Transition to multifunctional land use and agriculture

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Transient visions of agriculture

Agricultural research, education and extension have contributed greatly to an increase in agricultural production and labour use efficiency. The success story of this development of the last 50 years, as described in other contributions of this special issue, has made it possible to rethink the objectives of land use and agricultural production and to reshape agriculture and land use. This contribution reviews the transition in social visions of agriculture and its impact for research and policy.

Since the 1960s, there is a growing awareness of conventional agriculture ignoring or neglecting basic functions of the rural areas, which has resulted in a growing social pressure to care for these functions too. To meet this social pressure, several alternative visions and systems with ever-wider scope have been launched, for the time being culminated into Multifunctional Agriculture. Figure 1 offers a schedule of this socially driven transition in agricultural visions and derived systems.

Conventional agriculture getting out of date

Historically, the basic functions of agriculture are food production for the urban and rural population and provision of work and income for the rural population. Conventional agriculture confines the scope to these functions. From the start it has dominated the Common Agricultural Policy (CAP) of the EU-countries, in spite of the serious adverse effects of its narrow scope. Initially, the dominance of conventional agriculture was quite understandable, because Europe came out of World War II with insufficient food production and insufficient work and income, especially in rural areas. To overcome this, a policy mixture of subsidies including guaranteed prices and protection against foreign producers was adopted. However, this policy also encouraged the

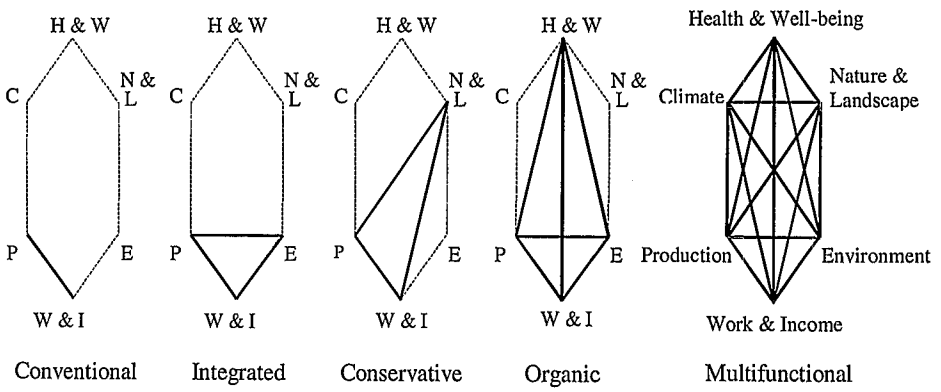

Figure 1. Transition of agricultural visions and derived systems to combine ever more rural functions.

continuous improvement of production methods. As a result, food shortages have turned into food excesses and the number of workers needed has drastically been reduced. Because the latter aggravated unemployment and poverty in many rural areas, subventions and trade protection were adapted but not abandoned. Still, the EU is spending almost half its budget to maintain socio-economic stability in its rural areas. It is even accepting stagnation in developing countries, caused by European trade protection and dumping of excesses. Fortunately, Agenda 2000 and the EU position in the World Trade Organization (WTO) show that the CAP tends to gradually reduce subsidies and trade protection (Anon., 2001a). This will increasingly expose European farmers to the competition from farmers elsewhere who often have fewer costs of land and labour. So the EU is adopting ever-stricter environmental regulations. Therefore, conventional agriculture will gradually be competed away and followed up by visions and systems with a wider scope.

Integrated agriculture as an environmental update

To overcome the serious adverse effects of conventional agriculture on the environment, scientists have developed various farming systems that include the environment as a third objective beside production and work/income. Notably the plant protectionists assembled in the International Organisation for Biological Control (IOBC) have contributed (Vereijken *et al.*, 1986, El Titi *et al.*, 1993). They have succeeded in largely replacing hazardous pesticides in various crops, but up till now there are hardly examples of cropping systems without remaining pesticide hazards. Besides, most integrated cropping systems need more knowledge and skill from the farmers, are less stable in yield and are less profitable. Therefore, integrated cropping systems with substantially less environmental hazards by pesticide and fertilizer use have not been broadly adopted, apart from a few crops for which retailers and consumers are willing to pay premium prices under an integrated label. So integrated agriculture has not yet succeeded in replacing conventional agriculture, though it has raised awareness and improved technology along the entire chain of production, processing, trade and consumption. Recently the leading European food retailers took the initiative to make

farmers adopt integrated agriculture. Alarmed by various food scandals, retailers decided to draw up a protocol of safe food production for their primary suppliers in Europe. Within EUREP-GAP (EUREP = Euro-Retailer Produce Working Group, GAP = Good Agricultural Practice) new standards for food safety are developed and laid down in this protocol (Anon., 2002a). Their standards apply to all agricultural sectors. Combined with initiatives of the EU and national governments concerning food safety and environment, this market initiative may succeed in replacing conventional agriculture by integrated agriculture as an update with less adverse effects on the environment and possibly on the health of the consumers too.

Conservation agriculture for valuable agro-historical areas

Conservation agriculture may be considered as a side-branch in the transition towards a wider scope. It owes its development to various European and national regulations for appropriate management of agricultural areas with high values of historical landscape and nature. In this way the traditional agricultural systems can remain preserved as a major part of the cultural heritage. The regulations include payments to let farmers keep nature and landscape in scope in these valuable but economically mostly marginal areas.

Organic agriculture only for a niche-market?

To escape from the hazards of chemical-synthetical inputs in conventional agriculture, small groups of (highly educated) consumers and farmers have established an alternative chain of production, processing, trade and consumption. It is based on a radical decline of any chemical-synthetical input (Anon., 2002b). They therefore call it organic agriculture. During the last decade organic agriculture has gained world-wide support and recognition, favoured by the growing awareness of the proven or suspected hazards of narrow-scoped conventional agriculture, but also favoured by improved professionalism in the organic chain. It remains to be seen whether organic agriculture will ever be able to replace conventional and integrated agriculture. For the time being the best opportunities are in the developed countries where people can afford to pay premium prices for more safety of the environment and health/well-being of man and animal. A break-through of organic agriculture will largely depend on yield improvement and cost reduction in order to make it economically more competitive with conventional products. However, if the organic chain keeps on rigidly declining biotechnology, the gap in cost-effectiveness with conventional agriculture may even get wider and 'organic' will remain a minority's alternative.

Multifunctional land use and agriculture as a multiple challenge

Considering the shortcomings of present visions and systems, it is a social, ecological and economic challenge to develop a multifunctional agriculture with all major functions of the rural areas in scope. *Multifunctional agriculture implies the integration of plant and animal production with environmental care (management of water, soil and air,*

notably control of emissions), conservation of nature and agro-historical landscape, control of climate and the effects of global warming (CO_2-storage, biomass for energy, water retention) and care of health and well-being (including tourism and recreation)(see also Anon., 2001b,c). A single farm, because of its limited resources and especially its limited scale, cannot carry such a broad set of functions. Only large regions may meet this challenge, based on multifunctional land use including multifunctional agriculture practised by a wide variety of farms. To ensure sufficient work and income, these functions should be marketed by a wide variety of rural products and services:

- governments paying farmers for water retention to protect cities and villages downstream against flooding;
- drinking water companies paying for conserving unpolluted water;
- governments or NGO's paying for management of nature and landscape of national or international interest, or education and social care of children, adults or aged on farms;
- inhabitants and tourists paying for access to and enjoyment of an attractive landscape.

Policy for multifunctional land use and agriculture

Transition from conventional to multifunctional agriculture poses two major conditions:

1. Farmers should reduce the environmental effects of plant and animal production to a minimum, because the wide variety of rural products and services requires a clean environment.
2. Consumers or authorities on their behalf, should create a market for the variety of rural products and services, especially in the region itself, since most of the services have to be enjoyed on the spot.

Both conditions are difficult to fulfil. Most farmers continue to increase the scale and intensity of production in order to survive on the liberalizing world market. On the other hand, European and national authorities try to enforce a more sustainable production by ever-stricter rules. As a result, authorities and farmers are getting in almost irreconcilable positions: the authorities want to abolish protection and subsidies and force sustainability, but farmers want to keep protection and subsidies to afford the 'luxury of producing sustainably'. For sustainability mostly brings by higher costs and lower yields and thus undermines competitiveness on a free market. A powerful onset for multifunctional agriculture would be, if the EU would abolish protection to meet its trade partners in the WTO and replace price subsidies by payments for 'green services', i.e., services to the other rural functions. It may do so by promoting:

1. The needed ecological innovation by imposing an economic penalty (loss of price subsidies) on the continuation of conventional agriculture and putting a reward to adoption of a system with a wider scope.
2. The needed development of a domestic market. If the regional consumers would learn to appreciate these services, they would be willing to gradually take over the payments.

By this innovative policy, the EU may encourage its farmers to step over from conventional to multifunctional agriculture and may encourage its consumers to increase their demand of food- and non-food products and services from the rural areas. However, multifunctional agriculture is not the only option for consumers and authorities to safeguard the other basic functions of the rural areas. Another option is to trust these functions, e.g. the provision for the related products and services, to various other providers, often with more knowledge and better equipment than farmers (Figure 2). In regions where neither of these two is adequate, the options could be combined. If both options would be feasible, authorities should as much as possible entrust the rural functions to the multifunctional farmers! With this option only a minimum of land should be purchased for the non-production functions, so that the production remains ensured.

Multifunctional agriculture is becoming a global theme both in trade policy, rural policy and research. However, the theme is most controversial, especially among policymakers trying to agree on a more liberal world trade. If their national agriculture is little competitive, they are inclined to justify subvention and market protection by claiming it is multifunctional. This claim implies that beside commodities their agriculture produces various non-commodity outputs, such as rural income and employment ('rural viability'), water management, nature and landscape. They argue that in case of complete liberalization, their national agriculture would be suppressed by foreign competition and would produce ever less non-commodity outputs, which would be unacceptable from a national point of view. Policy makers from countries with a competitive, export-oriented agriculture dispute these claims. They argue that most non-commodity outputs can be unlinked and provided separately, so that these more or less public goods would not be harmed by liberalization of agricultural trade. OECD is trying to bring clarity in this controversy by own research and by encourag-

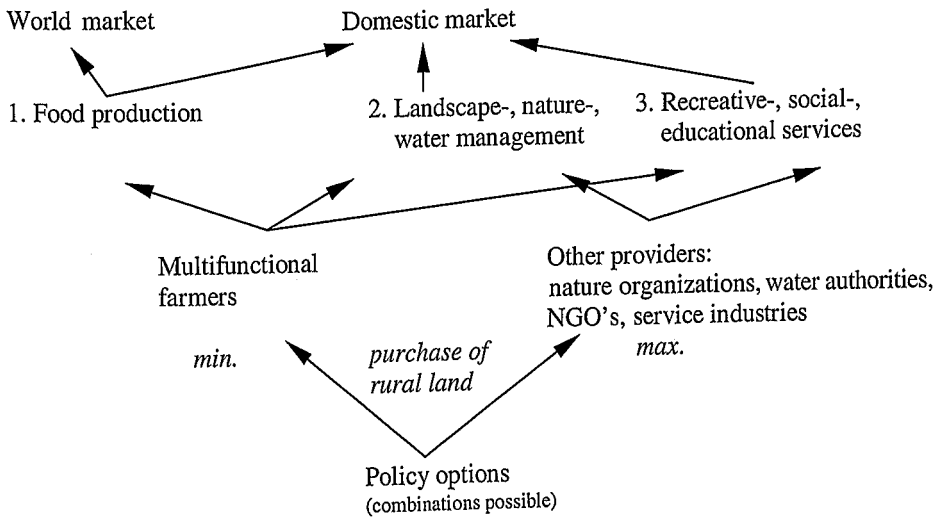

Figure 2. Policy options to develop the main functions of the rural areas or the 'green space'.

ing its member countries to discuss and report on the multifunctionality of their agriculture (Anon., 2002c).

Research for multifunctional land use and agriculture

To achieve a multifunctional agriculture that is compatible with free trade, rural policy makers need a lot of knowledge to design appropriate policy programmes. Researchers from various disciplines should support them by collecting and adapting existing knowledge and by replenishing it with new knowledge. However, in more and more rural regions agriculture is no longer a major provider of non-commodity outputs. Here, rural functions such as nature, landscape and recreation are already directly provided by non-agricultural providers such as nature organizations and recreation industry (Vereijken, 2001). For these regions, the theme should rather be expanded to multifunctional land use, including multifunctional agriculture. This theme can be subdivided in basic questions for policy and research:

1. Rural services, e.g. provision of public goods of regional, national or even international interest:
   - 1.1. Where are which physical opportunities in specific regions?
   - 1.2. What is the social demand in these regions?
   - 1.3. To what extent should the services or public goods be provided as non-commodity outputs by farmers, to what extent can they be provided directly, so not-linked with production and paid separately?
   - 1.4. To what extent can or should the services or public goods be spatially combined, with or without commodity production (multifunctional land use with or without multifunctional agriculture)?
2. Production of food or non-food commodities:
   - 2.1. Which are the physical opportunities in specific regions?
   - 2.2. Which are the economic opportunities, assuming progressive trade liberalization?
   - 2.3. Which are the physical and economic opportunities of demand-oriented farming systems combining commodity production and rural services (multifunctional agriculture)?

Researchers may help to answer these questions with various methods. Briefly, the author's own methods are presented.

Exploring physical opportunities of multifunctional land use and agriculture

The transition to multifunctional land use will often require the physical and economic restructuring of a region. We used Twente as a representative region for the rural areas of the Netherlands coping with intensive animal husbandry and urbanization. To help policymakers and entrepreneurs in finding opportunities of combining rural functions, e.g. products and services, we developed a search engine on the Internet (www.dualis.wag-ur.nl). It has a generic structure so that it can be easily expanded with data from other regions.

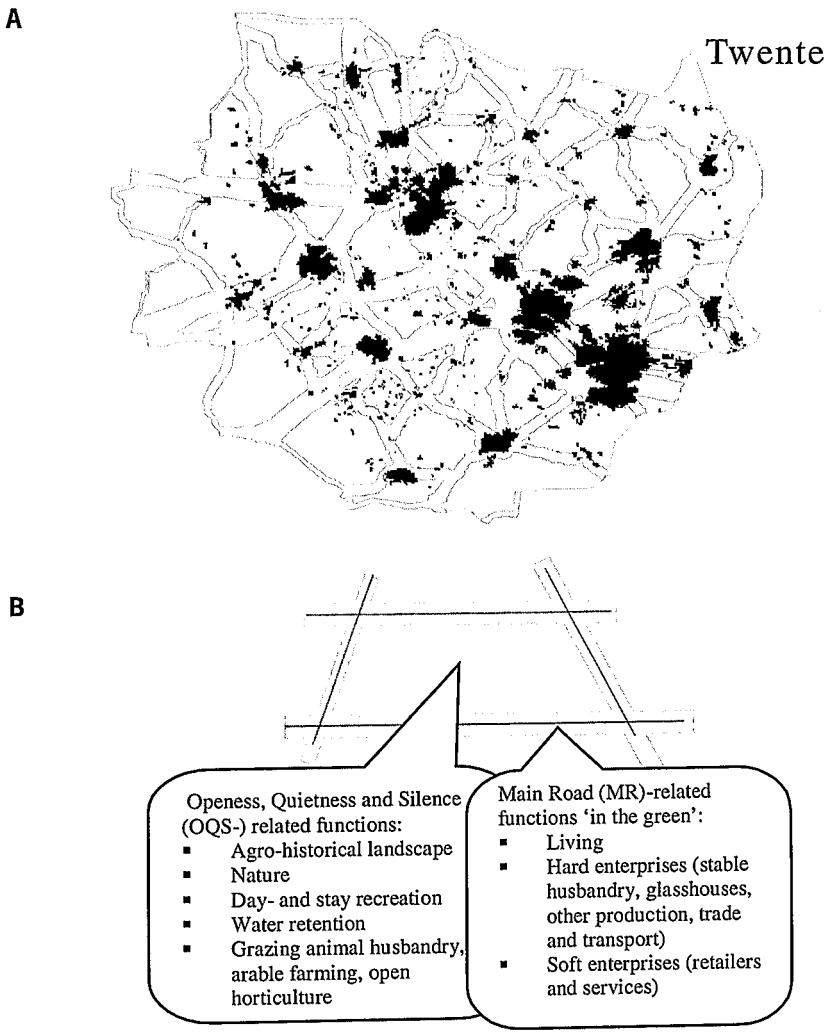

Figure 3. A. Dualistic planning of a rural region by OQS-spaces (800 km²) and MR-zones (500 km²); black = built area: 200 km² with 600,000 inhabitants. B. 'Green' and 'red' functions to be combined in the OQS-spaces and MR-zones.

The pilot region has been explored in the following way:

- The region has been uniformly subdivided in two kinds of areas: main road (MR-) zones and open, quiet and silent (OQS-) spaces (Figure 3A). This reflects the current land use and offers perspectives for optimum physical planning of all rural functions.
- The values of the indicators per function have been transformed in a ranking of three classes: high, middle and low, each comprising a third of the total rural area. This leads to uniform maps per indicator, which shows the MR-zones or OQS-spaces with low, middle or high indicator values.

- The indicator maps have been combined to function maps showing per zone or space the relative opportunity for the function based on the mean ranking of its indicators.
- The opportunity maps per function have been combined to opportunity maps for function combinations: 'green' multifunctional land use by OQS-related functions and 'red' multifunctional land use by MR-related functions (Figure 3B).

Prototyping demand-oriented farming systems

Farmers all over Europe have three basic options for the future:

1. *Mono-farmer.* Specialize on commodity production (by intensification and scaling up) and produce ever less scarcely or not rewarded non-commodity outputs.
2. *Multi-farmer.* Maintain, restore or innovate joint production of commodities and non-commodity outputs because commodities are increasingly less (free trade) and non-commodities are increasingly more (welfare-driven) rewarded.
3. *Green server.* Specialize on non-commodity outputs (rural services) because in combination (for example with water recharge, climate control and wetlands) they are more rewarding than commodity production (possible by-products, such as biomass).

In co-operation with teams from 15 European countries, the author has developed a method to design, test, improve and disseminate prototypes of integrated and ecological (arable) farming systems (Vereijken, 1999). This method can also be used to prototype multifunctional farming systems, aimed at demanded products and services in a region.

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