implications for the poor. As discussed above, there have also been allegations of 'land-grabbing' in developing countries by companies who want to

secure land for biofuel production, with poverty implications. Biofuels can however present an opportunity. For example with the right support, policy frameworks and access to markets smallholders could potentially benefit from increased demand for biofuel crops. However, safeguards need to be in place to ensure that poor people do not lose out.

Biofuel production needs to be environmentally, socially and economically sustainable. This includes (a) ensuring that biofuels deliver large positive energy and greenhouse gas balances over comparable fossil fuels; (b) ensuring bioenergy feed stocks are produced and processed sustainably without unacceptable impacts on people or nature; and (c) establishing bioenergy policies and programmes that address impacts on food availability and prices, poverty and the environment.



**BIOFUEL PRODUCTION**  
NEEDS TO BE ENVIRONMENTALLY, SOCIALLY AND ECONOMICALLY SUSTAINABLE



Fields of maize on upper catchment of Lake Bogoria, Kenya.

## 6. THE POTENTIAL OF SMALLHOLDER AGRICULTURE STRUCTURES

Agriculture forms the basis of rural economies throughout the developing world. In Africa, more than half the workforce is involved in agriculture. About 70% of the world's poor people still live in rural areas where small scale farming is the mainstay of livelihoods. The *World Development Report 2008* states that 'agriculture continues to be a fundamental instrument for sustainable development and poverty reduction' and 'improving the productivity, profitability and sustainability of smallholder farming is the main pathway out of poverty'.<sup>35</sup> Investing in agriculture can have an enormous poverty reduction 'pay off' due to agriculture's importance in food security and the economic dependence on agriculture in poor countries. Agriculture can ignite growth in other areas<sup>36</sup> making investment excellent 'value for money'. The International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) stressed that low input agro-ecological approaches to agriculture should be given particular priority to address poverty.

Globally 450 million small farms directly support nearly two billion people. However, smallholders have not been a focus for donors and policymakers in recent decades. Trade liberalisation has also led to the elimination of agricultural extension services which provided information and technology transfer for farmers. As well as being central to food security and poverty reduction, small farms can contribute to protecting valuable ecosystem services, limiting land conversion, and both mitigating and adapting to climate change impacts.<sup>37</sup> Biofuels and feedstock production represents an opportunity for the



Anishi Darai turns the manure stirrer outside her home in Chitwan, Nepal. Nearly 90% of villagers have bio gas installed as part of a project funded by WWF.

poor if well managed with appropriate safeguards.

The potential of smallholder farmers to contribute to sustainable agriculture would be increased by targeted support, examples suggested include:

- Agricultural extension services that encourage the application of low-external-input management practices. For example integrated pest management, minimum-tillage farming, small-scale water storage, and drip irrigation could help increase productivity of small farmers and have co-benefits for the environment.
- Increased availability of appropriate seeds, inputs, technology, credit, water storage, and other infrastructure.
- Policy and market incentives, which help farmers to adopt or continue sustainable methods of agricultural production.
- Broader access to land, water, and natural resources, including clearer tenure and the formal recognition

of communal or customary rights when appropriate.

- Expanded direct participation in the various policy, planning and governance processes that affect small farmers.<sup>38</sup>

During the 1970s, the Green Revolution increased agricultural production in developing countries with some dramatic and long lasting achievements, particularly in Asia.<sup>39</sup> However, it is argued that these changes often bypassed the poorest farmers, ignored key crops that are staples for the poor such as cassava, sorghum and yams, and led to considerable long-term environmental damage.<sup>40</sup> Future efforts to increase agricultural production need to learn from the successes and failures of the Green Revolution and ensure that interventions are sustainable, appropriate, and protect the natural capital that poor people depend on for their livelihoods.



## 7. REFOCUSING ON SUSTAINABLE AGRICULTURE

Increasing resource scarcity, climate change, environmental degradation, inequalities in the food system and persistent hunger mean that business as usual in the agricultural sector is not an option.

As the 2008 *World Development Report* states ‘the future of agriculture is intrinsically tied to better stewardship of the natural resource base on which it depends.’<sup>41</sup> Agriculture is sustainable when the productive resource base is maintained at a level that can sustain the benefits obtained from it. These benefits are physical, economic and social. Pressures on ecosystems have important consequences for agricultural production. In turn, agriculture has impacts on ecosystems, and on the services provided by ecosystems.<sup>42</sup>

Investment in agriculture needs to be informed by careful analysis of ecological carrying capacity, and an assessment of the value of ‘natural capital’ to local communities. Using voluntary standards and certifications might be one way to direct investment to more responsible production.

Productive landscapes that have multiple uses and support functioning ecosystem services such as water cycling and pollination have multiple benefits for human populations and biodiversity. Small farmers are potential allies in sustainable agriculture and the conservation of healthy landscapes (but also potential adversaries). Smallholders often favour heterogeneous agricultural systems such as agroforestry, which can help sustain biodiversity and ecosystem services. However, policy frameworks and incentives that favour

large scale agriculture can hinder the potential contribution of smallholder agriculture to food security, climate change adaptation and mitigation and environmental protection.<sup>43</sup>

At the same time efforts need to focus on making large scale agriculture sustainable, with appropriate incentives and policy frameworks. Demand for sustainable commodities from consumers is also a potential lever for change. Social justice issues vary with the type of agricultural system. With small scale rain-fed agriculture social justice issues are often about access and rights to land and water; with wage labourers engaged in commercial agriculture it will be about fair contracts and social codes of practice. Gender plays out differently in different types of system.

There is increasing pressure on productive land to provide for human populations. However, future investment in agriculture needs to ensure social and environmental safeguards. If agricultural enterprises are developed that outstrip the ability of local ecosystems to support agriculture production (e.g. the ability to provide sufficient water, and soil fertility) then productivity will be undermined. At the same time if agricultural enterprises are drawing heavily on local ecosystem services there may be implications for people who live in the vicinity or further afield, such as the depletion of ground water or river water. This is likely to have disproportionate impacts on the poor. For example in rural communities the poor can pay as much as 100 times more for water than those with regular water connections.<sup>44</sup> Poor people often rely on the ‘free’ services

provided by nature to meet their needs, such as natural water rather than piped water, and access to ‘public’ or ‘common’ land for gathering materials for their livelihoods. If more land is converted to agriculture, and more water resources used up, these free services may no longer be accessible to the poor.



### WORLD DEVELOPMENT REPORT

‘THE FUTURE OF AGRICULTURE IS INTRINSICALLY TIED TO BETTER STEWARDSHIP OF THE NATURAL RESOURCE BASE ON WHICH IT DEPENDS’

## 8. WWF

### WWF have specific areas of expertise in relation agriculture

**1.** We are promoting agricultural knowledge transfer and better management practices to enable farmers to improve productivity, environmental performance and social impacts. Examples include WWF projects in Pakistan and India in the sugar and cotton sectors where we work with the private sector and local communities. This work demonstrates that it is possible to develop solutions that benefit farmers' livelihoods and the environment, as farmers' gross margins can increase when they reduce their use of water, pesticides and chemical fertilisers.

**2.** Our Market Transformation Initiative is working to transform business practices to reduce the environmental impacts of production. We work with producers and throughout the supply chain of key commodities to find ways to incentivise improved production and management practices. We have played a proactive role in developing voluntary standards for agricultural commodities and were founding members of a number of roundtables which have agreed sustainability criteria for production. These include the FSC (Forest Stewardship Council), MSC (Marine Stewardship Council), Better Cotton Initiative (BCI) and Better Sugarcane Initiative (BSI), Roundtable on Responsible Soy (RTRS), Roundtable on Sustainable Palm Oil (RSPO). Whilst some of these schemes can have difficulty in attracting and facilitating the participation of small scale producers, we are working to see how we can improve engagement and benefits for smallholders and develop stronger social as well as environmental criteria.

**3.** Our One Planet Food initiative is working to reduce the environmental and social impacts



Cotton picking in Samudrala, India.

of food consumption. We work with governments and businesses to transform the food system to reduce key impacts of the food we consume. The project works on a number of exciting initiatives looking at sustainable diets, reducing the global environmental impacts of livestock consumption and working on some of the more systemic barriers to a sustainable food system via the Tasting the Future project.

**4.** We focus on sound management of water resources. We pioneered water footprint and virtual water analysis which has major implications for how we think about the role of international trade and consumption in sustainable agriculture. Water footprints can be a powerful way to communicate about water use in supply chains and

they help producers and retailers to understand the water related risks and impacts of their products. We also have decades of experience in improving water management on the ground in developing countries.

**5.** The private sector is an important partner for WWF as we strive to improve the environmental impacts of supply chains. We work with the private sector as a means of driving environmentally responsible development. This includes engaging with companies to protect common property resources that both underpin agricultural systems and are a key asset for the poor. For example we have worked with Marks & Spencer to develop the guide *Good Water Stewardship: guidance for agricultural suppliers*.<sup>45</sup>

## 9. POLICY RECOMMENDATIONS

Any food and farming strategy should be based on securing the basic human rights to adequate food and good health, and on reducing the global environmental impacts of the food we produce and consume. They should not be premised on a continuation of the status quo: widespread hunger, ill health associated with poor diets and increasing environmental degradation. The underlying causes of inequalities in the food system, such as unfair trade and subsidy systems, need to be addressed to ensure food security for the poor, and to promote sustainable agriculture. To reach a future where agriculture is sustainable requires investment, technology, a different approach to land and water use planning, a strengthened policy environment, and shifts in patterns of consumption and production.

### Land and water use planning

There is an urgent need for better land and water use planning. In many places, agricultural production for food and energy (both small and large scale) needs to sit alongside infrastructure, industry, conservation, tourism and other uses. Analysis of potential climate impacts needs to be incorporated into land and water use planning and decisions about future agricultural investments. Agriculture patterns should be planned according to water availability; a catchment approach is important for securing ecosystem health and stability; maintaining river and aquifer flows to downstream users is crucial; and agriculture design needs to take into account the needs of other water users. Safeguards need to be in place to protect the rights of subsistence farmers, smallholders and hunter gatherers in a future where land is increasingly valuable for energy and food crops.

### Supporting smallholders

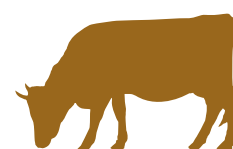
Support should be provided for measures that maximise the potential contribution of the millions of small farmers in developing countries to food security, environmental protection, and climate adaptation. Access to markets, knowledge and information along with technological assistance, could, if well designed and targeted, increase the productivity of smallholders. Land rights and sustainable access to land are also key for improving food security. With the right policy and governance frameworks, smallholders and poorer farmers could benefit from increased global demand for agricultural products and energy. Shorter commodity chains would also benefit smallholders, as would facilitating the inclusion of smallholders in roundtable and certification schemes.

### Sustaining ecosystem services

Productive agriculture is underpinned by the availability of soil, water and biodiversity. For long-term food and energy security agricultural systems must be sustainable. Global limits are already being breached in respect of the carbon and nitrogen cycles and biodiversity with unpredictable system-wide consequences. Proposed agricultural investments need to be informed by analysis of (a) ecological carrying capacity, including water resource availability, (b) the potential impact on ecosystem services, (c) the potential impacts on human populations who use those ecosystem services, and (d) impacts of and on climate change. Particular emphasis needs to be placed on potential impacts on poor people who often depend directly on ecosystem services and natural resources to meet their basic needs and to construct their livelihoods.

### Consumption-production-development links

The role of UK consumption in driving unsustainable agricultural production systems around the world should be assessed and addressed. We welcome the UK government's 2030 food strategy but further policy coherence (across the UK government, EU and beyond) is important to ensure that policies that support sustainable agriculture are not undermined by policies in other areas such as trade, procurement and energy security. The existing Common Agricultural Policy needs to be reformed so that it supports a transition to a more sustainable form of agriculture, shifting payments from subsidy entitlements towards payments for public goods and environmental services.<sup>46</sup> Businesses should be supported to become sustainable and reduce their environmental impact, and sustainability needs to be integrated into purchasing decisions in the private and public sectors.



## FOOD & FARMING STRATEGIES

SHOULD BE BASED ON SECURING THE BASIC HUMAN RIGHTS TO ADEQUATE FOOD AND GOOD HEALTH, AND ON REDUCING THE GLOBAL ENVIRONMENTAL IMPACTS OF THE FOOD WE PRODUCE AND CONSUME.

## References

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### Endnotes

- 1 IAASTD (2009) Agriculture at the cross roads, International Assessment of Agricultural Knowledge, Science and Technology for Development [http://www.agassessment.org/reports/IAASTD/EN/Agriculture%20at%20a%20Crossroads\\_Global%20Report%20\(English\).pdf](http://www.agassessment.org/reports/IAASTD/EN/Agriculture%20at%20a%20Crossroads_Global%20Report%20(English).pdf)
- 2 UNEP (2009) The environmental food crisis – The environment’s role in averting future food crises. A UNEP rapid response assessment [http://www.unep.org/pdf/FoodCrisis\\_lores.pdf](http://www.unep.org/pdf/FoodCrisis_lores.pdf); WWF International (2010) Hot House Brief on Biodiversity and Agriculture
- 3 The World Bank Where is the Wealth of Nations? Measuring Capital for the 21st Century <http://siteresources.worldbank.org/INTEEI/214578-1110886258964/20748034/All.pdf>
- 4 World Resources Institute (2005) The Wealth of the Poor: Managing Ecosystems to Fight Poverty, [http://pdf.wri.org/wrr05\\_lores.pdf](http://pdf.wri.org/wrr05_lores.pdf)
- 5 Millennium Ecosystem Assessment (2005) Ecosystems and Human Well-being: Synthesis. Island Press, Washington, DC, USA. <http://www.millenniumassessment.org/documents/document.765.aspx.pdf>
- 6 EC (2008) The Economics of Ecosystems & Biodiversity (TEEB): Interim Report [http://ec.europa.eu/environment/nature/biodiversity/economics/pdf/teeb\\_report.pdf](http://ec.europa.eu/environment/nature/biodiversity/economics/pdf/teeb_report.pdf) and The Cost of Policy Inaction (COPI) on Biodiversity <http://ecologic.eu/2363>
- 7 See reference 1 above
- 8 UNEP (2009) The environmental food crisis – The environment’s role in averting future food crises. A UNEP rapid response assessment [http://www.unep.org/pdf/FoodCrisis\\_lores.pdf](http://www.unep.org/pdf/FoodCrisis_lores.pdf)
- 9 See reference 1 above
- 10 FAO 2004 cited in WWF International (2010) Hot House Brief on Biodiversity and Agriculture
- 11 The World Bank (2007) World Development Report 2008: Agriculture for Development <http://siteresources.worldbank.org/INTWDR2008/Resources/2795087-1192111580172/WDROver2008-ENG.pdf>
- 12 See reference 5 above
- 13 See reference 1 above
- 14 <http://www.who.int/trade/glossary/story028/en/>
- 15 <http://www.who.int/dietphysicalactivity/publications/facts/obesity/en/>
- 16 See reference 8 above
- 17 Why No Thought for Food? A UK Parliamentary Inquiry into Global Food Security January 2010 [http://www.ukcds.org.uk/\\_assets/file/publications/why-no-food-for-thought.pdf](http://www.ukcds.org.uk/_assets/file/publications/why-no-food-for-thought.pdf)
- 18 See reference 8 above
- 19 See reference 1 above
- 20 See reference 17 above
- 21 See reference 1 above
- 22 See reference 17 above
- 23 [http://assets.wwf.org.uk/downloads/understanding\\_water\\_risk.pdf](http://assets.wwf.org.uk/downloads/understanding_water_risk.pdf)
- 24 [http://www.wwf.org.uk/filelibrary/pdf/uk\\_waterfootprint\\_v2.pdf](http://www.wwf.org.uk/filelibrary/pdf/uk_waterfootprint_v2.pdf)
- 25 IIED (2009) Building Resilience for an Interdependent World: Why the environment matters and what DFID should do about it.

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## References continued

- 26 World Resources Institute (2008) Roots of Resilience-Growing the Wealth of the Poor. Washington, DC. [http://pdf.wri.org/world\\_resources\\_2008\\_roots\\_of\\_resilience.pdf](http://pdf.wri.org/world_resources_2008_roots_of_resilience.pdf)
- 27 Reid, H. and K. Swiderska (2008) Biodiversity, climate change and poverty: exploring the links, IIED, London <http://www.iied.org/pubs/pdfs/17034IIED.pdf>
- 28 See reference 17 above
- 29 See reference 17 above
- 30 See reference 11 above
- 31 See reference 1 above
- 32 FAO (2010) Enabling agriculture to contribute to climate change mitigation: submission to the UNFCCC <http://unfccc.int/resource/docs/2008/smsn/igo/036.pdf>
- 33 [www.renewablefuelsagency.gov.uk/sites/renewablefuelsagency.gov.uk/files/\\_documents/Report\\_of\\_the\\_Gallagher\\_review.pdf](http://www.renewablefuelsagency.gov.uk/sites/renewablefuelsagency.gov.uk/files/_documents/Report_of_the_Gallagher_review.pdf)
- 34 For example by Oxfam [http://www.oxfam.org.uk/resources/policy/climate\\_change/downloads/bp114\\_inconvenient\\_truth.pdf](http://www.oxfam.org.uk/resources/policy/climate_change/downloads/bp114_inconvenient_truth.pdf) ODI <http://www.odi.org.uk/resources/download/78.pdf> and IIED <http://www.iied.org/pubs/pdfs/12551IIED.pdf> RSPB
- 35 See reference 11 above
- 36 Oxfam (2009) Harnessing Agriculture for Development [http://www.oxfam.org.uk/resources/policy/trade/downloads/research\\_harnessing%20agriculture\\_250909.pdf](http://www.oxfam.org.uk/resources/policy/trade/downloads/research_harnessing%20agriculture_250909.pdf)
- 37 WWF-MPO (2009) Smallholder Agriculture and the Environment in a Changing Global Context [http://assets.panda.org/downloads/wwf\\_mpo\\_smallholder\\_ag\\_policy\\_brief.pdf](http://assets.panda.org/downloads/wwf_mpo_smallholder_ag_policy_brief.pdf)
- 38 See reference 37 above
- 39 [http://www.thechicagocouncil.org/UserFiles/File/GlobalAgDevelopment/Report/gadp\\_final\\_report.pdf](http://www.thechicagocouncil.org/UserFiles/File/GlobalAgDevelopment/Report/gadp_final_report.pdf)
- 40 See reference 17 above
- 41 See reference 17 above
- 42 See reference 1 above
- 43 See reference 37 above
- 44 UNICEF (1998) cited in [http://assets.wwf.org.uk/downloads/understanding\\_water\\_risk.pdf](http://assets.wwf.org.uk/downloads/understanding_water_risk.pdf)
- 45 [http://plana.marksandspencer.com/media/pdf/about/partnerships/wwf/good\\_water\\_stewardship.pdf](http://plana.marksandspencer.com/media/pdf/about/partnerships/wwf/good_water_stewardship.pdf)
- 46 [http://assets.wwf.org.uk/downloads/proposal\\_new\\_common\\_agricultural\\_policy.pdf](http://assets.wwf.org.uk/downloads/proposal_new_common_agricultural_policy.pdf)



### Why we are here

To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

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