ERGEBNISSE VON TA-PROJEKTEN – NEUE TA-PROJEKTE

The *praxis* of reflexive design: lessons from a Dutch programme on sustainable livestock systems[1]

by John Grin, Francisca Felix, Bram Bos, Department of Political Science, University of Amsterdam, and Sierk Spoelstra, Animal Sciences Group of WageningenUR.

Deliberative policy analysis has been practiced often in cases that Beck, Giddens and others have designated "reflexive modernisation". Deliberation under such circumstances is to support a synthesising kind of judgment in which assumptions, knowledge claims, distinctions, roles and identities normally taken for granted must be critically scrutinised. Thus existing institutions tend to provide inadequate guidance for such "reflexive design".

In this paper, we shed some light on this challenge by telling and reviewing the story of *Programme 348: "Future Livestock Production Systems"* for the reflexive modernisation of Dutch agriculture, following major crises in the country's husbandry sector. Although an institutional arrangement had been created that was rather favourable to reflexive design, the programme encountered significant difficulties which we argue were rooted in the institutions that have emerged throughout agricultural modernization over the past century: established identities, knowledge stocks, economic rules and so on appear to fight back against the very projects that are designed to transform them. We draw on these findings in order to formulate some lessons for practices of reflexive design.

Over the last decade, there has been considerable attention to deliberative ("interactive" – Grin and Van de Graaf 1996 or "interpretive" – Hoppe and Grin 2000) policy analysis. The idea of deliberative policy analysis is to define both a problem and a solution in a process of reciprocal, argumentative exchange between the actors involved in the problem area: those who have a stake in it (the stakeholders: those who are co-owner of the problem; and those affected by potential solutions) and those who may be needed for implementing the solution (the co-producers of the solution). It has both a democratic, participatory and a pragmatic, efficacy rationale: it is to support policies that are designed to – legitimately and effectively – resolve the problems experienced by societal actors.

Not coincidentally, deliberative policy analysis has been practiced often in cases that in a very essential sense involve value dissent and major uncertainties: cases of "reflexive modernisation" (Beck 1997; Beck et al. 1997). Such issues concern dealing with the risks that have come with "simple modernization".[2] At least as much as these risks themselves, a crucial characteristic of risk society is the inability of existing institutions (that have developed through and tend to privilege simple modernization processes) to deal with them. These authors therefore argue for a "reflexive modernization", implying a need to redefine modes of knowledge production, fundamental societal distinctions such as femininity – masculinity or nature – technology and "rule altering politics". Thus, it requires more than the usual involvement of stakeholders and co-producers in design: additionally, such "discursive will formation [in recursive systems]" (Fox and Miller 1996, p. 91) requires that institutionally embedded assumptions, knowledge claims, distinctions, roles and identities which are normally taken for granted must now be critically scrutinised. In this article we wish to explore the repercussions of this additional requirement by discussing an example from one currently important area of reflexive modernisation: the transition to a different agriculture.

1 The modernisation of Dutch agriculture: orientations and institutions

Although remarkably little noted in discussions about knowledge society, agriculture in western societies is a primary example of a mature modernisation project. Governmentally stimulated modernisation led to a very rapid pace of rationalization (Bieleman 2000), decreasing the primary sector's share in the labour force from 19 % in 1947 to 5 % in 1990, while the amount

of capital goods (machines; cattle; buildings) increased by 80 % and the labour force decreased by 60 %. Success was basically due to a strong consensus on this modernisation, and a solid institutional embedment. The so-called "OVO (a Dutch acronym for research, information and education)-triad" generated knowledge and technology through innovative agricultural research and disseminated it to agricultural practice through education at agricultural schools as well as through information services to farmers. Policy making was in the hands of an "iron triangle" of the agricultural ministry, agricultural branche organizations and agricultural specialists in parliament (Bekke and de Vries 1994; Wisserhof 2000).

This tightly woven system was, for a long time, widely appreciated for its many successes. Social support started to diminish in the late 1970s, however, when concerns were raised on overproduction, animal welfare and environmental emissions, especially from manure. The classical institutional arrangements were opened up under the pressure of outside actors (non-governmental actors, citizens; their echoes in parliament) and successful attempts by the Ministry of Spatial Planning, Housing and the Environment to conquer a place at the table of agricultural decision making. A decade later, new institutional arrangements started to arise, stimulated by these earlier developments as well as by a general tendency towards the "retreat of government". One of these arrangements was "Programme 348: *Future Livestock Production Systems*" on which this article focuses.

2 Early proceedings of Programme 348: "Future Livestock Production Systems"

Programme 348 was launched as one of the policy responses (in addition to more "cold" measures) to the classical swine fever (CSF) epidemic that swept the country between February and September 1997 and which made the Ministry of Agriculture, Nature Management and Fisheries conclude[3] that existing modes of animal keeping were no longer satisfactory, given their consequences for animal welfare, emissions and use of resources. The programme was commissioned by the Ministry to DLO, a consortium of agricultural research institutes. DLO originally was the acronym of

Direction of Agricultural Research (later Service for Agricultural Research), reflecting its nature as a governmental branch. Privatisation of DLO during the late 1990s[4] had required a switch from lump-sum funding to a more demand and market oriented, programme-based research strategy. In important respects, the organization was still in the process of making that transition when P348 took off.

While the Ministry granted P348 to DLO, it was made very clear that – however complicated in this setting – it was intended to be *an intensive, trans-disciplinary co-operation* between the several DLO-institutes and several other institutes, representing different animal science disciplines as well as for example agro-economics. In addition, there was the substantive requirement to design "something completely different", with a knowledge intensive character, meeting changing societal demands and appropriate for agricultural practice.

In a programme proposal, programme leadership argued that it would be necessary to identify and integrate the views of consumers, citizens and social organizations on issues such as animal welfare, environmental emissions and food security with each other as well as with the views of farmers and market parties concerning agricultural and economic aspects. Thus the choice was made for *a deliberative method*, involving this variety of actors in dealing with this variety of aspects. Recognising that such radically innovative, deliberative and transdisciplinary research was not standard routine within the DLO organization, several non-standard rules were laid down in the programme proposal. These rules included the choice for a deliberative approach, and ensured firm commitment to such things as interdisciplinarily composed teams (in practice: comprising several institutes), system innovation as an objective, and the placement of programme interest above institutes' interests. Also, the programme leadership realised that this was a programme for far-going, non-standard innovation. Therefore, a choice was made for the method developed by the Dutch Agency for Sustainable Technology Development (STD; cf. Weaver et al. 2000; Green and Vergragt 2001; Henning and Krings 1998). The programme team followed a post-graduate thesis

both for the method for deliberative design (Grin et al. 1997) and the STD method.

Central to the method is the collective, deliberative development and realization of future visions to guide "processes of technological, cultural and structural change"; and backcasting to (also deliberatively) design projects for actually realizing them. Thus the programme started with vision development and backcasting. In a second stage, different teams worked to realize a variety of projects. At this stage, some new rules were formulated that were to ensure commitment to programme objectives in a situation in which the focus of activities shifted from the programme to the project level. These rules included the prescription that project teams would include at least a "leading stakeholder", a DLO project leader and a process adviser, consist of and transcend several DLO institutes; contribute to the joint website, thus facilitating project monitoring and mutual exchange, and demonstrate that they contributed to overall programme objectives. Budgets were allocated for periods of six months, on the basis of a list of agreed objectives and activities.

In spite of these careful provisions, the programme had to deal with major difficulties. Although project teams managed to realize programme objectives to a remarkably significant extent it is interesting to focus here on these difficulties. The reason is that most of them can be traced back to factors that are deeply embedded in existing institutions. That is, these factors basically reflect how existing institutions "fight back" against attempts to transform them into projects for reflexive modernisation. As such, these difficulties as well as the ways in which they were dealt with by these brave pioneers of the reflexive modernisation of agriculture, provide interesting lessons on the praxis of reflexive design.

For a more precise empirical underpinning of these lessons (including the details of the P348 institutional arrangements and the proceedings of individual projects) we refer to Grin et al. (2004). Here, we will only briefly summarize these projects' objectives, the involved stakeholders, and main results.

Project 1: "Zoö-centric design"

The objective of this project was to design a production system that – contrary to normal practice – departs from a simple consideration of animal welfare aspects and to subsequently test and adapt the design from the perspective of other criteria, including ecological concerns, economics and food safety. Leading stakeholder was the largest national animal protection association (*Dierenbescherming*), who indeed engaged enthusiastically and very actively in the project. Other stakeholders were much less active, due to, first, this leading role of the Dierenbescherming, second, a certain discomfort with their unusual role, and, third, alienation felt by some vis-à-vis the visions developed.

Much attention was paid to specific arrangements to stimulate trans-disciplinary co-operation: interactions were planned at all levels (individual, projects, groups), it was agreed that research work would be interdisciplinary in nature and it was symbolically decided not to make *a priori* budget divisions. Yet, reality was harder than anticipated. While difficulties were handled adequately by the process adviser experienced in group dynamics, transaction costs – that of course were only a derivative of the deeper causes mentioned – were eventually considered to be so high that the project leadership decided to get much of the work done "back-office". Thus the research work became strongly separated along traditional disciplinary divisions, a point reinforced by the fact that knowledge workers appeared to prefer analytical work rather to design.

The results were varied. In terms of deliberation, it must be noted that there was little balance between the various interests due to the strong involvement of one stakeholder, which both created a strong drive towards that stakeholder's favourite aspect and had a negative impact on the engagement of other stakeholders. In terms of reflexivity, a fully fledged reflexive design did not result, as a consequence of the ways in which the just mentioned role of the leading stakeholder. The difficulties encountered in trans-disciplinary co-operation also reinforced each other into a movement towards a more mono-disciplinary, analytical undertaking. On the other hand, a genuine basis for reflexive design was laid through the elaboration of knowledge needs for tuning breeding to animal

welfare and the exploration of the relations between animal welfare aspects and other design criteria.

Project 2: Sustainable Poultry Meat Production

The Sustainable Poultry Meat Production Project was intended to help resolve a variety of problems: animal welfare concerns, the sector's problematic image amongst consumers, food safety in relation with bacterial contaminations, emissions as well as dissatisfaction with the meat structure and taste of intensively produced poultry. The idea was to do so through designing a long term vision for integrating traditional and biological chains, as well as specific projects to work toward that vision.

The project started with interviews with stakeholders and, especially, co-producers, so as to make an inventory of their visions and their ideas on how to realize them. Of some 35 invited stakeholders, nearly half showed up at a workshop. They expressed interest for continued involvement; and indeed most of them continued to play a role. The problematic side of the coin was that, while a significant number of farmers was involved, banks, retailers and – especially – societal organizations were underrepresented. A second, and tougher, obstacle for truly reflexive design was implied by the initial lack of enthusiasm amongst participants in drafting long term visions. This was due to a limited sense of urgency, amongst farmers and other inside players, under-representation of problem-owning stakeholders and the fact that farmers felt that existing power relations hardly enabled them freedom of choice.

In spite of these initial difficulties, the project team eventually managed to produce long term visions, involving some interesting transdisciplinary syntheses. The main limitation was that, after all the discussions on short term problems, time did not permit to test extensively to what extent the visions indeed made sense in the eyes of stakeholders from different backgrounds.

Project 3: Family housing for organic pig raising

In order to deal with animal welfare and health concerns, to fit farms better into the landscape and to reduce emissions due to manure and transportation, this project aimed to design biological animal housing facilities and a so-called "short" chain (many functions on-farm) for biological pig keeping. Other objectives were to collect, develop and integrate knowledge, and to bring about interactions between a variety of stakeholders. The project team comprised several co-producers, including Nutreco, who initially was the leading stakeholder.

The project started with a workshop where farmers, knowledge workers and Nutreco constructively discussed opportunities for the project to contribute to a sustainable pig farming chain. Much less attention than in the poultry project was devoted to short term problems. After this first workshop, Nutreco stopped being the *primus inter pares* among the involved actors, since others appeared less interested in answering the specific research question Nutreco had been interested in experimental data rather than desk studies. Subsequently, the project focused on the design of long term visions. Several workshops and creativity sessions were held, and in addition farmers were consulted during visits to their homes on the ideas drafted by the knowledge workers.

The project team succeeded in creating significant commitment amongst farmers for actively contributing to that effort, and these farmers appeared to have clear ideas in the long term. Behind both the relative neglect of short term problems and the interest in long term visions was the *a priori* interest these stakeholders appeared to have in long term change given the societal pressure the pig sector had experienced since the 1980s. Another factor was that the designs were tailor-made for the specific regions of participating stakeholders. Trans-disciplinary co-operation was significantly promoted by the so-called innovative design method, which combines methodical design with initiating system innovation. It enabled the team to identify and deal with new knowledge needs, new ways of measuring emissions and new markets, as well as with the need to develop paradigmatically new knowledge on animal health. In these respects it is fair to say that the project contributed to reflexive design. However, scientific interest among participants in the project and division of the project in to two separate parts (pig housing systems and pig chains) limited the degree to which an actual design resulted.

Project 4: Hercules: innovative pig housing concepts

The Hercules project was intended to develop and test a new concept for pig housing and the production of organic fertilizers. The project aspired to simultaneously solve a range of problems with pig farming (energy use, emissions of ammonia and odorous gases to the environment, the costs of getting rid of the manure, and animal welfare concerns), by seeking a narrow integration of functions within the housing system.

From its start in 1998 as part of the so-called Environment, Economy and Technology (EET) programme, the project was a combined effort of six firms, ranging from manufacturers of pig house components to a chemical multinational, and three different agricultural research institutes. Two years later (in 2000), the project acquired additional funding from P348, which introduced the requirement to also involve farmers and adopt a deliberative method.

The project has been fairly successful in creating commitment from the participating co-producers, especially since market introduction was strongly emphasized during its final stages. Yet, the degree of reflexivity was significantly reduced by the decision to drop the manure belts and, as a result, the extensive use of straw. The reasons for this decision included the fact that the integral system was alien to the market, farmers were used to construct pig houses on a component-by-component basis, obtaining components from specialized firms. The belts appeared as a major cost-driver – partly because the cost-effectiveness of the system was not considered integrally – implying a cost increase of €0.05 per kilogram produced meat, which was considered prohibitively high, especially since, third, it appeared hard to sell the envisaged fertilizer specialities at a profit, which were new and demanded some changes in crop breeding practices. Finally, there were doubts concerning the scientific evidence on straw's benefits for animal welfare combined with concerns about its implications for labour conditions.

3 Lessons on reflexive design

Perhaps the single most important message from our case study is that creating an appropriate institutional arrangement is a necessary but *not* sufficient condition for reflexive design, and that, in reflexive design, the art of dealing with those circumstances that cannot be adequately pre-empted by such rules is crucial.

That it is a necessary condition for success became clear in e.g. the zoö-centric design project. It was these programme requirements which in all projects led to an unusual degree of efforts to *involve stakeholders* and to actively use their insights and desires/visions in the design process. These efforts have positively affected the proceedings and the outcomes of the programme as a reflexive design effort. When competition and cultural differences between institutes appeared to threaten *inter-disciplinarity*, the project leadership appeared to programme arrangements in order to legitimise practical measures to overcome these difficulties. Also, as regards the achievement of *reflexivity*, researchers deliberately sought knowledge of different types, realizing that current knowledge stocks had co-evolved with existing practices of intensive husbandry. To the extent that such knowledge did not appear sufficiently available – as was the case, e.g., for understanding the implications for future breeding programmes which truly take animal welfare as a point of departure for design – such knowledge needs were articulated for future research.

Yet stakeholder involvement, trans-disciplinarity and reflexivity have been continuously challenged, with mixed impacts on the proceedings and results of the programme. In the remainder of this section we will categorize these difficulties and provide a deeper understanding so as to eventually be able to provide some suggestions on how they might be dealt with better.

"Challenging factors" and their institutional roots

The difficulties encountered can be categorized as a variety of, often mutually reinforcing, factors. First, both during the initial stage of P348 and in the projects on zoö-centric design and poultry chains, among both stakeholders and researchers there was discomfort with the roles

they were supposed to play: farmers were supposed to act, and be accepted as, co-producers of knowledge and technology, both to benefit from their creativity and inventiveness and to base research and development on a renewed understanding of agricultural practice. These "new" roles were at odds with the identities these actors had assumed throughout the era of knowledge driven agricultural modernization, metaphorically emphasised and reified in the OVO triad. Significant attention to human relations was needed – and helped – to overcome such difficulties.

Second, and closely related, in all projects many knowledge workers exhibited a strong inclination towards their home disciplines rather than the trans-disciplinary, design-oriented attitude necessary for reflexive design. They anticipated that they would be assessed – in a situation of resource competition and organizational shrinking – in terms of articles published in disciplinarily and analytically (rather than design) oriented journals and in terms of their contribution to the budget of the home group. The fact that some early products of the programme met with ambiguous reception both fed these anticipations in later stages and indicated that the fear is not entirely implausible that they might be punished rather than rewarded for their innovative efforts. This cultural characteristic of the DLO organization combined with the fact that research and development had, until recently, been shaped by a myth of an ongoing modernization process, shared by knowledge workers, policy makers and primary producers alike (Van der Ploeg, 1999, chapter 6).

Third, the disciplinary differentiations between institutes, in spite of the rules set in P348, continued to play a role in the projects. In the zoö-centric design project, the eventual decision to reduce transaction costs through back-office work re-introduced these differentiations; in the poultry-project individual subprojects were defined along disciplinary lines.

Fourth, we have seen how stakeholders and co-producers anticipated constraints they would face whenever the project outcome "landed" in the real world, shaped by the existing regime of modernized agriculture. In the Poultry project, farmers felt limited by EC legislation, tailored to intensive rather than sustainable production and by their dependence on market parties in the highly specialized, differentiated chain that had emerged throughout post-war modernization. The latter also played a crucial role in the Hercules project, where a € 0.05 increase in the costs per kilogram of meat was considered virtually prohibitive. It is important to note here that this does not reflect a "hard" law of economics: many consumers now – other than in the years following World War II – appear prepared to pay for specialties, prepared meals and products for "new" food habits (Van Otterloo 2000). The problem with the modest cost increase must rather be attributed to the increased dependency of farmers especially on downstream players in the chain: the "logic" of the market – often reified in, for instance, contract relations between primary producers and later players – that cost increases of primary products are treated multiplicatively rather than additively.

Fifth, we have seen several instances of how the still controversial nature of the issue area interfered with P348's proceedings. In the poultry project, farmers feared that any preparedness on their side for a design that would be more far going than existing policies might lead to stricter policy norms. Similarly, the emphasis of the *Dierenbescherming* (Animal Protection Association) in the zoö-centric design project on providing a scientific basis for animal welfare aspects of animal keeping can partly be explained by that organization's keen interest in using science to "authoritatively" underpin its position in societal and political debates on the issue. A final example is the researcher in the poultry project who feared to loose his credibility within "the sector" through engaging in the design of a sustainable system – notably not in his role as provider of sound knowledge, but as a "reflexive designer".

4 Conclusions: The challenge of reflexive design

While the latter factor may be seen largely as a matter of political opportunity, the first four "challenging factors" have deeper roots. They are typical expressions of the existing regime which privileges existing practices. It is easy to recognise here the sort of mechanisms to which Frank Fischer (2003) has recently drawn attention. Drawing on post-modern writers like

Foucault (1984), Lefebvre (1991) and Bourdieu (1997), who have written about the "spaces" (institutional arrangements) for practices in which identities, social relations and rules are being contested and transformed, Fischer argues that "traces of previous interactions are so much ingrained [in such spaces] [that] no newly created space can be entirely cleared of those assumptions and meanings. Nor can spaces be emptied from expectations and experiences, or traces of social relations in other spaces". This leads Fischer both to proposing more research on the question how such spaces are "occupied, negotiated, subverted or mediated" in processes of "intersubjective dynamics"; and to asking what may help, meanwhile, to deal better with these dynamics through adequate facilitation of reflexive projects. We believe that the preceding analysis contributes some insights to the former; and that we may add some insights to Fischer's on the latter, not only in the form of some lessons from P348 on facilitation, but also concerning *the conditions under which* such facilitation may achieve some success.

Etienne Wenger's (1998) work appears to offer a fruitful perspective for the latter. He discusses learning as a process of transforming meanings and identities in "communities of practice", and conceptualises learning as anchored in different "modes of belonging". First, *engagement* in a "community of practice" offers opportunities for negotiation of meaning and the design and implementation of strategies. Engagement is necessarily bounded in time and space. These boundaries may be overcome through a second mode of belonging, *imagination*, the transcendence of time and space through creating new images of the world and ourselves. It is a way to recast the present. Finally, *alignment* is the bridging of time and space through connecting engagement in a community of practice to enterprises elsewhere. Alignment may be helpful because it brings a particular engagement in line with the practices it seeks to influence.

More precisely, in Wenger's account, engagement in the community of practice provides the by and large appropriate context for action, which remains close to standard routines. Learning largely results from the tension between the limits of that context on the one hand, and the

transcendental opportunities implied by imagination and alignment: wisdom results from the periphery of communities of practice. In P348, however, the engagement in which the project teams are supposed to be involved in are non-standard, even reflexive, in nature. Thus, while the institutional arrangement created for the project may favour such reflexivity, the practices they seek to align with as well as the actors engaged in the project may tend to rely more on existing practices and thus to challenge reflexivity.

Summarising our findings (Grin et al., 2004), engagement in reflexive design was served well by the institutional arrangement created around P348 and also, in certain circumstances, promoted by methods that stressed trans-disciplinary cooperation as well as imagination through the construction of visions. It was hampered by the fact that knowledge workers as well as other participants brought in established identities and tended to align with existing practices. Such alignment, as we have seen, could be accommodated through appropriate methods; it could, however, not be pre-empted, especially because it was brought in by participants who know the real world all too well. Similarly, alignment through anticipations of power relations (the poultry project) and institutional differentiations (Hercules) is hard to pre-empt. Imagination may help to make these issues discursive, but the degree of success seems to be co-determined by the degree to which this vision can be constructively related to the problems of the real world (cp. poultry vs. Hercules), in which participants know the project – and they themselves – will eventually land.

Notes

1) For a more elaborate discussion, see Grin et al. (2004).
2) Simple modernization is driven by scientific and technological progress, which are supposed to yield social progress. Reflexive modernization is driven by the desire to use scientific knowledge and rational understanding so as to adequately deal with the side effects created by such modernizations processes.
3) Ministry of Agriculture, Nature Management and Fisheries, *Kracht en kwailiteit* (policy memorandum)

4) Yet, the Ministry still is its most important client, funding about 70 % of the research portfolio. Cf. Dorst, A.; Schoonakker, D.; Velner, M., 1999: Het innoverend vermogen van P348 in relatie tot de staande DLO organisatie. Rotterdam: Erasmus Univeristy, Faculty of Management. Research Report.

References

Beck, U., 1997: The Reinvention of Politics. Rethinking Modernity in the Global Social Order. Cambridge: Polity Press

Beck, U.; Giddens, A.; Lash, S., 1997: Reflexive modernization. Cambridge: Polity Press

Bekke, H.; Vries, J. de, 1994: De salto mortale van het Ministerie van Landbouw, Natuurbeheer en Visserij. Alphen a/d Rijn: Samson H.D. Tjeenk Willink

Bieleman, J., 2000: Landbouw, part I. In: Techniek in Nederland in de twintigste eeuw: Landbouw & Voeding. Zutphen: Walburg Pers., p. 11-233

Fischer, F., 2003: Discursive spaces for participatory governance: theoretical notes on design and facilitation. Submitted to Governance

Foucault, M., 1984: Of other spaces. Diacritics – A Review of Contemporary Criticism, vol. 16, no. 1m, p. 22-27

Fox, C.J.; Miller, H.T., 1996: Postmodern public administration. Toward discourse, London: SAGE

Green, K.; Vergragt, Ph.J., 2001: The SusHouse Methodology. Design Orienting Scenarios for Sustainable Solutions. Journal of Design Research

Grin, J.; Felix, F.; Bos, B.; Spoelstra, S., 2004: Practices for reflexive design: lessons from a Dutch project on sustainable agriculture. Int. J. Foresight and Innovation Policies, vol. 1, nos. 1-2, p. 126-148

Grin, J.; Graaf, H. van de, 1996: Technology Assessment as learning. Science, Technology and Human Values, vol. 20, no. 1, p. 72-99

Grin, J.; Graaf, H. van de; Hoppe, R., 1997: Technology assessment through interaction: a guide. Den Haag: SDU (Working document Rathenau Instituut; W57)

Hennen, L.; Krings, B.-J., 1998: Forschungs- und Technologiepolitik für eine nachhaltige Entwicklung. Berlin: Büro für Technikfolgen-Abschätzung beim Deutschen Bundestag (TAB)

Hoppe, R.; Grin, J., 2000: Traffic goes through the TA machine: A culturalist comparison. In: Vig, N.J.; Paschen, H. (eds.): Parliaments and Technology: the Development of Technology Assessment in Europe. New York: SUNY Press, chapter 10, p. 273-324

Otterloo, A.H. Van, 2000: Voeding. In: Weaver, P.; Jansen, L.; Grootveld, G. van; Spiegel, E. van; Vergragt, P.: Techniek in Nederland in de twintigste eeuw: Landbouw & Voeding. Zutphen: Walburg Pers. Sustainable technology development. Sheffield: Greenleaf Publishing, part II, p. 235-376

Ploeg, J.D. Van der, 1999: De virtuele boer. Assen: Van Gorcum

Wenger, E., 1998: Communities of Practice. Learning, Meaning, and Identity. Cambridge: Cambridge University Press

Wisserhof, J., 2000: Agricultural Policy Making in the Netherlands: beyond Corporatist Policy Arrangements? In: Tatenhove, J. van; Arts, B.; Leroy, P. (eds.): Political Modernisation and the Environment. The Renewal of Environmental Policy Arrangements. Dordrecht etc.: Kluwer Academic Publishers, p. 175-198

Contact

Department of Political Science
University of Amsterdam
Oudezijds Achterburgwal 237
NL-1012 DL Amsterdam, The Netherlands

John Grin
E-Mail: j.grin@uva.nl

Francisca Felix
E-Mail: f.felix@uva.nl

Bram Bos
E-Mail: a.p.bos@uva.nl;

Sierk Spoelstra
Animal Sciences Group of WageningenUR.
Edelhertweg 15, NL-8200 AB Lelystad NL
The Netherlands
E-Mail: sierk.spoelstra@wur.nl

«