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GEOGRAPHICAL SHIFT IN LIVESTOCK PRODUCTION: CONSEQUENCES FOR LAND USE PLANNING AND POLICY MAKING

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ABSTRACT This paper describes the process of changing agricultural production and the consequences for natural resources and the environment. More specifically, the paper explores the geographical component of these developments, and the use of planning support tools to assist planning and decision making. Some conclusions and recommendations are presented with respect to land use planning and policy making.

Keywords: Agriculture, Livestock, Natural resources, Spatial planning support tools.

INTRODUCTION Globally, progress in the agricultural sector has resulted in a remarkable output growth in terms of volume, range and quality, and has allowed agricultural production to cope with population growth and rising demand. This also involved a shift towards the production and consumption of animal products. In 1965 the per capita meat consumption in the developed countries reached 62 kg per year, which steadily increased to 83 kg in 2005. Up to the 1980s, daily meat and milk consumption were only common to people in the developed countries, such as the Netherlands, and a small, wealthy class elsewhere. But the demand for animal products in the developing countries has been growing rapidly since, driven by rising incomes, growing populations and urbanization. The per capita consumption of meat in the developing world rose from 14 kg in 1980 to 30 kg in 2005.

The livestock sector is responding to this demand-led surge in livestock products through some drastic transformations, and undergoes structural changes along the whole supply chain: distribution, processing and production sites are all affected. This so-called “livestock revolution” is characterized by an increase of large retailers, a tendency towards vertical integration and coordination along the supply chain, and industrialization of the production process. The FAO concludes that we “[...] need to accept that the intensification and perhaps industrialization of livestock production is the inevitable long-term outcome of the structural change process that is ongoing for most of the sector” (Steinfeld et al., 2006: p. 283).

The transformations in livestock production have had some serious drawbacks. Globally, intensive livestock production and its structural changes are associated with a range of

environmental impacts. These impacts, such as the impacts on the environment, as well as public health risks, are increasingly criticized. Typically, there shows to be a strong geographic component in many of the involved issues, such as livestock distribution, access to markets, disease risk and environmental impacts. In general, livestock production tends to concentrate in peri-urban areas, especially in the developing countries, favoured by cheap input supplies (in particular feed) and market outlets for livestock products, which can be found in the vicinity of large cities. The geographical component is being explored in two case studies for the Netherlands and Southeast Asia in next sections.

LIVESTOCK PRODUCTION IN THE NETHERLANDS The agricultural cluster is a key area of the Dutch economy, accounting for 10% of the national income and employments in the Netherlands, and using about two-thirds (1.9 million hectares) of the total land (Ministry of LNV, 2005). The basic strengths are the mild climate and fertile level soils, good transportation links to the major population centers of northwest Europe, but also the efficient chain of supply, production, processing, distributing and marketing of agricultural products. Dutch agriculture has a high level of professional expertise, knowledge, research and training, making it an innovative and internationally competitive sector. Main weaknesses are the relative scarcity of labour and land, and resulting high prices of farmland, forcing the primary sector to either diversify or to increase the production per hectare, animal and person (Ministry of LNV, 2005). Diversification includes all kinds of side activities, such as recreational facilities, overnight accommodation, energy production, and farms shops. Intensification especially focuses at a further specialization of the primary production and an increase in scale and intensity. Gies et al. (2007) describe a recent rapid incline in very large livestock farms in the Netherlands. According to the IPPC (Integrated Pollution Prevention and Control) Directive of the European Union such farms are to be regarded as industrial activities (EU, 1996). But intensification also showed it drawbacks in the past decades, in particular with respect to the environmental impacts of livestock farming. Furthermore, outbreaks of various animal diseases, such as classical swine fever in 1997, have seriously disrupted the development of intensive livestock farming in recent years (Ministry of LNV, 2005).

These developments did trigger a research project at the Wageningen University with the aim to assess the suitability of areas for future intensive livestock farming, and developing a spatial planning support method using a combination of GIS and multi-criteria techniques. The method includes two basic phases: (1) identifying restricted areas, and (2) assessing the suitability of the remaining areas for different scenarios, using GIS and multi-criteria techniques. The method has been applied in the Netherlands at the local level for dairy farming, and at the regional level for pig farming (Carsjens & van der Knaap, 2002; Carsjens, 2009). The results illustrate the potential applicability of GIS as a supporting tool for scanning alternative future spatial scenarios, taking into account a variety of economical and environmental issues. However, this particular research did not include any specific issues related to the process of planning and decision making, and has primarily been set up from the perspective of exploring the future options. The results have not been used in actual planning practice, but showed to be relevant for the Food and Agricultural Organization (FAO) of the United Nations, in a research project that aims at developing a spatial planning support tool for the strategic spatial planning of

future livestock production in developing countries. This project will be described in the next section.

LIVESTOCK PRODUCTION IN SOUTHEAST ASIA Livestock production is developing very fast in the developing countries. The growth in production is mainly supported by industrial systems, achieved through growth in scale and a shift towards monogastric species production, such as pigs and poultry (FAO, 2003, Delgado et al. 2002). The livestock production also tends to concentrate in areas favoured by cheap input supplies (in particular feed) and by good market outlets for livestock products (Steinfeld et al., 2006). Such conditions are found in the vicinity of large cities. The proportion of livestock production met by industrial systems production is increasing rapidly, as those systems react faster to growing demand. The rapid growth in scale is general, and the new settlements directly compete with land-based, small-scale production, often supplanting them. In general, the industrialization of production leads to a disconnection between livestock activities and cropping activities. This happens on a functional level (large-scale livestock production shifting to industrial type management), and on a spatial level (industrial livestock activities moving towards peri-urban areas). These changes have serious impacts on the environment, animal and public health and the welfare of small holders (Gerber, 2006). Many smallholder farmers are being pushed out of the livestock sector because they are unable to compete with the new large-scale commercialized production. Rural people who know of no other life than farming, face falling into poverty if their farms no longer supports them and if they find no alternative sources of income (Gerber, 2006). While cheap animal protein favours poor consumers, the poverty and equity effects of industrial livestock production are, on balance, largely negative (de Haan et al., 2001). Furthermore, most developing countries, such as China, Thailand and Vietnam in Southeast Asia, are lacking appropriate and effective policy and regulations to address these problems.

The Livestock, Environment and Development (LEAD) Initiative, based at the Food and Agricultural Organization, started the Area Wide Integration (AWI) project that aims to reduce the environmental impacts of the rapidly growing livestock production sector, by integrating specialized livestock production with cropping activities on a regional scale (Gerber, 2006). The AWI project includes four main issues: (1) the assessment of current manure management strategies; (2) an economic and policy analysis of these strategies; (3) the spatial analysis and planning of livestock production, and (4) the design and evaluation of technical and policy options for a more sustainable future development of livestock production. The spatial planning of livestock production is important given the major influence of the geographical component that is included in many of the involved issues, such as livestock distribution, access to markets, disease risk and environmental considerations. The experiences with the spatial planning support methods in the Netherlands were used to develop a supporting method that was applied in the AWI case study areas in China and Thailand.

The method was specifically designed to support the scanning of alternative future spatial scenarios, but also to address specific context-related requirements: (a) it should be easy-to-master by decision makers, (b) able to include a variety of qualitative and quantitative criteria, (c) able to run on standard computer sets and (d) allow stakeholder participation. The basic approach, shown in Figure 1, involves a first step to characterize, describe and parameterize the decision rules, i.e. by using workshops to identify objectives, related

sets of criteria and their relative importance (weights) for different scenarios (Carsjens, 2009).

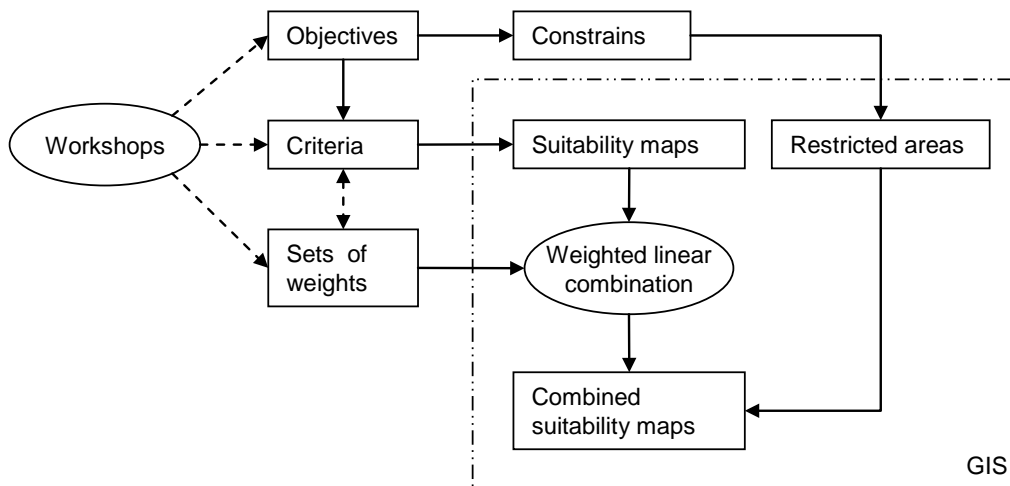


Figure 1. Basic approach of the planning support method (for explanation see text).

The second step concerns the assessment of the study area for each of these scenarios, i.e. by identifying restricted areas, and assessing of the suitability of the remaining locations. From technical perspective the method is transparent and simple, and starts with consulting the relevant policy makers and stakeholders in workshops. In these workshops the required types of output were discussed, as well as the use in planning and decision making of future livestock farming in the area. The policy- and decision-making context was an important focal point in the process of applying the method in the case study areas (Carsjens, 2009).

DISCUSSION The case studies show that a spatial planning support method can substantially improve decision making for livestock production. While mitigation of environmental pollution by animal waste can be tackled by improving waste management practices at farm level, the spatial planning of livestock production should reduce environmental impacts through a proper zoning and buffering, avoiding negative environmental impacts in sensitive areas. Although zoning is not new to livestock policies, a GIS method can support stakeholder participation and can make the decision making process more transparent. The use of GIS improves communication by providing detailed and clear maps to stakeholders and decision makers. However, although the output maps may look very detailed and accurate, quite often they are not. Local circumstances can very easily differ from the more generic maps. Decision makers should be aware of the fact that the maps are merely indicative, and should be used as such. Furthermore, the output will strongly depend on the availability and quality of the input data (see also Carsjens, 2009). Although the availability of data progressively increases in most countries, this remains a potential weakness of the method (in this respect the classic adage “garbage in, garbage out” is still true). Other uncertainties are inherent to the use of multiple criteria techniques (e.g. Triantaphyllou 2000), for example: Are all relevant criteria and stakeholders included? Some of these uncertainties may be tackled with a sensitivity analysis (Delgado & Sendra, 2004).

The case studies also illustrate that the effective implementation of planning support tools also requires regulations or official decisions by the government, explicitly stating that only areas indicated in the maps as environmentally acceptable are allowed for establishing new livestock farms. In doing so, the output maps will become an authoritative tool for enforcing a proper spatial allocation of new livestock farms. Complementary policy will also be needed to impose improved manure management on farms. Monitoring and enforcement of waste discharge standards and fines to non-compliance should be applied to improve waste management. The case studies show that awareness raising and capacity building among farmers and the government is a prerequisite to promote agricultural good practices and to elicit the necessity to comply with the regulations. The cases identified the expertise to drive action as a weak point for success in addressing environmental issues. Continuous efforts to develop and strengthen professional capacity are and will be a key factor for success in addressing livestock related environmental issues.

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