

THE MULTI-FUNCTIONAL USE OF URBAN GREEN SPACE

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Abstract

This paper draws the attention to the use of urban land use as a promising and new playground for urban green space design, including viable small-scale agricultural activities. First, an overview of urban green space planning is given, followed by a typology of approaches to evaluate urban green space. Next, the specific importance of urban green space for small-scale agriculture and horticulture is highlighted. The paper concludes with an elaboration of the rich multi-tasking performance of urban green space for a modern urbanized society.

1. Red and Brown versus Green and Blue

The history of human settlements exhibits interesting features which can be depicted in terms of colour codes. The Ancient World was mainly a rural world ('green'), while the first signs of urbanization were mainly found along riverbanks and coastal areas ('blue'). The founding father of modern economics, Adam Smith, regarded the openness of spatial systems as a sine qua non for trade and prosperity (for a historical review, see also Tulleken 1988), and arising from this, agglomeration advantages were the main stimulus for urbanization. These spatial advantages comprised, inter alia: market presence, a variety of joint facilities, safety and protection, and relatively stable governance systems. So, as time went by, a gradual transition from a rural world to an urban world ('red') took place: circa 200 years ago, some 20 per cent of the total world population was living in cities, whereas at present about 80 per cent are urbanized. In the 19th century, another important development took place, which made a decisive impact on the geography of human settlements, viz. the Industrial Revolution. This led to a mass concentration of industrial developments ('brown') and strongly reinforced the emerging urbanization trends.

Nowadays, we observe a more mixed pattern with: still a structurally increasing rate of urbanization ('red') for both residential and industrial purposes; a declining importance of rural areas ('green') as economic activity centres; an increasing importance of water ('blue') as an organizing spatial planning principle in coastal zones and along rivers; and a consolidation of industrial areas ('brown') as economic heartlands, albeit that the regeneration of brownfield sites in large cities is gaining importance (e.g. in the form of harbour front residential and commercial development), and green industrial initiatives are coming to the fore.

The transformation of urban space – with an unprecedented dynamics in functional land use – prompts the question whether there is a balance between 'red' and 'green' (or, more precisely, between 'red+brown' and 'green+blue'). In the present paper we will address in particular the question of functional use – the economic use of green space in urban areas. Green space in modern cities may have a number of different forms (see Baycan Levent et al. 2009):

- limited public green space (e.g. beds of flowers or plants) that enriches urban ecological quality of life;
- open public space (e.g. urban parks or riverbanks) that serve the recreational needs of visitors (e.g. through walking, sports activities);
- private gardens attached to the citizen's property meant for private use;
- private green space belonging to corporate organizations (e.g. schools, hospitals, industrial parks) that serve to strengthen the image of openness, nature and health within the city limits.

Our paper will address in particular two major elements of urban land use, viz. open green space and private gardens. In Section 2 we explain the importance of urban green areas, while Section 3 is devoted to the design of a systematic typology of urban green space. Next, Section 4 focuses on the private use of urban green space, in particular for agriculture, and Section 5 reviews models and techniques for assessing urban agriculture. Then, in Section 6, we outline a multi-tasking perspective and the contours of a green urban world. Finally, Section 7 will be somewhat speculative in nature and paint a panoramic picture of the future of urban agriculture.

2. Urban Green Spaces

Urban green space is an indispensable element of urban quality of life. Green areas are environmental – and sometimes historico-ecological – assets of great importance for any city. The importance of ‘urban green’ has been clearly recognized in urban architecture (see, e.g., MacHarg 1971), by, for instance, Ebenezer Howard with his Garden Cities, Charles Fourier with his Phalansteries, and Ernest Calleback with his Ecotopia.

Urban green policy has – in the light of urban sustainability policy – attracted much interest in recent years (for an overview, see, e.g., Baycan-Levent et al. 2009). In various towns and cities, new programmes based on ecological approaches have been developed for the protection and management of nature in urban green spaces. Moreover, policy makers and planners have started to pay significantly more attention to initiatives designed to foster sustainable development and to improve the quality of life in urban areas by the clean-up and redevelopment of under-utilized brownfield sites. Actually, there has been a growing recognition among urban community groups and environmental organizations that brownfields have enormous potential for ‘greening’ city environments, through the implementation of parks, playgrounds, greenways, and other open spaces.

It should be noted that urban green spaces provide a range of benefits in various forms and offer a variety of opportunities to people. They reinforce the identity of towns and cities, which can enhance their attractiveness for living, working, investment and tourism, and therefore these spaces can contribute positively to both the quality of life and the competitiveness of cities. In addition, urban green spaces moderate the impact of the negative consequences of human activities by, for example, absorbing pollutants and releasing oxygen. Furthermore, they maintain a certain degree of humidity in the atmosphere; regulate rainfall; moderate changes in temperature; curb soil erosion; form the basis for the conservation of fauna and flora; contribute to the maintenance of a healthy urban environment by providing clean air, water and soil; improve the urban climate; and maintain the balance of the city’s natural urban environment.

And, finally, they preserve the local natural and cultural heritage by providing habitats for a diversity of urban wildlife and conserve a diversity of urban ecosystems.

Clearly, many more social benefits of urban green spaces can be mentioned. In the framework of the present paper, we refer in particular to agricultural functions, as a green space might deliver products such as wood or fruits and also compost and energy as a result of urban green production. The presence of these spaces can create an increase in the economic value of an area and may provide new jobs. Green areas, water bodies, open space and attractive landscape types are all aspects of an attractive urban setting. In particular, attractive landscape types can lead to a considerable increase in real estate values, e.g. through hedonic prices.

It is thus clear from this summary of the importance of green urban areas that urban architecture and urban ecology are two intertwined disciplines. These disciplines have clearly demonstrated that a successful integration of nature within the urban environment will depend upon: (a) the effective application of ecological knowledge; (b) the integration of complementary approaches of the relevant professions; (c) adequate training in ecology for those involved in open space management; (d) public planning interpretation of urban nature; and (e) partnership with the local economy. A major research and policy challenge is the design of an integrative framework for urban green policy in relation to its functional-economic uses. This will now be discussed further in Section 3.

3. Assessment of Green Urban Spaces: A Typology

Urban green is often at the centre of the debate on urban sustainability, as it is so essential for urban quality of life. This discussion on the meaning of various types of urban green usually prompts usually serious questions concerning the valuation of urban space (for an extensive overview, see McConnell and Walls 2005). In the ecological economics literature, it is customary to make a distinction between the ‘use value’ and ‘non-use value’ of the environment. ‘Use value’ refers to the economic functions of space, e.g. for recreation, growing vegetables, etc., while ‘non-use value’ refers to intangible functions of space, e.g. aesthetic pleasure, psychological well-being, social interaction, etc. It is noteworthy that urban green spaces offer access to, and use of, a great variety of (mainly positive) ecological functions.

The various functions of urban green spaces clearly show that green spaces have a complex and multidimensional structure, and contain important values that contribute to the overall quality of urban life. A taxonomy of values for urban green spaces has been presented by Baycan-Levent et al. (2009). In this taxonomy, the authors have defined a variety of urban green space values classified according to five categories (a) *ecological values*: intrinsic natural value, genetic diversity value, life-support value; (b) *economic values*: market value; (c) *social values*: recreational value, aesthetic value, cultural symbolization value, historical value, character-

building value, therapeutic value, social interaction value, substitution value; (d) *planning values*: instrumental/structural value, synergetic and competitive value; (e) *multidimensional values*: scientific value, policy value. The authors have also developed an operational taxonomy for the evaluation of urban green spaces in parallel with their taxonomy of urban green space values (see Table 1). This taxonomic framework offers a systematic assessment approach which embraces the complex and multidimensional structure of urban green areas.

Most of the values attached to urban green spaces are non-priced environmental benefits which include, for example, pleasant urban landscapes, peace and quiet, and hence potential recreational opportunities. It should also be recognized that qualitative valuations of green spaces are difficult to integrate into conventional assessment procedures. For non-monetary valuation of urban green spaces, suitable methods include: geographical information system (GIS) methods, multi-criteria decision methods, meta-analysis, and rough set analysis. It is obvious that the complex and multidimensional structure of urban green spaces makes the description or design of a single ‘best’ evaluation model for urban green spaces difficult. Increasing complexity in urban green spaces requires an evaluation on the basis of multiple decision criteria and multiple effects in an urban policy context. This multidimensional evaluation may comprise monetary and non-monetary valuation methods for both quantitative and qualitative information. Consequently, this evaluation should provide relevant policy-support and guidance to help society and planning authorities improve the quality of life in cities.

4. A Functional Analysis of Urban Agricultural Land Use

Sections 2 and 3 were mainly devoted to urban green spaces as a public good open to the public at large. However, the urban space comprises also numerous green patches that are mainly used for private purposes, including the growing of agricultural produce. According to Jane Jacobs (1969), innovative agricultural activities started in cities. It is in cities that new goods and services were first created; and this even holds for innovations created specifically for farming. When medieval households started to consume grain, probably only a little was obtained from the rural hinterland. Instead, the city population grew most of it for themselves in the fields partly within the walls. The medieval cities must have been their own first markets for metal agricultural tools made by their smiths. Only many years later, did these tools also become common in the rural areas.

Nowadays, there is not much land left for extensive, space-consuming agricultural activities in urban areas. However there are a few exceptions, in particular on account of their positive effect on health and relaxation:

- 1) commercial farmland, in particular health farms;
- 2) allotment gardens;

- 3) community gardens;
- 4) school gardens and city farms.

Commercial farmland in urban areas is at present increasingly seen as an urban recreation area where citizens can walk, cycle, or enjoy nature. This often results in many limitations for 'real' farmers, related to, for example, odour or noise nuisance and fragmentation of the landscape due to other economic activities. However, there is a specific kind of farming activity that benefits from the presence of the citizens; these are the health farms. For example, in the Netherlands, almost 1,000 of such farms exist, which take care of mentally challenged, stressed managers, ex-inmates, etc. From a research study of Hassink et al. (2007), it appeared that, in 2008, the average annual revenue from health-care activities on a non-institutional health farm was about €73,000, which would amount to annual revenues of €72 million for the total Dutch non-institutional health-farming sector. The health care is generally financed by the government.

The second group of activities comprises urban gardens. Urban agriculture in developed countries, such as the allotment gardens in the Netherlands, are often small pieces of land tucked away in the corners of the city, owned by the local authority or railway companies. These plots of land are rented to residents so that they can grow flowers or vegetables, often on their own parcel. Community gardens are usually maintained by a group of persons (the community), just as school gardens, which have an extra-educational function. These kinds of gardens, have several benefits:

- Social aspect: the group of persons who rent an urban vegetable garden is very diverse with both low income and high income families, old and young, and with different nationalities. All these people meet and interact when working in their garden.
- Health aspect: being outside, working in the garden is beneficial to both the physical and mental health of people, as is shown in many studies.
- Educational aspect: both adults and children see and learn how different kinds of vegetables and flowers grow in different seasons and that kind of animals and birds are interested in the harvest as well.
- Environmental aspect: from a planning point of view, urban gardens can be welcome green oases in urban neighbourhoods, with the same climatic and regulating effects that other urban green areas have.

In addition, urban gardens also provide agricultural products. However, often the costs of producing are higher than the value of the harvest. Nevertheless, fresh food and vegetables from one's own garden are usually more greatly appreciated than products from the supermarket. This is also what Armstrong (2000) found in her study of community gardens in New York. In conclusion, therefore, the social value of urban green is not negligible.

Table 1. A typology of various approaches to the valuation of urban green spaces

<i>Values of urban green spaces</i>	<i>Values of urban green spaces from an economic perspective</i>	<i>Valuation methods</i>
1. Ecological values		
Intrinsic natural value Genetic diversity value Life-support value	Existence value Bequest value Indirect use value	<i>Monetary valuation:</i> cost-benefit analysis, travel-cost method, replacement costs, tourism revenues, production function, contingent valuation <i>Non-monetary valuation:</i> species and ecosystem richness indices, genetic difference, genetic distance, phenotypic trait analysis, biodiversity index, keystone processes, health index, ecosystem resilience and stability analysis, hierarchical structure, population viability analysis, eco-regions or eco-zones
2. Economic values		
Market value	Direct/ Indirect use value	<i>Monetary valuation:</i> market analysis, production functions, financial analysis, economic cost-benefit analysis, travel cost methods, hedonic price method
3. Social values		
Recreational value Aesthetic value Cultural symbolization value Historical value Character-building value Therapeutic value Social interaction value Substitution value	Direct use value Existence value Existence value Bequest value Indirect use value Indirect use value Indirect use value Direct use value	<i>Monetary valuation:</i> travel cost method, tourism revenues, contingent valuation
4. Planning values		
Instrumental/ Structural value Synergetic and competitive value	Indirect use value Existence value	<i>Monetary valuation:</i> cost-benefit analysis, contingent valuation, hedonic price method <i>Non-monetary valuation:</i> geographical information systems (GIS) method, multi-criteria decision method
5. Multidimensional values		
Scientific value Policy value	Indirect use value Indirect use value/ Existence value	<i>Monetary valuation:</i> financial analysis, cost-benefit analysis, cost-effectiveness analysis, tourism revenues, taxes revenues <i>Non-monetary valuation:</i> performance analysis, multi-criteria decision methods, meta-analysis, value transfer, rough set analysis, fuzzy set analysis, content analysis

5. Urban Agriculture in Developed Countries

From the perspective of local communities, the vulnerability of a global world adds uncertainty and lack of trust to the food sector because much of the economic game is defined by unknown international decision makers. For several active economic and social players, in particular consumers, the notion of a 'borderless world' is uncomfortable and many communities are looking for solutions to gain some protection from the instability of global economic forces, by developing forms to better explore the resources that nature can provide. One such form is urban agriculture. This is generally practiced for income-earning or food-producing activities but may also be associated with recreation and landscape management. Urban agriculture makes a positive contribution to food security, to food safety and to energy savings by shortening the circuits that distribute food products. Immediate advantages such as freshness of fruits and vegetables, better choice of high-quality meat products and simple processes for food traceability, all mark a new trend in urban consumption and behaviour. Because of its ecologically-sound and efficient form, urban agriculture based on biological recycling methods is also generally associated with sustainable practices.

In New York there is a long history of using community gardens to improve psychological well-being and social relations, to facilitate healing, and to increase supplies of fresh foods, (Armstrong 2000). During and after both World Wars, community gardens provided increased food supplies which required minimal transportation. During the Great Depression, city lands were made available to the unemployed and impoverished by the Work Projects Administration; nearly 5000 gardens on 700 acres were cultivated in New York City through this programme.

London offers another example. There are around 30,000 active allotment holders gardening on 831 ha of land, of which 111 ha are in inner London. Traditionally, allotment gardening has been a pastime for low-income or retired men. Furthermore, there are 77 community gardens in London which are located around the city, on housing estates, near railways, on temporary land and in community centres. Community gardeners grow mainly flowers and ornamental plants, although there is also some cultivation of fruit and vegetables as well (Garnett 1999).

The Netherlands has around 250,000 community- and allotment gardens, which account for around 4,000 ha of land. In Amsterdam, about 350 ha of land is used for urban gardens. These gardens used to be places where fresh products were grown for the urban population. After WWII, they increasingly became ornamental gardens in which residents garden but also spend time relaxing.

In 2006, in the Netherlands, almost 19 million visits were made to an urban community or allotment garden (CBS 2007). But the number of visits has decreased by two-thirds since 1990, and the kind of visitors changed. When looking at the details, as shown in Table 2, it appears that

most visits are made in spring when the garden needs to be prepared for the new season, and when the crops need to be sown. However, in 1990, most visits took place during the summer time, probably because in 1990 more vegetables were grown which needed to be harvested, while in 2006 more vegetable plots had been turned into flower gardens. When looking at the average age of the gardeners it seems that it is not only the elderly who enjoy urban gardens. In fact, the group of gardeners of 65 years and older has been getting smaller over the years, while the group of youngsters (0-15 years old), together with the group of persons between 45 and 65 years old is growing. Another interesting development concerns gender: in 1990 80 per cent of the visits were made by males, while in 2006 this was reduced to 51 per cent.

In addition, the geographical distribution of allotment visits in the Netherlands did not change much. Most of the visits were made in the Western part of the Netherlands, the main urbanized part of the country, which includes the Randstad.

Table 2: Characteristics of visitors to urban gardens (both community and allotment gardens) in the Netherlands between 1990-2006

Visits to urban gardens	1990	2006
<i>Seasonal visits</i>		
Winter	2	11
Spring	35	46
Summer	38	15
Autumn	25	27
<i>Gender</i>		
Man	81	51
Women	19	49
<i>Age visitors</i>		
0-15 years	1	16
15-25 years	1	2
25-45 years	17	9
45-65 years	48	53
65 years and older	34	20
<i>Part of the Netherlands</i>		
North (rural)	4	5
East (rural)	8	6
West (urban)	77	81
South (intermediate)	12	7

Source: CBS (2007)

This picture of the changing use of urban gardens by a changing group of gardeners fits with the idea that today social and health benefits are seen as increasingly important, compared with producing food. Not only the elderly spend their time gardening, but also younger persons,

often the whole year round. In addition, men and women tend to enjoy these green benefits equally. The large share of urban gardens in the more urbanized part of the Netherlands indicates the importance of this kind of urban agriculture in most urban regions in the country.

6. A Multi-Tasking Perspective on a Green Urban World

Urban green can fulfil many tasks, from leisure to production. The first accepted way to intentionally promote green urban spaces was by constructing urban gardens. According to the received historical view, the Hanging Gardens of Babylon were built by Nebuchadnezzar II around 600 BC. Since the early 18th century, urban architecture has emphasized the use of this ornamental tool, in order to create pleasant and beautiful towns where decorative public gardens have encouraged citizens to be interested in learning about the world and many of its botanic species. Because of food crises, another very interesting gardening facility was promoted later in many northern European towns, where collective areas were allocated to the local population by the municipalities for families to cultivate urban vegetable gardens. Nowadays, such gardens still exist in large cities such as New York, Berlin, Paris, London, Amsterdam or Moscow, and in many other smaller towns. In general, these individual plots are very small (they may be no more than 50 square metres in size) but they can, nevertheless, provide families with fresh seasonal products, health and other educational or environmental benefits (Armstrong 2000).

From a global view, green urban spaces materialize according to the different contexts that they help to integrate. For instance, in poor countries, where the world's largest cities can be found, it is necessary to take advantage of all the opportunities to supply nutritionally adequate and safe food. Here, urban agriculture is generally practiced for food-producing activities that generate self-employment, direct revenues, or savings, thus contributing to greater social stability. Communities of practice have been studied and described in the municipalities of Montevideo (in Uruguay), Quito (in Ecuador), Curaca (in Brasil), Santiago de los Caballeros (in the Dominican Republic), Texcoco (in Mexico), Bamako and Ouagadougou (in West Africa), and Nairobi (in Kenya) and Tokyo's Nerima Ward (in Japan) (FAO, 2000). It has been observed that one of the reasons for the development of urban agriculture concerns its adaptability and mobility compared with rural agriculture. The expansion of cities helps to bring a wave of novel opportunities that encompasses urban, peri-urban and rural activities.

Also, from the perspective of local communities, the vulnerability of a globalized world adds uncertainty and lack of trust to the individual decision processes because a great deal of the economic game is defined by unknown international decision makers. According to Ward et al. (2008), this has led to new rules in most of the agricultural policies and responsible institutions. A transition from a *productivist* towards a *post-productivist* model is emerging, independently from the dominance of long-established international trade rules. For many active economic and

social players, such as consumers, the notion of a borderless world is uncomfortable, and many communities are considering the possibility to gain a certain degree of protection from the instability of global economic forces by further developing ways to better utilize the resources that can be provided. One such way is urban agriculture.

In most developed regions, however, green urban spaces are supposed to provide aesthetical environments for recreation and leisure, for which tourism and welfare are the drivers of the landscape management. But, in both situations, whether in poor or richer environments, positive externalities may be obtained and they are generally associated with sustainable practices. That is, in terms of food security or energy savings, by shortening the food distribution channels; by facilitating biological recycling methods; or by promoting scope economies among reallocated services associated with agricultural activities. Thus, urban agriculture can meet many ecological and economic goals in urban land-use planning.

7. The Future of Urban Agriculture

By 2015 about 26 cities in the world are expected to have a population of 10 million or more. At the present time, to feed a city of this size – for example Tokyo, São Paulo or Mexico City – at least 6000 tonnes of food must be imported each day. Such large cities seem to be mushrooming out of control and becoming a major problem for humankind. If urbanization is indeed out of control, then the emergence of a new generation of very large cities may undermine any progress towards sustainable development¹. Urban land use needs to be flexible in order to meet the many socio-economic and sustainability objectives of our complex space-economy.

Multi-tasking to promote an enhanced use of farm land, including within urban areas, may turn out to be a win-win situation, as explained by Deelstra et al. (2001). But a major constraint is that urban planners around the world need to be able to understand the different motivations of local societies, adopting attractive land use solutions designed to meet their individual needs. Such effort is not easy due, firstly, to the difficulties in finding a consensus among the diverse policy aims; and, secondly, to the ever-present strong pressures on land use within and around the cities, which causes increasingly high land prices. As such, and in order to accomplish that task (under conditions of city expansion with congestive demands), policy makers are continually searching for tools to integrate resource management and planning, using all the links between rural and urban areas, intensifying them if possible, and predicting citizens' needs in rural and urban areas.

¹ PANOS Briefing 34, June 1999, in <http://www.panos.org/>

The spectrum of activities based on urban agriculture to promote the green urban world is limitless and depends almost exclusively on the creative nature of the local population and its entrepreneurial capacities and leadership. However, significant added value is required if such activities are to be competitive with traditional urban industry. In Europe, there are many business combinations based on urban agriculture that provide different land use functions. Examples of such multi-tasking for the green urban world include: agricultural and livestock farms for educational purposes or health care; feed production combined with recreation and wastewater treatment; aquaculture with water storage and water sports; food and beverages of biological origin and high quality standards in farm production (e.g. cheese, jams and cosmetics) in association with pro-active tourism; museum-oriented activities related to innovative or scientific processes used in food products of farm origin; urban forestry offering health and microclimate benefits; and energy extensive crops allied to both recreation and educational goals.

One can only speculate about the future of urban agriculture. Nowadays, urban land use already involves the regeneration of decayed industrial areas embracing the concepts of modern fine arts to build green recreation places. Or there is the possibility of cropping with no land by the application of hydroponics, or even the use of skyscraper terraces to construct neo-Babylonian suspended gardens and *tropical* mini-forests. Perhaps submerged gardens or under-sea-farming will one day be among the romantic visions of mankind?

In conclusion, the *post-productivist* model opens perspectives to many new-farm types and new urban-garden forms in cities, which are rapidly changing their general red-brownish cartographic colour into an exciting mix with splashes of bluish-green. Or, in other terms, it is amazing how – just when the rural world is becoming multi-tasking (Vaz and Nijkamp 2009) because of the emergence of multifunctional agriculture – urban areas are beginning to identify the important role of agriculture in reshaping the landscape architecture of cities and to put into practice the many new concepts for business-farms and green land-use forms.

References

- Armstrong, D., A survey of community gardens in upstate New York: Implications for health promotion and community development, *Health & Place* vol. 6, 2000, pp. 319-327
- Baycan-Levent, T., R. Vreeker and P. Nijkamp, A Multi-Criteria Evaluation of Green Spaces in European Cities, *European Urban and Regional Studies*, vol. 16, no. 2, 2009, pp. 219-239
- CBS, Centraal Bureau voor de Statistiek [Dutch Statistics], Heerlen, 2007
- Deelstra, T., D. Boyd and M. van den Biggelaar, Multifunctional Land Use: an opportunity for promoting urban agriculture in Europe, *Urban Agriculture Magazine*, vol. 4, 2001, pp. 33-35

- FAO, Urban and Peri-urban Agriculture on the policy agenda: Virtual conference and information market, A joint venture of the FAO Interdepartmental Working Group (IDWG), 2000, online: www.fao.org/sd/ppdirect/ppre073.htm
- Garnett, T., Urban agriculture in London: rethinking our food economy, Paper presented at the international workshop 'Growing Cities Growing Food' in Havana, Cuba, October 1999
- Hassink, J., C. Zwartbol, H.J. Agricola, M. Elings and J.T.N.M. Thissen, Current status and potential of care farms in the Netherlands. *NJAS Wageningen Journal of Life Sciences* vol. 55, no. 1, 2007, pp. 21-36
- Jacobs, J., *The Economy of Cities*, Random House, New York, 1969
- MacHarg, I.L., *Design with Nature*, Doubleday, New York, 1971
- McConnell, V. and M. Walls, *The Value of Open Space, Resources for the Future*, Washington DC, 2005
- Tulleken, K., *The Age of God-Kings*, Time-life Books, Amsterdam, 1988
- Vaz, M.T.N. and P. Nijkamp, Multitasking in the rural world: technological change and sustainability, *International Journal of Agricultural Resources, Governance and Ecology*, 2009 (forthcoming)
- Ward, N., P. Jackson, P. Russell and P. Wilkinson, Productivism, Post-Productivism and European Agricultural Reform, *Sociologia Ruralis*, vol. 48, no. 2, 2008, pp. 118-132