



HAL
open science

Trust in governance and the acceptance of genetically modified food in the Netherlands

Jan Gutteling, Lucien Hanssen, Neil van Der Veer, Erwin Seydel

► **To cite this version:**

Jan Gutteling, Lucien Hanssen, Neil van Der Veer, Erwin Seydel. Trust in governance and the acceptance of genetically modified food in the Netherlands. *Public Understanding of Science*, 2006, 15 (1), pp.103-112. 10.1177/0963662506057479 . hal-00571079

HAL Id: hal-00571079

<https://hal.science/hal-00571079>

Submitted on 1 Mar 2011

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Trust in governance and the acceptance of genetically modified food in the Netherlands

Jan Gutteling, Lucien Hanssen, Neil van der Veer and Erwin Seydel

This paper assumes that trust is a major issue in the interaction between government, citizens and societal organizations. The central question in this paper relates to the specific determinants of public trust. A survey study is reported ($n = 1019$) which focuses on the role of trust in the acceptance of genetically modified (GM) food. Our expectation was that three types of trust: “trust in governance,” “trust in government,” and “trust in NGOs” would be important predictors of the public acceptance of GM food. The data were collected in the summer of 2001 in the context of the formal Dutch public debate on GM food. The results indicate that 42 percent of the respondents do not trust developments in GM food. Only a third of the sample does trust the government with respect to GM food developments. Approximately 50 percent of the respondents express a high level of trust in non-governmental organizations for this issue. The data further show that trust in governance seems to be an important constraint for the further development of GM food in the Netherlands. With higher levels of trust in governance people have a more positive attitude toward GM food, are more likely to accept it, and are more optimistic about technological developments.

1. Introduction

In September 2000, the Dutch government published the so-called Integral Document on Biotechnology. In this document, the government explicitly recognized the importance of communication with the public and other stakeholders with respect to future developments in biotechnology under the conditions of the precautionary principle, openness of information and decision-making, and an optimal transparency in communication.

Dutch public opinion with respect to genetically modified (GM) applications in food had become increasingly critical in the years before the public debate (Hanssen et al., 2001). The public clearly had an interest in GM food and found having information about biotechnology important (Jong et al., 2000). It was quite clear that the public claimed a role in decision-making processes with respect to risks associated with biotechnology. However, at the same time the public acknowledged its lack of adequate information to play a serious role in decision-making about GM food (see, e.g. Heijs and Midden, 1996; Midden et al., 1998; Gutteling et al., 2001a, 2001b).

As part of the communication processes outlined in the government document, a state “Committee on Biotechnology and Food” organized a debate with the Dutch general public. A public debate is a specific operationalization of the plea of the European Commission for “European Governance,” which aims to strengthen the culture of dialogue and consultation in government decision-making processes (European Commission, 2001). The results of the Dutch public debate on GM food were published in early 2002 (Committee on Biotechnology and Food, 2002).

Government formulated as a goal of the Committee on Biotechnology and Food to “identify the conditions under which food biotechnology is acceptable for society.” In the course of the formal debate with the general public—societal organizations were excluded from the debate—the role of the government in the future development of GM food raised a number of questions. Is the control of regulations well organized? Who is responsible for regulations? Can the information provided by government be trusted? The prominent issue in the debate appeared to be the position of the government as “provider of certainty to the public” (Hanssen et al., 2001).

The question is how should we interpret the public wish for participation and more information in the context of the public’s acceptance of GM food? On the basis of the self-reported lack of adequate information, one might assume that providing information, and thus increasing the public’s knowledge about GM foods, might solve the problem (see e.g., Gaskell et al., 2004). However, research has indicated that this is not a solution; increasing the knowledge level of the public with an intensified stream of information does not lead to a higher level of public acceptance (Midden et al., 1998; Hamstra and Feenstra, 1993; Durant, Bauer and Gaskell, 1998).

American studies do indicate that knowledge is related to the acceptance of modern technologies, but that trust in the actors that are developing and regulating these technologies plays a more important role in the public acceptance (Priest, 2001; Earle and Cvetkovich, 1995). For the European public, a similar conclusion seems appropriate (Frewer, Scholderer and Bredahl, 2003; Gaskell et al., 2001). Trust has been defined as an expectation toward another person or an organization, that this person or organization will act in line with one’s own interests. Trust allows a person to take decisions and to act in the absence of complete knowledge of the consequences. The missing information is replaced by trust in order to tolerate the perceived uncertainty of the situation (Luhmann, 1988; Earle and Cvetkovich, 1995; Frewer et al., 2003). Members of the European public that express trust in actors relevant to the food production chain, are more inclined to accept the introduction of GM food (Gaskell et al., 2001). Gaskell et al. attribute the important role of trust to the increasingly complex world in which people just cannot be knowledgeable on all societal issues. For that reason, part of the public may want to rely on organizations, such as governments, private companies or societal organizations to take care of business for them (Gaskell et al., 2001).

An important constraint for this process is that these organizations communicate with the general public about issues like GM food in order to gain the level of trust necessary to adequately play the attributed role in the decision-making process. According to Fung and Wright (2001) the quality of the democratic decision-making process depends on the quality of the process of argumentation and persuasion that precedes decision-making. The central process here is the development of mutual trust by active participation and sharing responsibility (Hajer, 2002). In that context, the lack of trust in stakeholders responsible for risk prevention can also be interpreted as a way to stimulate organizations to a higher activity level: “to bind the trusted into a relationship and attitude of responsibility” (Szerzynski, 1999: 239). In the same sense, the seemingly straightforward question for more

information is probably more than to satisfy an information need. Many people probing organizations for additional information want to stimulate the organization to take additional action (Irwin, Dale and Smith, 1996). The call for additional information and participation that is observed in recent public opinion surveys about modern biotechnology may have similar intentions.

Summarizing, trust is crucial for the public acceptance of GM food. In this paper, we study the role of trust in the acceptance of GM food, as well as the attitude and the public's behavior toward GM food in the Dutch context. In particular, we focus on the trust the general public expresses in two stakeholders, namely government and non-governmental organizations (NGOs). Compared to the surrounding countries, the Netherlands' NGOs have a relatively large number of members and sponsors (see Gutteling, 2002). The presence and contribution of NGOs in the GM debate has been quite substantial, but they were excluded from the formal debate on GM food. In this study, we analyze the levels of trust expressed by the Dutch public, and we look at the role of trust in these stakeholders in relation to the public acceptance of GM food.

2. Method

Procedure

In June 2001, before the formal public debate started, we assessed public perceptions and attitudes with respect to GM food and trust in relevant actors by means of telephone interviews with a sample of the Dutch population of 15 years and older. Telephone numbers were acquired by taking a randomized sample from the database of private telephone users of KPN Telecom (sample size was 1473). This database has a national coverage and is run by the largest telecom firm in the country. The net response of completed and usable interviews was 1019 (69.2 percent). A non-response analysis was performed.

Questionnaire

Trust

The respondents were confronted with a series of statements relating to trust in actors relevant to the food production chain and decision-making processes in that chain (all items were measured on a five-point scale; disagree/agree). Factor analysis revealed three clusters of intercorrelated items, explaining in total 53 percent of the variance. Three of the items aggregate to one underlying construct: "trust in governance." The items are "trust that government will involve the public in its decision making," "trust that the private sector seriously takes consumer interests into consideration" and "the expectation of how GM food will influence the quality of life."

The factor analysis shows that three other items aggregate to one concept: "trust in government." The items are "I trust that the government will take the interest of the public into account in the decision making process about GM food," "the control on GM food is in good hands with the government" and "the government is competent with respect to GM food."

Finally, the factor analysis revealed a third concept: "trust in NGOs." The items are "societal organizations are competent with respect to GM food," "I'm confident that in the process of decision making on GM food with the government, societal organizations will act in the interest of the public" and "the societal organizations must have a major influence on GM food decision making."

Perception and behavior with respect to GM food

We measured the public perception of GM food and technology in general in three separate ways. The “attitude toward GM food” was measured with five statements that were previously used by Jong et al. (2000), with a Cronbach’s α of .69. The “acceptance of GM food” was measured using items from recent Eurobarometer studies (e.g. 52.1; see e.g., Durant et al., 1998), relating to perceived risk, perceived usefulness, moral acceptance and the stimulation of GM food or not. According to Gaskell et al. (2001) these items are the most important predictors of support for the introduction of GM food (the four items have a Cronbach’s α of .76). Finally, we asked respondents to indicate how they assessed the influence of six technologies on the quality of life, as was also done in the Eurobarometer 52.1 (Durant et al., 1998). The six technologies are solar energy, telecommunication, GM food, the Internet, nuclear energy and biotechnology. The construct of “technological optimism” comprises five of these six technologies (Cronbach’s $\alpha = .61$, solar energy was left out).

The respondents were asked three questions relating to behavioral aspects, namely whether one has participated in a protest action against GM food by signing one’s signature, whether one has participated in a demonstration against GM food, or whether one has sought actively for information about GM food. All inter-item correlations between these items were significant ($p < .001$, with the exception of “seeking information” and “demonstrating”). We aggregated the behavioral items to the construct of “direct behavior.” On the basis of the aggregated scale, the respondents could be assigned to one of two groups: a group of 791 respondents (83.9 percent) which can be considered as “passive” (said no to all behavioral questions), and a group of 152 respondents (16.1 percent) we named as “relatively active” (they said yes to at least one of the questions). In addition, we asked respondents whether they were a member of one of eight societal organizations, which are relevant to the debate on GM food. The level of “indirect behavior” is established simply by counting the number of memberships.

Other questions

We asked respondents to judge the information transfer process regarding GM food, both in general terms and with respect to several organizations in particular (measured on five-point scales; “insufficient/sufficient”). The “information sufficiency” is formed with seven items (Cronbach’s $\alpha = .65$). The “familiarity” of GM food is measured with one item with a five-point scale (very unfamiliar/very familiar). The “knowledge” of GM food is assessed with five items (answers either correct or incorrect) according to a set of questions used previously by Durant et al. (1998). These items did not form an internally consistent scale; nevertheless, for all respondents the number of correct answers was counted. Finally, we asked respondents for the “personal relevance” of GM food (one item, six-point scale; very unimportant/very important), for the level of “personal concern” (one item, six-point scale; very worried/not worried at all), and a series of questions relating to demographics (age, educational level, gender, family income, and religiosity).

3. Results

Characteristics of respondents and non-respondents

When we compare the characteristics of our respondents with population data (CBS, 2001), we observe that relatively more women participated in the study (54 percent, compared to 50.2 percent in the population; $\chi^2 = 5.8$, $df = 1$, $p < .05$). Furthermore, people between

36 and 45 years of age are overrepresented (with 29 percent), as well as people with the highest levels of formal education. The analysis of the non-response group indicates this group comprises relatively many people with lower levels of formal education (40 percent compared to 27 percent in the group of respondents; $\chi^2 = 17.7$, $df = 2$, $p < .01$). For the other demographics, the distribution of the respondents and non-respondents is similar. The motivation for not participating in the study was not related systematically to the issue of GM food (many non-respondents indicated “lack of time” or “not interested to participate,” respectively 45 percent and 37 percent). The conclusion is that the group of respondents, in spite of the rather high response rate, is not entirely representative of the Dutch population. This will have to be taken into account when interpreting our data and generalizing our findings.

Of all respondents, approximately 39 percent said they knew about GM food. However, only 12 percent had actively been seeking information about GM food, and 46 percent remembered having read or heard about GM food in newspapers, on television or the radio. Of all respondents, 969 completed the simple five-item GM knowledge quiz. Of those respondents, 33 percent had a low score (maximum two answers correct), 59 percent had an average score (three or four answers correct) and 8 percent had all answers correct. When asked about the personal relevance of GM food, 13 percent answered that GM food was not important personally, whereas 42 percent said it was important or very important to them. Seventeen percent indicated they were not worried about GM food; however, 35 percent were worried or very worried.

Levels of trust in governance, trust in government and trust in NGOs

Approximately 73 percent of our respondents think that government should not be the only actor to take decisions about the future of GM food. A group of respondents of similar size does trust the government to consider the public interests, and 68 percent are of the opinion that NGOs will act in the public interest. In the public’s eye, NGOs do better with respect to expertise than the government (55 percent versus 31 percent for NGOs and government, respectively). Almost 38 percent of the sample is not convinced that control of GM food is in reliable hands with the government. On the other hand, 45 percent is convinced that it is. Approximately 78 percent of the sample feels that NGOs should have an important role in the decision-making process on GM food, and more than 90 percent of the respondents would be in favor of an increased level of cooperation between NGOs and the government. The private sector is not judged very positively. Almost 50 percent of the sample is convinced that companies do not take the public interests into account. Table 1 gives the distribution of the respondents over the three constructs of trust.

Table 1. Trust in governance, trust in government and trust in NGOs

| | Relatively low | | Ambivalent | | Relatively high | | <i>n</i> |
|---------------------|----------------|--------|------------|--------|-----------------|--------|----------|
| | <i>n</i> | % | <i>n</i> | % | <i>n</i> | % | |
| Trust in governance | 334 | 41.6 % | 309 | 38.5 % | 160 | 19.9 % | 803 |
| Trust in government | 330 | 36.5 % | 274 | 30.3 % | 301 | 33.3 % | 905 |
| Trust in NGOs | 141 | 15.4 % | 321 | 35.0 % | 454 | 49.6 % | 916 |

Separate items were recoded to reflect values ranging from 0 to 2, and aggregated to scales with values ranging from 0 to 6. Aggregated values 0, 1, and 2 were taken together as ‘low,’ aggregated values 3 and 4 as ‘ambivalent’ and aggregated values 5 and 6 as ‘high.’

The data from Table 1 show that approximately 50 percent of the public expresses a relatively high level of trust in NGOs with respect to GM food. Another 35 percent is ambivalent toward this actor. NGOs are not seen as trustworthy by approximately 15 percent of the respondents. Only a third of the respondents express a relatively high level of trust in government. Roughly equal proportions of the respondents are ambivalent toward government or express a relatively low level of trust. Trust in governance is rather controversial: approximately 42 percent have relatively low trust in governance, 20 percent have relatively high trust, and 39 percent are ambivalent in their judgment of trust in governance relating to GM food.

Table 2 presents three separate multivariate analyses of attitude toward GM food, acceptance of GM food, technological optimism, and direct and indirect behavior with the three levels of trust in governance, trust in government and trust in NGOs as factors. In this analysis, we used gender, educational level and age as covariates because of the slight deviations of our sample compared to the Dutch population. Multivariately all trust factors were significant (governance: $F = 26.36$, $p < .001$; government: $F = 6.32$, $p < .001$; NGOs: $F = 2.86$, $p < .01$). In all analyses, all three covariates were significant.

The tests of between-subject effects underline the importance of the factor of trust in governance, as was found with the multivariate tests. Table 2 reveals significant differences for all five dependent variables. Inspection of the means shows that respondents with a high level of trust in governance have a more positive attitude toward GM food compared to those with a relatively low level of trust in governance, are more likely to accept it, and are more optimistic about technology. For these dependent variables, the ambivalent group always takes a position between the low and high trust groups. With respect to the behavioral measures, we see the opposite: respondents from the low trust group are more likely to express overt behavior against GM developments (demonstrate, sign petitions, etc.)

Table 2. Estimated marginal means and tests of between-subject effects of attitude toward GM food, acceptance of GM food, technological optimism, and direct and indirect behavior, for three levels of trust in governance, trust in government and trust in NGOs, with gender, age and educational level as covariates

| | Low | Ambivalent | High | F (sign.) |
|----------------------------|---------------------|-------------------|-------------------|-------------|
| <i>Trust in governance</i> | | | | |
| Attitude | 2.02 ^{a,b} | 2.68 ^a | 3.14 ^b | 87.74 *** |
| Acceptance | 0.48 ^{a,b} | 0.99 ^a | 1.36 ^b | 83.32 *** |
| Technological optimism | 0.85 ^{a,b} | 1.29 ^a | 1.48 ^b | 93.46 *** |
| Direct behavior | 0.31 ^{a,b} | 0.18 ^a | 0.11 ^b | 9.72 *** |
| Indirect behavior | 1.50 ^{a,b} | 1.13 ^a | 0.84 ^b | 8.27 *** |
| <i>Trust in government</i> | | | | |
| Attitude | 2.23 ^{a,b} | 2.57 ^a | 2.77 ^b | 18.32 *** |
| Acceptance | 0.61 ^{a,b} | 0.95 ^a | 1.09 ^b | 20.87 *** |
| Technological optimism | 1.02 ^{a,b} | 1.18 ^a | 1.29 ^b | 10.46 *** |
| Direct behavior | 0.30 ^{a,b} | 0.13 ^a | 0.20 ^b | 8.99 *** |
| Indirect behavior | 1.40 ^a | 1.11 ^a | 1.13 | 2.64 |
| <i>Trust in NGOs</i> | | | | |
| Attitude | 2.82 ^{a,b} | 2.52 ^a | 2.40 ^b | 7.11 ** |
| Acceptance | 1.09 ^{a,b} | 0.79 ^a | 0.85 ^b | 5.68 ** |
| Technological optimism | 1.21 | 1.16 | 1.13 | < 1 |
| Direct behavior | 0.28 | 0.20 | 0.20 | 1.12 |
| Indirect behavior | 1.06 | 1.19 | 1.30 | < 1 |

* $p < .05$, *** $p < .001$

Contrast tests with as reference the group with low trust. Letters reflect significant differences ($p < .05$).

than those from the ambivalent and high trust groups. The respondents from the low trust group are also significantly more frequent members of societal organizations with a specific critical opinion on GM, compared to the ambivalent and high trust groups.

For trust in government, the data in Table 2 resemble those for trust in governance, with the exception of NGO membership. Respondents with a relatively low level of trust in government have a less positive attitude toward GM food, are less likely to accept GM food, are less optimistic about technology, and are more inclined to participate in protest behavior.

For trust in NGOs, the data in Table 2 show statistically significant differences only for attitude toward GM food and acceptance of GM food. Those with a relatively high level of trust in NGOs, have a less favorable attitude toward GM food, and are less likely to accept it than those with a low level of trust in NGOs.

Predicting GM food acceptance

Further analysis indicates that the acceptance of GM food is significantly correlated to attitude toward GM food ($r = .66, p < .001$), technological optimism ($r = .47, p < .001$), and trust in governance ($r = .48, p < .001$), government ($r = .25, p < .001$), and NGOs ($r = -.08, p < .05$), respectively. On the basis of these correlations, we performed a hierarchical regression analysis, in which acceptance of GM food was predicted in three steps: attitude toward GM food (model 1), model 1 plus technological optimism (model 2), and model 2 plus the three measures of trust (model 3) (see Table 3).

Each of the three models adds significantly to the prediction of the acceptance of GM food. As expected from the correlations, model 1 adds most. This model explains 28 percent of the variance in the acceptance of GM food. In model 3, 31 percent is explained, which indicates that the technological optimism and the three trust factors explain only a small proportion of the acceptance. In the final model in Table 3, the attitude toward GM food is by far the most important predictor of acceptance (beta = .41), followed by technological

Table 3. The prediction of acceptance of GM food with three sets of predictors

| | Acceptance of GM food | | |
|--------------------------------|-----------------------|-----------------|----------------------------|
| | <i>R</i> sq. | <i>F</i> change | Sign. <i>F</i> change (df) |
| <i>Model summary</i> | | | |
| Model 1 | .277 | 239.61 | *** (1,626) |
| Model 2 | .297 | 18.30 | *** (1,625) |
| Model 3 | .309 | 3.51 | * (3,622) |
| <i>Regression coefficients</i> | | | |
| | <i>Beta</i> | <i>t</i> | <i>significance</i> |
| <i>Model 1</i> | | | |
| Attitude | .53 | 15.48 | *** |
| <i>Model 2</i> | | | |
| Attitude | .48 | 12.13 | *** |
| Technological optimism | .16 | 4.29 | *** |
| <i>Model 3</i> | | | |
| Attitude | .41 | 9.99 | *** |
| Technological optimism | .11 | 2.80 | ** |
| Trust in governance | .14 | 2.91 | ** |
| Trust in government | -.00 | < 1 | NS |
| Trust in NGOs | -.03 | < 1 | NS |

* $p < .05$, ** $p < .01$, *** $p < .001$

optimism ($\beta = .11$) and trust in governance ($\beta = .14$). Technological optimism and trust in governance are also moderately correlated ($r = .52$). In model 3, trust in government and trust in NGOs do not predict acceptance of GM food significantly.

4. Discussion and conclusions

This study shows that with respect to GM food and public trust, three separate constructs can be distinguished which we called trust in governance, trust in government and trust in NGOs respectively. Trust in governance was measured with items as “trust that government will involve the public in its decision-making,” “trust that the corporate sector seriously takes consumer interests into consideration” and “the expectation of how GM food will influence the quality of life.” Trust in government or NGOs was related to competence and decision-making strategies of those organizations. On the eve of the formal Dutch debate on GM food, 42 percent of the respondents in a representative Dutch sample had low trust in the developments of GM food. On the other hand, 20 percent did trust these developments, and 39 percent were rather ambivalent about it, indicating that government timed the formal public debate well considering the seemingly controversial nature of the GM food issue. Trust in government with respect to GM food indicates an even more controversial situation: the proportions of respondents indicating low, ambivalent or high levels of trust in government were almost identical. Almost 50 percent of the Dutch public trusted NGOs with respect to the GM food issue, 35 percent were ambivalent toward NGOs and 15 percent did not trust NGOs very much.

Our expectation, based on the available literature, was that (the three types of) trust would be important predictors of the attitude toward GM food, public acceptance of GM food, technological optimism, and various forms of behavior toward GM issues. Trust in governance supports this expectation. Trust in governance seems to be an important constraint for the further development of GM food in the Netherlands. With higher levels of trust in governance people have a more positive attitude toward GM food, are more likely to accept it, and are more optimistic about technological developments. People with higher levels of trust in governance with respect to GM food are less inclined to protest against GM developments by demonstrating or signing petitions, and they are less involved in societal organizations that criticize GM developments.

Trust in government is also related to attitude, the acceptance of GM food, technological optimism and protesting behavior. Higher levels of trust in government coincide with a more positive attitude, more acceptance, more technological optimism and less protesting behavior. Trust in NGOs is related only to attitude and acceptance. Those expressing a high level of trust in NGOs are less positive about GM food, and are less likely to accept GM food. In an overall test of acceptance of GM food, it appeared that of these variables attitude is the most important predictor, followed by technological optimism and trust in governance. Remarkably, trust in government and trust in NGOs no longer play a role.

Recent studies in the United States have indicated that “trust in societal actors” was an important predictor of the public support for GM food developments (Priest, 2001; Irani, Sinclair and O’Malley, 2002). Our study shows a different result, in which at least “trust in government” and “trust in NGOs” are only indirectly important as individual predictors of the acceptance of GM food. Trust in government and trust in NGOs are important predictors of the public attitude toward the GM issue, and in that sense they are indirectly important for the acceptance of GM food. Public trust remains the important issue in the near future. It is a rather complex social and political phenomenon. And it is not just the restoring of public

faith in government, industry, NGOs or other stakeholders. Trust is related to the way government or politicians are inclined to involve the public within decision-making, how industry is handling consumer interests, and individuals' perception of the way biotechnology may influence their life (Hanssen et al., 2001).

In this respect, governance and trustworthiness have become crucial. Governance is a broad concept referring to the use of power and authority to conduct public life and to manage social and economical development. Contemporary societies are no longer seen as having a privileged political "center" from which future developments can be monitored and governed. Rather, the initiatives and contributions from different actors (governmental bodies, enterprises, NGOs, experts and lay audiences) will influence a more or less turbulent setting, a more or less unpredictable course of events. Like communication, the procurement of social and economical support is an ongoing, longitudinal process. Political power is a dynamical entity that circulates through networks and does not belong to any position in particular, but rather is distributed among various participants.

From the perspective of governance, public understanding and acceptance of biotechnology can be understood much better. Trust in governance seems to be an important constraint for the further development of GM food in the Netherlands, even more important than trust in government or NGOs.

References

- CBS (Dutch Census Organisation) (2001) *Statistical Yearbook 2001*. Voorburg: Centraal Bureau voor de Statistiek.
- Committee on Biotechnology and Food (2002) *Food and Genes: A Public Debate on Biotechnology and Food*. The Hague: Department of Agriculture, Nature Preservation and Fisheries (in Dutch).
- Durant, J., Bauer, M.W. and Gaskell, G. (1998) *Biotechnology in the Public Sphere: A European Sourcebook*. London: Science Museum.
- Earle, T. and Cvetkovich, G. (1995) *Social Trust: Toward a Cosmopolitan Society*. London: Praeger.
- European Commission (2001) Com. (2001) 428, 25 July 2001.
- Frewer, L.J., Scholderer, J. and Bredahl, L. (2003) "Communicating about the Risks and Benefits of Genetically Modified Foods: the Mediating Role of Trust," *Risk Analysis* 23(6): 1117–33.
- Fung, A. and Wright, E.O. (2001) "Deepening Democracy: Innovations in Empowered Participatory Governance," *Politics and Society* 29(1): 5–42.
- Gaskell, G., Allum, N., Wagner, W., Nielsen, T.H., Jelsøe, E., Kohring, M. and Bauer, M. (2001) "In the Public Eye: Representations of Biotechnology in Europe," in G. Gaskell and M. Bauer (eds) *Biotechnology: the Years of Controversy 1996–2000*, pp. 53–79. London: Science Museum.
- Gaskell, G., Allum, N., Wagner, W., Kronberger, N., Torgersen, H., Hampel, J. and Bardes, J. (2004) "GM Foods and the Misperception of Risk Perception," *Risk Analysis* 24(1): 185–94.
- Gutteling, J.M. (2002) "Biotechnology in the Netherlands: Controversy or Consensus?," *Public Understanding of Science* 11(2): 131–42.
- Gutteling, J.M., Midden, C., Smink, C. and Meijnders, A. (2001a) "The Netherlands: Controversy or Consensus?," in G. Gaskell and M. Bauer (eds) *Biotechnology: the Years of Controversy 1996–2000*, pp. 229–36. London: Science Museum.
- Gutteling, J.M., van der Veer, N. and Hanssen, L. (2001b) *Research Public Debate Biotechnology and Food. Public Attitudes Biotechnology and Food: June 2001*, Report 1. Enschede: Twente University (in Dutch).
- Hajer, M.A. (2002) "Naar een samengesteld begrip van democratie: of hoe aan representatie nieuwe inhoud kan worden gegeven," in G.M.A. van der Heijden en J.F. Schrijver (red.) *Representatief en Participatief. Dubbele Democratie*, pp. 71–88, p. 83. Delft: Eburon.
- Hamstra, A. and Feenstra, M.H. (1993) *Public Debate Genetic Modification of Animals, Is That Allowed? Project Report and Evaluation*. Leiden: SWOKA (in Dutch).
- Hanssen, L., Gutteling, J.M., Lagerwerf, L., Bartels, J. and Roeterdink, W. (2001) *In the Margins of the Public Debate on "Food and Genes": Research under Commission of the Committee Biotechnology and Food*. Enschede: Twente University (in Dutch).
- Heijs, W.J.M. and Midden, C.J.H. (1996) *Biotechnology: Attitudes and Influencing Factors. Fourth Survey*. Eindhoven: Technical University of Eindhoven.

- Irani, T., Sinclair, J. and O'Malley, M. (2002) "The Importance of Being Accountable," *Science Communication* 23(3): 225–42.
- Irwin, A., Dale, A. and Smith, D. (1996) "Science and Hell's Kitchen: The Local Understanding of Hazard Issues," in A. Irwin and B. Wynne (eds) *Misunderstanding Science? The Public Reconstruction of Science and Technology*, pp. 47–64. Cambridge: Cambridge University Press.
- Jong, J.M. de, Gutteling, J.M., Koopman, B.R. and Seydel, E.R. (2000) "Genetische manipulatie: maatschappelijke reacties en communicatieprocessen," *Tijdschrift voor communicatiewetenschap* 28(2): 165–80.
- Luhmann, N. (1988) "Familiarity, Confidence, Trust: Problems and Alternatives," in D. Gambetta (ed.) *Trust: Making and Breaking Cooperative Relations*, pp. 94–107. Oxford: Blackwell.
- Midden, C.J.M., Hamstra, A.M., Gutteling, J.M. and Smink, C. (1998) "The Netherlands," in J. Durant, M.W. Bauer and G. Gaskell (eds) *Biotechnology in the Public Sphere: A European Sourcebook*, pp. 103–17. London: Science Museum.
- Priest, S. (2001) "Misplaced Faith: Communication Variables as Predictors of Encouragement for Biotechnology Development," *Science Communication* 23(2): 97–110.
- Szerzynski, B. (1999) "Features—Risk and Trust," *Environmental Values* 8(2): 239–52.

Author

Jan Gutteling is associate professor in the Department of Communication Studies at the University of Twente. Lucien Hanssen is director of Deining Societal Communication, a research and consultancy office specializing in the public debate on emerging technologies from life and nano sciences. Neil van der Veer is director of Newcom Research and Consultancy (<http://www.newcomresearch.nl/>). Erwin Seydel is full professor in the Department of Communication Studies at the University of Twente.

Correspondence: Jan Gutteling, Associate Professor, Department of Communication Studies, University of Twente, PO Box 217, 7500 AE Enschede, the Netherlands, e-mail: j.m.gutteling@utwente.nl