LUISS Guido Carli
LIBERA UNIVERSITA' INTERNAZIONALE DEGLI STUDI SOCIALI

Dipartimento di Scienze Politiche

Corso di Laurea Magistrale in Relazioni Internazionali

Cattedra di Sviluppo sostenibile e flussi migratori

ENVIRONMENTAL SUSTAINABILITY AND HUMAN HEALTH IN THE FOOD SYSTEM

RELATORE
Prof. Alfonso Giordano

CANDIDATA:
Giulia Ciuffreda

CORRELATORE
Prof. Marcello Di Paola

ANNO ACCADEMICO 2012/2013

Index

ENVIRONMENTAL SUSTAINABILITY AND HUMAN HEALTH IN THE FOOD SYSTEM

This work originates from the merging of a personal interest in nutrition and an academic interest in sustainable development. As consumers, it is a key point to ask oneself if there is a way to improve significantly the sustainability of personal dietary habits, while keeping a healthy lifestyle: choosing organic and fair trade products is effective? Or turning to vegetarianism or veganism would be better? Are these choices really beneficial to the body, in a world were diseases of affluence are so widespread and general knowledge about them so little? As academic students, it is interesting to understand how the non-sustainability of the current food system is connected to malnutrition, which dynamics and trends should be taken into account, and which solutions may improve both sustainability of the food chain and consumers' health status. In particular, beyond a descriptive analysis of interconnected topics, it may be useful to find out which stakeholder(s) hold the main power within the food chain and which "part", among producers, consumers, and public authorities, could concretely promote the adoption of sustainable diets.

Key questions

Which dynamics affect sustainability in the food system?
How such connections affect our health?
Who holds the power to shape the food chain?

The sustainability of the food production system and the correlation between diets and diseases of affluence have been treated as separate issues for a long time; dietary concerns systematically related to the inefficiencies of the food chain were those of food insecurity and subsequent undernutrition, which is only one half of malnutrition. Even though there are some studies from the '80s, a more or less consistent literature on sustainable diets and NR-NCD has developed only at the end of the '90s and in the 2000s. Yet, a comprehensive definition has been given by FAO only in 2010, addressing **sustainable diets as "*those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystem, culturally acceptable, accessible, economically fair and affordable; nutritionally***

Sustainable diets

Low environmental impacts;
Socially, culturally and economically fair;
Healthy.

adequate, safe and healthy; while optimizing natural and human resources". This definition summarizes all issues that had been investigated in earlier studies, and is widely recognized as the main and most complete one, in that it covers environmental sustainability, healthiness of diets, cultural acceptability, and economic issues, both in a present and future perspective.

Investigating the dynamics underlying all of the issues mentioned in the definition in one single research would have been too ambitious and would have probably generated too much confusion. This is the reason why some clear boundaries have been set to this study. Firstly, the research deals with agricultural and land livestock food products only, leaving out fishery and fish livestock; being aware that the two domains are too different to be treated together in an in-depth analysis, agriculture and livestock products' chain has been chosen because **the vast majority of the foodstuffs that we eat comes from fields and meadows, and because farming is still the main source of income** for the vast majority of the world's people. Second, the focus is centered on the two "extremes" of the chain, namely in-farm production and consumption, due already mentioned intention of providing a deeper analysis; however, the rest of the food chain has not been cut out completely: it has been included in essential points, where not considering the impact of all steps of food production would have severely diminished the value of this research. "Sustainability" is mainly taken as *environmental* sustainability, even though social and economic sustainability issues are covered when necessary. Last, "malnutrition" is mainly intended as overnutrition, since **the primary interest of this research is to connect sustainable food with dietary habits preventing diseases of affluence**, both in developed and developing countries.

Boundaries of the research

Main area: agriculture and livestock;
Focus: in-farm production and final consumption;
"Sustainability": low environmental impact;
"Malnutrition": overnutrition.

The work is divided into four parts: the first chapter aims at providing an overview of socio-economic and demographic trends currently ongoing, environmental concerns,

Key determinants of environmental depletion

Economic and socio-demographic trends have affected the global demand for food in terms of quantity and quality (Western diet), as well as the way we produce foodstuffs (conventional system); the overconsumption of resources and high energy-dense foods is the main cause for environmental depletion.

and the dietary transition. The ongoing environmental depletion is connected to worldwide socio-economic and demographic trends (urbanization, population growth, globalization, economic growth); however, the key determinant of the current state of the environment is overconsumption of resources. **In the food sector, overconsumption means both the excessive exploitation of natural resources and energy use**, which make the conventional system not sustainable in the long run, **as well as the increase of per capita consumption of energy-dense food**, i.e. the global nutrition transition towards the Western diet.

Food production

An increased demand for food has led to the development of industrial agriculture, based on fossil energy, agrochemicals, intensive monocrop cultivation. A sustainable intensification of production would require a combination of traditional practices and advanced technology.

The second part investigates the food production system, with special attention to farming and livestock, as previously explained, plus an overview on the rest of the food chain. Population growth and increasing per capita demand have led to the **evolution of the food production system towards industrial agriculture, characterized by the use of fossil energy, external inputs, and intensive monocrop or livestock raising**. Besides, dietary shifts towards more energy-dense (and resources-intensive) foods, like red meat, is worsening the pressure of farming activities on ecosystems. The way the conventional system is damaging the environment poses serious threats to future productivity and, thus, to future food security; such considerations have raised interest in sustainable farming practices. **Sustainable production intensification**, based on traditional knowledge and new technology in a locally-specific approach, **would thus be environmentally and socio-economically sustainable**, while representing a possible response to the increase in food demand. Globalization and dietary shift towards perishable foods have created remarkable

Food consumption

The nutrition transition towards the Western diet is causing, beyond environmental depletion, an epidemiologic transition towards "diseases of affluence". A sustainable diet would include both sustainable production methods and healthy eating habits.

wastes along the food chain; the evidence presented by some researchers shows that local food systems are not necessarily more sustainable that long-distance food chains, so that it might be more important to implement the sustainability of the whole production through proper policies, rather than *a priori* banning long food chains as a bad thing.

The third section deals with food consumption and enters more specifically the question of sustainable diets. The same overconsumption caused by the nutrition transition, which is making the food production system more and more inappropriate, is causing an epidemiologic **transition from communicable to non-communicable (dietary-related) diseases**. Suggestions for a healthier diet include the reduction in excessive energy intake, as well as the reduction of consumption of animal source foods, sugars, and fats; from the research carried out, **it seems that vegetarian alternatives are not necessarily healthier than (balanced) omnivore diets**. About the sustainability of foods, on the perspective of the consumer, the reduced intake of foods typical of the Western diet would significantly reduce per capita consumption, even though there are some trade-offs to take into account (like the meat-fish substitution). Again, **vegetarian and vegan dietary styles have not proven to be necessarily more sustainable than omnivore diets including organic meat**, for instance. Some studies focus on the production side and the promotion of sustainable farming to foster sustainable diets, since the consumer is considered to have a limited power to affect food production impacts. So, although the ultimate choice of what to eat is given to the individual, the mainstream food production system unavoidably affects this choice.

Sustainable diets

Some very famous examples of sustainable diets are the Mediterranean Diet, protected by UNESCO, and the Asian diets, based on a reduced consumption of animal source foods, vegetable oils and processed foods.

The value of sustainable diets goes beyond healthiness and environmental sustainability: they can promote rural development and smallholders' food security, reduced private and public health expenditure, conservation of some traditional cultures entailing sustainable food systems, like the Mediterranean or the Asian diets.

In the last chapter the focus is shifted of the main challenges for the implementation of sustainable diets, namely the need to operationalize the definition via proper indicators, investments in agriculture, the role of producers and food industry in promoting health, and the role of consumers' behavior. This last part involves the potential task of public authorities, too. Even though some examples of sustainable diets can be found, **there are still no complex indices to operationalize the concept** and make complete information available to policy-makers. However, the lack of indicators and indices does not hinder completely the chance to act on the food production system to make it sustainable, even if in more uncertain conditions. **The key for public authorities will be that of investing, especially in R&D, farmers' education and smallholder farming development, and promoting investments in the conversion to sustainable farming** through actions like the internalization of externalities and public procurement.

Challenges

To operationalize the concept of sustainable diet to create proper indicators;
To invest in sustainable farming and R&D;
To include nutrition concerns in the food chain;
To properly inform and educate consumers.

However, investing in sustainable agriculture is not enough to effectively foster sustainable diets on the supply side: a nutrition-sensitive food chain should be developed, so that not only investments in agriculture would encompass nutrition considerations, but **the attention to healthiness of food should be spread all along the chain**, too. Even though consumers may have some power, especially in developed countries with more or less strong associations, the food chain does affect food consumption choices. A conversion towards sustainable and healthy food implies, in first place, the **re-gaining of both the agricultural sector and consumers of their decision power and, at the same time, a more active and positive role of the middle stages of the chain, such as retailers**. Anyways, despite the influence of the food supply chain in

Key actors

Retailers have gained a strong power in conditioning food demand and production methods, especially in developing countries, while in developed areas consumers and producers are re-gaining space.

shaping consumption styles (and, as a consequence, health status and environmental per capita impact), consumers do play a part; thus, they have to be properly informed, educated, and supported to be put in the conditions to turn their healthy (and sustainable) attitudes into a concrete behaviour. This is possible through public standards regulation, voluntary labeling, consumers' education, and especially through market instruments incentivizing healthier and more sustainable choices. In the intention to reduce food environmental impact and increase people's benefit, consumers have a (more or less limited) power to choose and to affect the market; on the other side, food producers, processing and retailing industries play a role in guaranteeing the availability of such a choice. However, both sides have to be somehow educated and encouraged towards the adoption of sustainable diets by public authorities: the Swedish experience on labeling has shown that **food producers and industries' commitment is essential**, as well as the agreement among stakeholders may be crucial for policies effectiveness.

Reference List

Abrahams Z. *et al*. (2011), "Diet and mortality rates in Sub-Saharan Africa: stages in the nutrition transition" *BMC Public Health* 2011 11:801

Altieri M. A. (1999), "The ecological role of biodiversity in agroecosystems", *Agriculture, ecosystems, and Environment* vol. 74 (1999), pp. 19-31

Auernhammer H. (2001), "Precision farming – the environmental challenge", *Computers and Electronics in Agriculture* vol. 30 (2001), pp. 31-43

Barilla Center for Food and Nutrition (2011), "*Doppia piramide: alimentazione sana per le persone, sostenibile per il pianeta*", Codice Edizioni

Barilla Center for Food and Nutrition (2011), "*Nuovi modelli per un'agricoltura sostenibile"*, Codice Edizioni

Barilla Center for Food and Nutrition (2011), "*Oltre gli OGM. Le biotecnologie in ambito agroalimentare*", Codice Edizioni

Barilla Center for Food and Nutrition (2012), "*Eating planet – Nutrirsi oggi: una sfida per l'uomo e per il pianeta*", Milano: Edizioni Ambiente

Baumung R. and Hoffmann I. (2010) "Animal genetic diversity and sustainable diets" in Burlingame B. and Dernini S. (ed.) *Sustainable diet and biodiversity*, FAO – Food and Agriculture Organization, pp. 82-93

Bermudez O. I. and Tucker K. L. (2003), "Trends in dietary patterns of Latin America populations", *Cad. Saude Publica*, vol 19 (sup. 1), pp. S87-S99

Bloom, D. E. *et al.* (2012), "The Global Economic Burden of Noncommunicable Diseases", *PGDA Working Paper* No. 87, January 2012, Massachussets: Harvard School of Public Health

Boehlje M. and Doering O. (2000), "Farm Policy in an Industrialized Agriculture", *Journal of Agribusiness*, vol. 18 no. 1, March 2000, pp. 53-60

Boscolo M. (2013), "Globesity: i costi sociali dell'obesità in un mondo più longevo", in *Food for Health*, April 2013

Campbell K., Noonan-Mooney K., Mulongoy K. J. (2010), "Biodiversity, nutrition, and human wellbeing in the context of the Convention on Biological Diversity" in Burlingame B. and Dernini S. (ed.) *Sustainable diet and biodiversity*, FAO – Food and Agriculture Organization, pp. 36-43

Campbell T. C. and Campbell T. M. (2006), "*The China study: the most comprehensive study of nutrition ever conducted and the startling implications for diet, weight loss, and long-term health*", Dallas: BenBella Books, Inc.

Carlsson-Kanyama A. (1998), "Climate change and dietary choices — how can emissions of greenhouse gases from food consumption be reduced?", *Food Policy* vol. 23 no. 3/4, pp. 277-293

Cincotta R. P., Wisnewski J, and Engelman R. (2000), "Human Population in the Biodiversity Hotspots", *Nature* vol. 404, April, 27th 2000, pp. 990-992

Czarnezki J. J. (2011), "The future of food eco-labeling: organic, carbon footprint, and environmental lifecycle analysis", 30 *Stanford Environmental Law Journal* 24 (2011)

Donald, P.F. (2004), "Biodiversity Impact of Some Agricultural Commodity Production Systems", *Conservation biology* vol. 18 no 1, February 2004, pp. 17-37

Doodman D. (2009), "Blaming cities for climate change? An analysis of greenhouse gas emissions inventory, *Environment and Urbanization* vol 21 no 1 April 2009, pp. 184-201

Drewnowski A (2000), "Nutrition Transition and Global Dietary Trends", *Nutrition* vol. 16 no 7/8, pp. 31-43

Drewnowski A. and Popkin B. M. (1997), "The Nutrition Transition: New Trends in the Global Diet", *Nutrition Reviews* vol 55 no. 2, pp. 31-43

Duchin F. (2005), "Sustainable consumption of food – A framework for analyzing scenarios about change in diets", *Journal of Industrial Ecology* vol. 9 no. 1-2, pp. 99-114

Erlich P. R. and Holdren J. (1971), "Impact of Population Growth", *Science*, 171, 3977, Mar. 26, pp. 1212-1217

Erlich P. R., Erlich A. H., and Holdren J. (1970), "*Population, Resources, Environment*", Freeman, S. Francisco

Falguera V., Aliguer N., Falguera M. (2012), "An integrated approach to current trends in food consumption: Moving toward functional and organic products?", *Food Control* no. 26, pp 274-281

Fanzo J., Cogill B., Mattei F. (2012), "Metrics of Sustainable Diets and Food Systems", *Bioversity International Technical Brief*, Rome, Italy

FAO (2012), "*The state of food and agriculture 2012 – Investing in agriculture for a better future*", FAO Publishing, Rome

FAO (2012), "*The state of food and agriculture 2013 –Food system for better nutrition*", FAO Publishing, Rome

Feenstra G (2002), "Creating space for sustainable food systems: lessons from the field", *Agriculture and Human Value* vol. 19 (2002), pp. 99-106

Foley, J.A. *et al.*(2005), "Global Consequences of Land Use", *Science* vol. 309, no. 570, July 2005, pp. 570-574

Fronte M. (2013), "Il cibo come vettore di salute", in *Food for Health*, April 2013

Gabriel D. *et al.* (2010), "Scale matters: the impact of organic farming on biodiversity at different spatial scales", *Ecology letters* vol 13 (2010), pp. 858-869

Galal O. M. (2002), "The nutrition transition in Egypt: obesity, undernutrition, and the food consumption context", *Public Health Nutrition* vol. 5 no 1A, pp. 141-148

Garnett T. (2013), "Three perspectives on sustainable food security: efficiency, demand restraint, food system transformation. What role for LCA?", *Journal of Cleaner Production*, doi: 10.1016/j.jclepro.2013.07.045

Garnett, T. (2011), “Where are the best opportunities for reducing greenhouse gas emissions in the food system (including the food chain)?”, *Food Policy* vol. 36 (2011), pp. S23-S32

Gearhardt A. N. *et al.* (2010), “Can food be addictive? Public health and policy implications”, *Addiction* no. 106, pp. 1208-1212

Ghassemi H., Harrison G., and Mohammad K. (2002), “An accelerated nutrition transition in Iran”, *Public Health Nutrition* vol. 5 no 1A, pp. 149-155

Godfray H.C.J. *et al.*(2010), “Food Security: the Challenge of Feeding 9 Billion People”, in *Science*, vol. 327 no. 5967, pp. 812-818

Gold K. and McBurney R. P. H. (2010), “Conservation of plant diversity for sustainable diets”, in Burlingame B. and Dernini S. (ed.) *Sustainable diet and biodiversity*, FAO – Food and Agriculture Organization, pp. 108-114

Grimmond S. (2007), “Urbanization and global environmental change: local effects of urban warming”, *The Geographical Journal,* vol. 173, Issue 1, March 2007, pp. 83-88

Gussow J. D., Clancy K, (1986), “Dietary guidelines for sustainability”, *Journal of Nutritional Education* vol. 18, 1986, pp. 1-4

Guyomard H. *et al.* (2012), “Eating patterns and food systems: critical knowledge requirements for policy design and implementation”, *Agriculture and Food Security* vol. 1 no. 13

Harland J. I. *et al.* (2012), “Achieving *eatwell plate* recommendations: is this a route to improving both sustainability and healthy eating?”, *British Nutrition Foundation Nutrition Bulletin* no. 37, pp. 324-343

Hassan-Wassef H. (2012), “Redesigning dietary education”, in *CIHEAM, MediTERRA 2012*, Presse de Sciences Po, Annuels, 2012, pp. 399.422

HLPE (2013), *Investing in smallholder agriculture for food security*, A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome

Hole D.G. *et al.* (2005), “Does organic farming benefit biodiversity?”, *Biological conservation* vol. 122 (2005), pp. 113-130

Horrigan L., Lawrence R. S., Walker P. (2002), “How Sustainable Agriculture Can Address the environmental and Human Health Harms of Industrial Agriculture”, *Environmental Health Perspectives* vol. 110 no. 5, pp. 445-456

IBRD (1992), *World Development Report 1992: Development and the Environment*, New York: Oxford University Press

Ilbery B. and Maye D. (2005), “Food supply chains and sustainability: evidence from specialist food producers in the Scottish/English borders”, *Land Use Policy* vol. 22 (2005), pp. 332-344

Inderst G., Kaminker Ch., Stewart F. (2012), “Defining and measuring green investments: Implications for institutional investors’ asset allocations”, *OECD Working Papers on Finance, Insurance, and Private Pensions* no. 24, OECD Publishing

Jaenicke H., Virchow D. (2013), “Entry points into a nutrition-sensitive agriculture”, *Food Security*, August 2013, pp. 1-14

Johns P. and Eyzaguirre P. (2006), “Linking biodiversity, diet and health in policy and practice”, *Proceedings of the Nutrition Society* vol. 65, 2006, pp. 182-189

Joint WHO-FAO Experts Consultation (2003), *Diet, Nutrition, and the Prevention of Chronic Diseases*, WHO Technical Report Series no. 916, Geneva 2003

Kalmijn S. *et al*. (1997), “Dietary fat intake and the risk of incident dementia in the Rotterdam Study”, *Annals of Neurology* vol. 42, no. 5, pp. 776-782

Kalnay E. and Cai M. (2003), “Impact of urbanization and land-use change on climate”, *Nature* vol 423, 29 May 2003, pp. 528-531

Kennedy G., Nantel G., and Shetty P.(2004), “Globalization of food systems in developing countries: a synthesis of country case studies”, in FAO Paper no 83, “*Globalization of food systems in developing countries: impact on food security and nutrition*”, Rome 2004, pp 1-26

Kerselaers E. *et al.* (2007), “Modelling farm-level economic potential for conversion to organic farming”, *Agricultural Systems* vol. 94, 2007, pp. 671-682

Kim S. *et al.* (2000), “The Nutrition Transition in South Korea”, *American Journal of Clinical Nutrition* vol. 71, pp. 44-53

Koohafkan P. (2010), “Dynamic conservation of Globally Important Agricultural Heritage Systems: for a sustainable agriculture and rural development”, in Burlingame B. and Dernini S. (ed.) *Sustainable diet and biodiversity*, FAO – Food and Agriculture Organization, pp. 56-65

Kosulwat V. (2002), “The nutrition and health transition in Thailand”, *Public Health Nutrition* vol. 5 no. 1A, pp. 183-189

Kuhnlein H. V. (2010), “ Biodiversity and sustainability of Indigenous Peoples’ foods and diets”, in Burlingame B. and Dernini S. (ed.) *Sustainable diet and biodiversity*, FAO – Food and Agriculture Organization, pp. 118-124

Kuhnlein H. V. *et al.* (2004), “Arctic Indigenous Peoples experience the nutrition transition with changing dietary patterns and obesity”, *The Journal of Nutrition* vol. 134 no 6, pp. 1447-1453

Lairon D. (2010), “Biodiversity and sustainable nutrition with a food-based approach”, in Burlingame B. and Dernini S. (ed.) *Sustainable diet and biodiversity*, FAO – Food and Agriculture Organization, pp. 30-35

Lansink A.O., Pietola K., Bäckman S. (2002), “Efficiency and productivity of conventional and organic farms in Finland 1994-1997”, *European Review of Agricultural Economics* vol. 29 no. 1 (2002), pp. 51-65

Lee, D. R. (2005), “Agricultural sustainability and technology adoption: issues and policies for developing countries”, *American Journal of Agricultural Economy* vol. 84 no.5, pp. 1325-1334

Macdiarmid J. I. (2012), “Is a healthy diet an environmentally sustainable diet?”, *Proceedings of the Nutrition Society*, vol. 72, 2013, pp. 13-20

Macdiarmid J. I. *et al*. (2012), "Sustainable diets for the future: can we contribute to reducing greenhouse gas emissions by eating a healthy diet?", *American Journal of Clinical Nutrition* vol. 96, pp. 632-639

McMichael A. J. *et al.* (2007), Food, livestock production, energy, climate change, and health", *The Lancet*, vol. 30 (9594): 1253-1263

Meadows D. H., Meadows D. L., Randers J., and Beherens W. W. (1972), *The limits to growth*, New York: New American Library

Misra A. *et al.* (2011), "Nutrition transition in India: secular trends in dietary intake and their relationship to diet-related non-communicable diseases", *Journal of Diabetes*, vol. 3 (2011), pp. 278-282

Mogues, T. *et al.* (2012), " The Impacts of Public Investment in and for Agriculture", *IFPRI Discussion Paper* no. 01217, October 2012

Moss, M. (2013), *"Salt, sugar, fat: how the food giants hooked us"*, Random House

Murray W. J. (2010), "Sustainable crop production intensification", in Burlingame B. and Dernini S. (ed.) *Sustainable diet and biodiversity*, FAO – Food and Agriculture Organization, pp. 66-74

Newman P. (2006), "The environmental impact of cities", *Environment and Urbanization* vol. 18 no 2 October 2006, pp. 275-295

Niggli U., Fliessbach A., Hepperly P. and Scialappa N. (2009), "Low Greenhouse Gas Agriculture: Mitigation and Adaptation Potential of Sustainable Farming Systems", FAO, April 2009, Rev. 2 – 2009

Oltjen J. W. and Beckett J. L. (1996), "Role of ruminant livestock in sustainable agriculture systems", *Journal of Animal Science* vol. 74, pp. 1406-1409

Onimawo I. (2010), "Traditional food systems in assuring food security in Nigeria", in Burlingame B. and Dernini S. (ed.) *Sustainable diet and biodiversity*, FAO – Food and Agriculture Organization, pp. 181-196

Padilla M., Capone R., Palma G. (2010), "Sustainability of the food chain from field top late: the case of the Mediterranean Diet", in Burlingame B. and Dernini S. (ed.) *Sustainable diet and biodiversity*, FAO – Food and Agriculture Organization, pp. 231-240

Panayotou T. (1993), "Empirical tests and policy analysis of environmental degradation at different stages of economic development", *Working Paper WP238, Technology and Employment Programme*, Geneva: International Labor Office

Paoletti F. (2010), "Organic farming: sustainability, biodiversity and diets" in Burlingame B. and Dernini S. (ed.) *Sustainable diet and biodiversity*, FAO – Food and Agriculture Organization, pp. 254-261

Parfitt J., Barthel M., Macnaughton S. (2010), "Food waste within food supply chains: quantification and potential for change", *Philosophical Transactions of the Royal Society B* vol. 365 (2010), pp. 3065-3081

Parry M. L. (2004), "Effects of climate change on global food production under SRES emissions and socio-economic scenarios", *Global Environmental Change* vol 14 (2004), pp 53-67

Petrillo P. (2010), “Biocultural diversity and the Mediterranean Diet”, in Burlingame B. and Dernini S. (ed.) *Sustainable diet and biodiversity*, FAO – Food and Agriculture Organization, pp. 224-230

Pimentel D. and Pimentel M. (2003), “Sustainability of meat-based and plant-based diets and the environment”, *American Journal of Clinical Nutrition* vol. 78 (Suppl.), 2003, pp. 660 S-663S

Pimentel D. *et al.* (2005), “Environmental, energetic, and economic comparison of organic and conventional farming systems”, *BioScience* vol. 55 no. 7, July 2005, pp. 573-582

Popkin B. M. (1999), “Urbanization, lifestyle changes, and the nutrition transition”, *World Development* vol. 27 no 11, pp. 1905-1916

Popkin B. M. (2001), “Nutrition transition: The changing global nutrition challenge”, *Asia Pacific Journal of Clinical Nutrition*, vol 10 (suppl.), pp. S13-S18

Popkin B. M. (2004), “The Nutrition Transition: an Overview of the World Patterns of Change”, *Nutrition Reviews* vol. 62 no 7, pp. S140-S143

Popkin B. M. and Gordon-Larsen P. (2004), “The nutrition transition: worldwide obesity and their determinants”, *International Journal of Obesity* vol. 28 (2004), pp. S2-S9

Popkin B. M. *et al*. (2001), “Trends in Diet, Nutritional Status, and Diet-related Non-communicable Diseases in China and India: The Economic Costs of the Nutrition Transition”, *Nutrition reviews* vol. 59 no. 12, pp. 379-390

Pretty, J. (2007), “Agricultural sustainability: concepts, principles and evidence”, *Philosophical Transactions of the Royal Society B*, vol. 363 (2008), pp. 447-465

Pugliese P. (2001), “Organic Farming and Sustainable Rural Development: A Multifaceted and Promising Convergence”, *Sociologia Ruralis* vol 41 no. 1, January 2001, pp. 112-130

Puska P. (2002), “Nutrition and global prevention on non-communicable diseases”, *Asia Pacific Journal of Clinical Nutrition*, vol. 11(Suppl), pp. S755-S758

Reijnders L. and Soret S. (2003), “Quantification of the environmental impact of different dietary protein choices”, *American Journal of Clinical Nutrition* vol. 78 (Suppl.), 2003, pp. 664S-668S

Rosegrant M.W., Agcaoili-Sombilla M., and Perez N.D. (1995), “Global Food Projections to 2020: Implications for Investment”, *Food, Agriculture, and the Environment Discussion Paper* 5, October 1995, Washington D.C.: International Food Policy Research Institute

Satterthwaite D., McGranahan G., and Tacoli C. (2010), “Urbanization and its implication for food and farming”, *Phil. Trans. R. Soc. B* vol. 365 no. 1554, pp. 2809-2820

Scherr S. J. and Yadav S. (1996), “Land Degradation in the Developing World: Inplications for Food, Agriculture, and the Environment to 2020”, *Food, Agriculture, and the Environment Discussion Paper 14*, May 1996, Washington D.C.: International Food Policy Research Institute

Schmidthuber J. And Tubiello F. N. (2007), "Global food security under climate change", *PNAS* vol. 104 no 50, December 11th

Shi, T., Gill R. (2005), "Developing effective policies for the sustainable development of ecological agriculture in China: the case study of Jinshan County with a systems dynamics model", *Ecological Economics* vol. 53 (2005), pp. 223-246

Singh R. B. (2000), "Environmental consequences of agricultural development: a case study from the Green Revolution state of Haryana, India", *Agriculture, Ecosystem, and Environment*, vol. 82 (2002), pp. 97-103

Smith K. A. *et al.* (1997), "Emissions of N20 and NO associated with nitrogen fertilization in intensive agriculture, and the potential for mitigation", *Soil Use and Management*, vol. 13 Issue supplement s4, pp. 296-304

Smith, B. G. (2008), "Developing sustainable food supply chains", *Philosophical Transaction of the Royal Society B* vol. 363 (2008), pp. 849-861

Sonesson U., Davis J., and Ziegler F. (2010), "Food Production and Emissions of Greenhouse Gases", *SIK-Report no. 802,* Göteborg: SIK – The Swedish Institute for Food and Biotechnology, ISBN 978-91-7290-291-6

Standing Committee on the Scientific Evaluation of Dietary Reference Intakes, Food and Nutrition Board (1999), "Dietary reference intakes for calcium, phosphorus, magnesium, vitamin D, and fluoride", Institute of Medicine, Washington, DC, National Academy Press

Stehfest E. *et al.* (2009), "Climate benefits of changing diet", *Climate Change* vol. 95, 2009, pp. 83-102

Steinfeld H., Gerber P. (2010), " Livestock production and the global environment: Consume less or produce better?", *PNAS* vol. 107 no. 43, October 26, 2010, pp. 18237-18238

Stern, D. I., Common M. S., and Barbier E. B. (1996), "Economic Growth and Environmental Degradation: the Environmental Kuznets Curve and Sustainable Development", *World Development* vol 24 no 7, pp. 1151-1160

Thrupp, L. A. (2000), "Linking agricultural biodiversity and food security: the valuable role of agrobiodiversity for sustainable agriculture", *International Affairs* vol. 76 no.2, pp. 265-281

Tilman D. *et al.* (2002), "Agricultural sustainability and intensive production practices", *Nature* vol. 418, 8 August 2002, pp. 671-677

Tobler C. *et al.* (2011), "Eating green. Consumers' willingness to adopt ecological food consumption behaviors", *Appetite* no. 57 (2011) 674-682

Trichopoulou A. (2012), "Diversity *v.* globalization: traditional foods at the epicentre", *Public Health Nutrition* vol. 15 no.6, pp. 951-954

Tzouvelekas V., Pantzions C. J., Fotopoulos C. (2001), "Technical efficiency of alternative farming systems: the case of Greek organic and conventional olive-growing farms", *Food Policy* vol. 26 (2001), pp. 549-569

Van Den Berg H. and Jiggins J. (2007), "Investing in farmers – The impacts of Farmers Field Schools in Relation to Integrated Pest Management", *World Development* vol. 35 no.4, pp.663-686

Vermeir I. Verbeke W. (2008), "Sustainable food consumption among young adults in Belgium: theory of planned behavior and the role of confidence and values", *Ecological Economics* no. 63, 2008, pp. 542-553

Videira N. *et al.* (2012), "Background paper on sustainable food consumption and growth", *First multinational knowledge brokerage event on sustainable food consumption*, 25-27 January 2012, Lisbon

Wallén A., Brandt N., Wennersten R. (2004), "Does the Swedish consumer's choice of food influence greenhouse gas emissions?", *Environmental Science and Policy* vol. 7, 2004, pp. 525-535

Weber, C. L. , and Matthews H. S. (2008), "Food-Miles and the Relative Climate Impacts of Food Choices in the United States", *Environmental Science and Technology* vol. 40 no. 10 (2008), pp. 3508-3513

White T. (2000), "Diet and the distribution of environmental impact", *Ecological Economics* vol.34 no.234, pp. 145-153

Wilson C. and Tisdell C. (2001), "Why farmers continue to use pesticides despite environmental, health and sustainability costs", *Ecological Economics* vol. 39, 2001, pp. 449-462

Withrow D. and Alter D. A. (2011), "The economic burden of obesity worldwide: a systematic review of the direct costs of obesity", *Obesity Reviews* no. 12, pp. 131.141

Wolf O. *et al.* (2011), "Do healthy diets in Europe matter to the environment? A quantitative analysis", *Journal of Policy Modeling* vol. 33, 2011, pp. 8-28

Yang G. *et al.* (2008), "Emergence of chronic non-communicable diseases in China", *Lancet* vol. 372, November 8th, 2008, pp. 1697-1705

York R., Rosa E. A., and Dietz T (2003), "Footprints on the Earth: the Environmental Consequences of Modernity", *American Sociological Review* vol. 68, No. 2 (Apr., 2003), pp. 279-300

Zhai F. *et al*. (2009), "Prospective study on nutrition transition in China", *Nutrition Reviews* vol. 67, suppl. 1, pp. S 56-S61

Websites

Angelo M. J. (2009), "Corn, carbon and conservation: rethinking U.S. agricultural policy in a changing global environment" ExpressO Available at: http://works.bepress.com

FAO (2011), *Food wastage footprint*, concept note, March 2012, internet: http://www.fao.org/ (consulted on July, 31th, 2013)

FAOSTAT database (2012), internet: http://faostat3.fao.org (consulted on August, 14th, 2013)

OECD (2012), "*Sustainable agriculture productivity growth and bridging the gap for small-family farms, Interagency report to the Mexican G20 presidency*", 12 June 2012, internet: www.oecd.org (consulted on July 15th, 2013)

Pretty, J. (2009), "Can ecological agriculture feed nine billion people?", available at www.monthlyreview.org

Reisch L., Eberle U., Lorek S. (2013), " Sustainable food consumption: an overview of contemporary issues and policies", *Sustainability: Science, Practice, and Policy* vol. 9 no. 2, summer 2013, available at: http://sspp.proquest.com/

UNEP (2011), *Agriculture – Investing in natural capital*, internet: http://www.unep.org/greeneconomy/ (Consulted on August 25th, 2013)

UNEP (2012), "*GEO 5 – Global Environmental Outlook*", internet : http://www.unep.org/geo/ (consulted on June 25th, 2013)

United Nations (2013), "*World Population Prospects: The 2012 Revision"*, internet: http://esa.un.org/ (consulted on June 20th, 2013)

Vorley, B. (2001), "The chains of agriculture: sustainability and restructuring agri-food markets", internet: http://pubs.iied.org/ (Consulted on August 25th, 2013)

WHO (2013), internet: http://www.who.int (consulted on August 16th, 2013)