Does framing work?
An empirical study of Simplifying Models for sustainable food production

KOEN JASPAERT[a], FREEK VAN DE VELDE[a,b], GEERT BRÔNE[a,c],
KURT FEYAERTS[a] and DIRK GEERAERTS[a,*]

Abstract

We investigate empirically whether framing in general, and the use of Simplifying Models as a framing tool in particular, has an effect on the way topics are cognitively construed. Existing studies on framing in linguistics have either been theoretical or descriptive. Going beyond such methodologically simple approaches, we use a more rigid test design involving the use of a control group, the construction of test conditions in which different Simplifying Models constitute the major source of variation, the inclusion of independent variables like age and prior knowledge of the subjects, and the use of linear and logistic regression analysis. Our results show that our more rigid methodological approach yields a more reliable image of the effect of Simplifying Models on the way in which people deal with information on a complex topic like sustainable food production. Fleshing out these effects further may in time lead to a better informed construction of communication on complex social topics.

Keywords: Simplifying model, framing, empirical evidence, sustainable food production.

1. Introduction

In the last decade insights and methods from cognitive linguistics and cognitive discourse analysis have been introduced into the study of the social,

political and cultural dimensions of language. This is most prominently the case in Critical Discourse Analysis (Fairclough 2003; Chilton 2004; Van Dijk 2008; Wodak and Meyer 2009 and many others) and cognitive sociolinguistics (Dirven et al. 2003; Kristiansen and Dirven 2008). These disciplines make use of the conceptual and methodological apparatus of cognitive linguistics in order to "analyze the various ways our conception of social reality is shaped by underlying cognitive and/or cultural models or patterns of thought" (Dirven et al. 2003, back cover). A crucial concept in this context is that of *framing*—roughly, the way in which the verbal perspectivisation of a real-world phenomenon highlights certain aspects of that phenomenon at the expense of others, and thus suggests a particular way of thinking about the phenomenon in question (Lakoff 1996; Lakoff et al. 2004). But how effective is framing? Does it actually guide our thinking about a subject in the way suggested by Lakoff? That is the question that we address in the present paper: can it be shown empirically, on the basis of methodologically rigorous research, that framing works? A research methodology was developed, elaborating on the methodology presented by Aubrun and Grady (2006). This methodology was then applied in an experiment in which the effectiveness of so-called Simplifying Models for communication about sustainable food production was tested. Results show to what extent and in which way framing generates an effect.

1.1.   *Theoretical background: Frame semantics, framing and Simplifying Models*

From a theoretical perspective, the idea of framing that is put to the test in this study has its roots in *frame semantics*. Frame semantics originated in the 1970s from attempts to model the relation between linguistic semantics and encyclopaedic knowledge that is usually associated with linguistic items (Fillmore 1982, 1985, 1987; Petruck 1996; Cienki 2007). The philosophy of frame semantics runs counter to formalist approaches of semantics that describe linguistic meaning in terms of necessary and sufficient conditions (so-called checklist theories). Fillmore and others argued that traditional formal semantic models cannot adequately account for the semantics of individual words and the relationship between semantically related lexical items. Using the example of the everyday scenario of a commercial transaction, Fillmore (1977) illustrated how a series of English verbs (*buy, sell, spend, cost*, etc.) are related by the *frame* or *script* they evoke and by the different aspects of the frame that they highlight.

A semantic frame can be defined as a coherent structure of interrelated concepts, based on recurrent patterns of experience. Through our daily encounter with commercial situations, a structured script has solidified in long-term memory, which includes the prototypical agents, their acts and the settings of

such a transaction. According to frame semantics, knowledge of such structures builds the necessary foundation on which the meaning of separate lexical items is built.

Defined in this way, the notion of frame constitutes one of the cornerstones of cognitive linguistics. In the broad definition used here, it is in fact largely identical with Lakoff's Idealized Cognitive Model (1987; see Cienki 2007 or Geeraerts 2010 on the relationship between both concepts). Apart from cognitive linguistics, other disciplines have argued for the usefulness of the concept of frame/framing, whether or not with a slightly different interpretation of the concept (Andor 1985; Tannen 1985; Croft and Cruse 2004; Cienki 2007; for an overview, see Bednarek 2005). These include sociology and anthropology (Bateson 1972; Goffman 1974; Tannen 1993), and psychology and computer science (Schank and Abelson 1977). As Cienki (2007: 173) puts it, "the common thrust between these different framings of the term 'frame', namely that knowledge schemas guide and structure our use of language, is of greater significance than the distinctions between the various uses of the term in different disciplines".

The key idea that lexical semantics is to a large extent determined by the frame that is evoked as structuring background, i.e., by the framing of a concept, has a pragmatic and rhetorical potential that has been explored in research in recent years. This application of frame semantics was to some extent already anticipated by Fillmore (2006 [1982]: 386), who pointed out that "[f]rom a frame semantic point of view, it is frequently possible to show that the same 'facts' can be presented with different framings, framings which make them out as different 'facts'". This amounts to the insight that the way in which an issue is framed has a potentially crucial impact on its social, political and institutional perception (cf. also Reddy 1993; Dirven et al. 2001).

This conviction has driven multiple scholars in various disciplines to conduct applied research into the effect of framing. The following selection presents a brief overview of this line of research. In a recent study, Rojo López and Orts Llopis (2010) provide a systematic overview of positive and negative metaphors used to frame the global financial crisis of 2008 in English and Spanish newspapers. Charteris-Black (2005) and Bhatia (2009), among others, point to different strategies for framing (the war on) terrorism by way of different metaphors. O'Malley (2009) draws on frame theory to analyse the talks in an Irish radio programme about the concept of disability as an instance of institutional discourse. It is claimed that—counter to the stated aim of the radio programme—the nature of these radio talks reinforces the image of the disabled person as Other. Several studies by Brigitte Nerlich and her colleagues describe framing strategies in communication by both official instances and the press, about recent matters of public health and biosecurity (Nerlich et al. 2002; Nerlich et al. 2009; Brown et al. 2009). Closer to the topic of the present

paper, Holmgreen (2008) investigates how different metaphorical constructions in the printed Danish media reproduce and promote the viewpoints of particular societal groups on the controversial issue of biotechnology. Besides the semantic impact of metaphorical patterns, some studies, like Croft (2009) about the semantics of the frames EAT and FEED, focus on data about the argument structure of different constructions in their framing analysis. In the same vein, Li (2010) describes aspects of transitivity in both American and Chinese press reports of the NATO bombing of the Chinese embassy in Belgrade in May 1999.

What linguistic studies like these have in common, is a descriptive perspective on (a variation of) framing phenomena as they occur throughout corpus data. They all provide adequate insight into the various ways, depending on the communicative goal at hand, a single target concept can be framed by different verbal structures. None of these studies, however, digs in a systematic way into the presumed *effects* caused by different framing devices. Yet, it would be erroneous to claim that so far research into the effects of framing has been totally absent. Especially in the fields of sociology and communication studies, numerous studies have been carried out focusing on framing effects, wherein the same critical information is cast in either a positive or a negative light; see Levin et al. (1998) for an exhaustive overview and a valence-based typology of framing effects. In a recent study, elaborating on this line of research with insights from cognitive linguistics and neo-Gricean pragmatics, Holleman and Pander Maat (2009) experimentally identify framing effects of what is being verbally profiled in both interpretation and production tasks. Along similar lines of experimental research, the current project looks into framing effects of different metaphoric models being profiled to convey the same message about sustainable food production. Despite many studies describing and empirically attesting metaphor as a framing device, experimental research into its behavioural effects is largely missing. At the end of his descriptive study of alternative metaphoric frames used for communication about chronic youth violence, Dodge (2008: 587) clearly identifies the need for future metaphor research:

Even though metaphors have heuristic value as hypotheses for empirical inquiry, they should not be confused with formal scientific models. Metaphorical thinking is sloppy science that must be transformed into testable hypotheses, rigorous analysis, and empirical testing. Through such testing, some metaphors will go beyond the metaphorical and turn into applicable models for human behavior, prevention, and policy.

This is exactly the research perspective of the present study as well as of the projects by Frameworks Institute and the independent research institute Cultural Logic, who conduct frame-based studies about social issues in public discourse. Crucial to this line of research is the investigation of the impact of

frame-based explanations of social issues ranging from mental health and education to global warming and sustainability. In order to operationalise the idea of frame-based explanations, Cultural Logic introduced the concept of *Simplifying Model*. Drawing on the findings of Conceptual Metaphor Theory, Simplifying Models (SM) are defined as concise and efficient conceptual explanations, structured by frame-based knowledge and specifically by metaphorical models, which can quickly enter public debate on complex social issues, and which may help to ground and extend public opinion in a positive way:

Simplifying models are designed to produce a conceptual shift in thinking rather than simply add to existing knowledge. They typically involve analogies with familiar, concrete images that help laypeople think about a topic in ways that are compatible—though not identical—with expert understanding. For instance, in previous work commissioned by the FrameWorks Institute on behalf of various American organizations, Cultural Logic has found that the idea of *Public Structures* (from roads and bridges to court systems, city councils and zoning laws) is a helpful organizing idea for thinking about the critical role of government. (Aubrun and Grady 2006: 2)

SMs are considered to be an important part of a general communication strategy because they offer a 'tangible' perspective on complex and abstract issues through the use of concrete or specific images. Specifically, SMs derive their explanatory power from a systematic mapping of structure from a familiar 'source' concept onto a complex target concept, comparable to the type of structure mapping described in Conceptual Metaphor Theory (Lakoff and Johnson 1980; Lakoff 1987; Kövecses 2002). Through this mapping, the target concept is provided with a conceptual skeleton that may help to grasp it in a comprehensible and engaging way. In the present paper, we present a refinement of the methodology used by Aubrun and Grady (2006) for studying the impact of SMs, with a specific focus on obtaining empirically sound quantitative results. This methodological approach is then tested in a large-scale study within Flanders, the Dutch-speaking part of Belgium. To appreciate the motivation for developing such an alternative and going one step further than the existing studies by Aubrun and Grady, it is necessary to have a closer look at the results they obtained and the method they used.

1.2.   *Methodological background: TalkBack testing of SMs*

Although the topics of sustainability of food production systems has been on the political and social agenda for a number of years (and will continue to be), it has been observed that a majority of the population, both in Europe and the United States, does not have a suitable basic conception of these notions. In other words, although there is a general awareness of the environmental problems we are facing, certain key concepts from expert discourse have not found

general acceptance yet. Part of the complexity of the notion of sustainability with regard to food production resides in the fact that a full understanding of the notion requires a combination of different perspectives: sustainable food systems are *economically* efficient, *ecologically* maintainable and *socially* acceptable. It is therefore no surprise that there is no general agreement on a correct definition of the concept. The lack of common ground on sustainable food production was the incentive for applied framing research that measured the potential impact of various SMs: how can the issue be framed in such a way that it may boost public debate? In a series of studies in the US, UK and France, a number of SMs were tested, with the aim to arrive at "a common, transatlantic language for talking productively about food systems" (Aubrun and Grady 2006: 3). The scope hence extends beyond national concerns and focuses on the potential transcultural communication on sustainability:

It is clear, given the interconnected nature of the modern world, that problems such as the sustainability of our food production practices cannot be addressed within the boundaries of a single country, and that the conversation should be international. There is obvious value in finding messages that can help to forge a conceptual vocabulary that cuts across national and cultural boundaries. (Aubrun and Grady 2006: 3)

In a first attempt to test the potential impact of frame-based input in shifting people's perspective on food production from what they refer to as a 'plate-centric view' (i.e., the view of the individual consumer) to the bigger picture of food production, SMs were tested that could help to grasp the complex interaction of technical, economic and social factors. On the basis of a qualitative study, it was concluded that the following basic concept is useful in communication on sustainable food production: a *runaway food system* is threatening vital *foundations* we depend on. The use of the double metaphors highlights two different aspects of the food production problem. First, the reference to a *runaway* food system profiles the importance of management and control (and the current lack thereof). Second, the source image of threatening vital *foundations* may serve to conceptualise the need for a stable ecosystem. In order to test the impact of the SM, test paragraphs like the following were used as stimuli.

Experts are increasingly concerned about what they call the Runaway Food System. The way we produce food today has radically changed, and now has the power to alter the Foundations of life as we know it almost by accident. Farming chemicals like pesticides and weed-killer are permanently altering our soil and water. Genetic engineering is changing the nature of the plants and animals we eat. And mile-long fishing nets are dragging the ocean floor and altering ecosystems. America needs to retake control of the runaway food system before it does more damage to the foundations we depend on. (Aubrun et al. 2006: 4)

The method that was used to assess the impact of paragraphs such as the above is referred to as *TalkBack Testing*. It includes a series of feedback tests, from traditional interviews and written surveys to the use of 'chains' of participants who are asked to pass on a message from one to the other. The extent to which participants in the TalkBack test are able to recall, use or elaborate on the central concepts included in the paragraphs they just heard or read, serves as a measure of the efficiency of the SM. TalkBack testing, in other words, is intended as a method to test a model's potential to become an 'organising principle' in the conceptualisation of and the communication about sustainable food production.

In a large-scale study with about 650 participants, Aubrun and Grady (2006) used TalkBack testing to assess the potential of a range of SMs. A comparison of the output of different models suggests that an 'ideal' SM could be of the type illustrated by the paragraph cited above. It expresses a core proposition or 'general statement' ("Our methods of producing food have become so powerful, and are so uncontrolled, that they are threatening the basic systems that are vital to our well-being") by means of the double metaphor of (a) a runaway train, profiling the lack of control inherent to current food production systems, and (b) damaged foundations, which serves to convey the idea that irreparable damage is being done to the ecosystem. Next to the metaphorically structured image, concrete examples are given that are sufficiently graphic so as to be understood immediately, that are sufficiently different so as to span the entire range of the problem, and that are important enough so as to reveal the seriousness of the situation.

In two follow-up studies in Europe (Aubrun and Grady 2006 and Aubrun et al. 2007), it was investigated to what extent the American models can be extended to other languages and cultures. 400 French and 330 UK residents were subjected to the same TalkBack Test as in the original American study. The major outcome of these comparative studies is that especially the structural metaphor (*damaged foundations*) yields good results in all three contexts in which it was tested, which makes it a possible candidate for a joint transcultural basis from which communication can start: "That is, the analogy with Physical Structure adds substance to the currently empty notion of Sustainability—and may even yield a more effective *substitute* for the term itself" (Aubrun and Grady 2006: 36).

1.3. *Further development of the TalkBack methodology*

In our view, the existing studies using the TalkBack methodology may be strengthened by taking a more stringent approach to both the elicitation and the analysis of the specific responses. The reliability of the findings of the previous, more explorative studies could be increased significantly by attending to

a number of methodological problems. First, evidence for the effect of SMs is generally presented in an anecdotal and qualitative manner rather than being supported by *quantitative data*. The studies do not present a measure to assess the robustness of the effects, which leads to informal conclusions. Second, what is generally missing is a measurement of respondents' *prior knowledge* of the topic of sustainable food production. Without an assessment of individual respondents' level of familiarity with the topic, it cannot be reliably concluded that a successful response to the TalkBack test can be attributed to the treatment with a SM. In the same vein, other characteristics of the subjects in the study may obscure the view on whether and how SMs really work. In other words, it is important to take into account the interaction between SMs and other variables that may influence the way people talk about sustainable food production. And third, in the existing studies, different examples are used in combination with the different SMs. This again hampers a reliable assessment of the exact impact of the SM, independently of other dimensions in which the different paragraphs vary.

With the present study, we want to overcome these methodological shortcomings. Our insistence on empirically viable testing is part of a broader movement within cognitive linguistics towards methods of analysis that live up to the standards of the social and the psychological sciences: see, among others, Geeraerts (2006), Gries and Stefanowitsch (2006), Stefanowitsch and Gries (2006).

2.   Method and design

In order to investigate empirically whether different forms of framing the issue lead to differences in the effectiveness of communication, a follow-up study introducing SMs in the communication about sustainable food production was carried out. In this study, we have tried to overcome the problems mentioned in Section 1.3 by using a more rigid test design and a more complicated statistical analysis of the results. This involved (a) the use of a control group (see also Aubrun et al. 2007), (b) constructing testing conditions in which the variability in the text paragraph is more stringently controlled, (c) keeping track of independent variables like age and prior knowledge of the subjects, and (d) the use of linear and logistic regression analysis. It is our aim to show that this more rigid methodology enables us to document the effectiveness of SMs in communicating about food production sustainability in a more reliable way.

In this study 354 subjects were presented information about food sustainability in four distinct conditions (cf. Table 1). In each of these conditions, a paragraph was read to the subjects, who were then asked to respond to the information given in a number of different ways. In the control condition, no SM was used. Each of the experimental conditions contained a metaphor which

Table 1. *Design of the study*

Condition	Metaphor
Model 0	Ø (control group)
Model 1	Runaway train
Model 2	Retaining walls
Model 3	Illness

served as a SM. The paragraph in the first experimental condition contained the metaphor of a runaway train: current unsustainable methods of agriculture lead to an unstoppable destruction of the entire ecosystem. The second condition was built around the metaphor of retaining walls, the idea being that unsustainable methods of food production eat away at the foundations of our ecosystems. The third condition compared the unsustainable food production practices to an illness.

Each paragraph was built around the idea of nature, the environment, as a system in *balance*. Balance is one of the main sensory sources from which Image Schemas can arise (see Evans and Green 2006: 178–179, 190). As Johnson (1987: 74) points out: "The structure of balance is one of the key threads that holds our physical experience together as a relatively coherent and meaningful whole. And (...) balance metaphorically interpreted also holds together several aspects of our understanding of our world." Of particular interest to the present study is the experience of balance in bodily homeostasis. This specific notion of balance can be metaphorically extended to systems such as psychology, arguments, law and moral, mathematics etc. (Johnson 1987: 87–96). In our study, the balance scheme applies as well: unsustainable food production practices bring the environment out of balance. The frame that is activated through this metaphor can be represented in the following way:
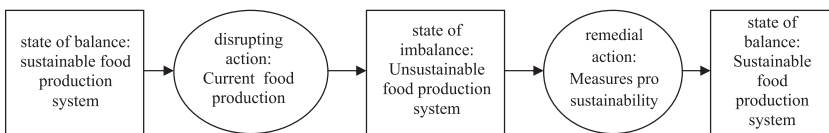

Figure 1. *BALANCE frame applied to sustainable food production*

In the construction of the paragraphs we used the same basic scheme as Aubrun and Grady (2006). Each paragraph starts with a 'general statement' about the problematic nature of our current food production system. This general statement is followed by three examples of actions causing that state, a

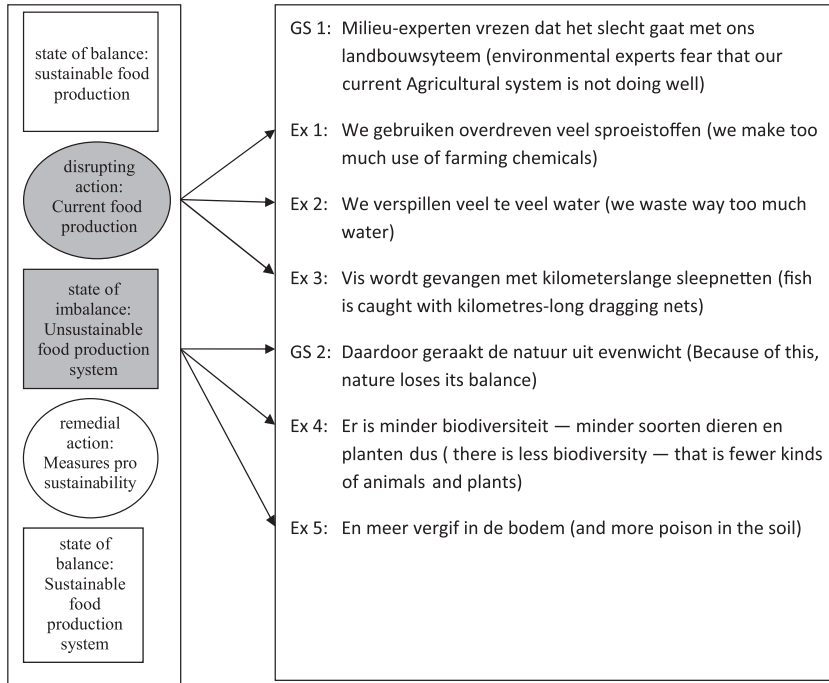| state of balance: sustainable food production | GS 1: Milieu-experten vrezen dat het slecht gaat met ons landbouwsyteem (environmental experts fear that our current Agricultural system is not doing well) |
disrupting action: Current food production	Ex 1: We gebruiken overdreven veel sproeistoffen (we make too much use of farming chemicals)
	Ex 2: We verspillen veel te veel water (we waste way too much water)
state of imbalance: Unsustainable food production system	Ex 3: Vis wordt gevangen met kilometerslange sleepnetten (fish is caught with kilometres-long dragging nets)
	GS 2: Daardoor geraakt de natuur uit evenwicht (Because of this, nature loses its balance)
remedial action: Measures pro sustainability	Ex 4: Er is minder biodiversiteit — minder soorten dieren en planten dus (there is less biodiversity — that is fewer kinds of animals and plants)
state of balance: Sustainable food production system	Ex 5: En meer vergif in de bodem (and more poison in the soil)

Figure 2.   *Construction of control paragraph*

second general statement and two more examples (see Figure 2). In general statement 2 explicit reference is made to the fact that due to disruptive actions like the ones mentioned in examples 1 to 3, our food production system is in a state of imbalance. Examples 4 and 5 illustrate that state of imbalance. In this way a paragraph is created that refers explicitly to the disrupting action and the state of imbalance represented in Figure 1. The other aspects of the frame remain implicit. This yields the paragraph for the control condition, presented in Figure 2.[1] The paragraphs in which a SM is introduced conclude with a third general statement which includes explicit reference to the SM. In addition, each SM is invoked twice in other statements in the paragraph. The introduction of a SM in the paragraph has two kinds of effects on the way the frame presented above is activated. First, some of the aspects of the frame that remained implicit in the control paragraph may now be expressed explicitly.

1.   Highlighted aspects of the frame (right-hand side of the Figure) are indicated by shading. GS stands for 'General Statement'; Ex stands for 'Example'.
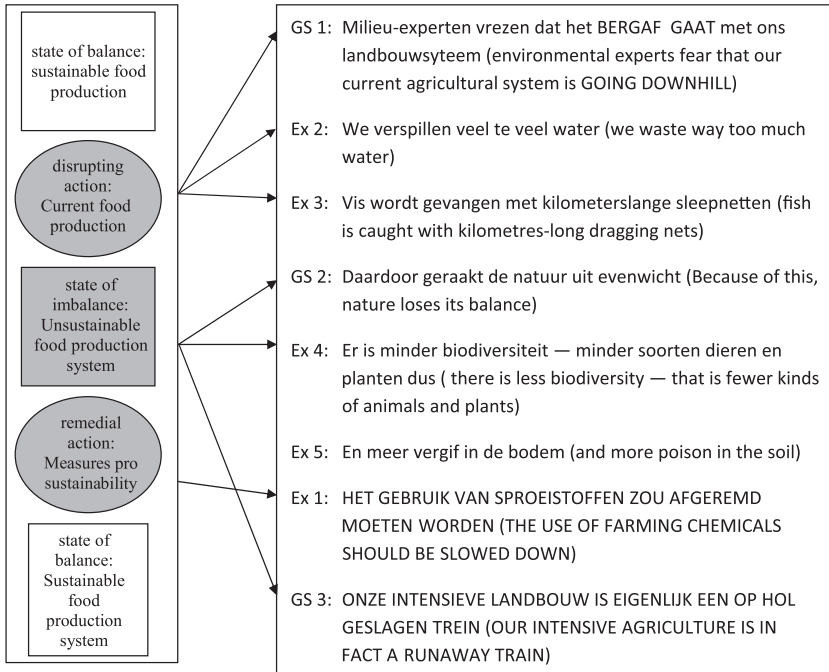
Figure 3.   *Construction of SM 1: runaway train*

Second, some of the aspects of the frame that were expressed non-metaphorically or through the basic BALANCE image schema, may now be expressed through the SM metaphor. In selecting and incorporating the three SMs, we took care that each of the models altered the presentation of the frame in distinct ways (see differences in shading of the frame parts in Figures 2–5).

Through the introduction of the first SM (Figure 3), the runaway train model, the remedial action component is made more explicit through the introduction of the SM in example 1, by the use of the word *afgeremd* ('slowed down'). In addition, the model is introduced explicitly in general statement 3, and referred to in a more indirect way in general statement 1, by using *bergaf gaan* ('going downhill'). These occurrences of the model add a metaphoric reference to the state of imbalance, highlighting in the view of Aubrun and Grady (2006) that the imbalance is a question of lack of control.

Just as the first SM, the second and third SM (respectively the retaining wall model and the sickness model) add an (extra) metaphoric reference to some of the elements that were explicitly present in the control paragraph. In addition they add explicit reference to aspects of the frame that were only present implicitly in the control paragraph. In the case of the second SM (Figure 4), this
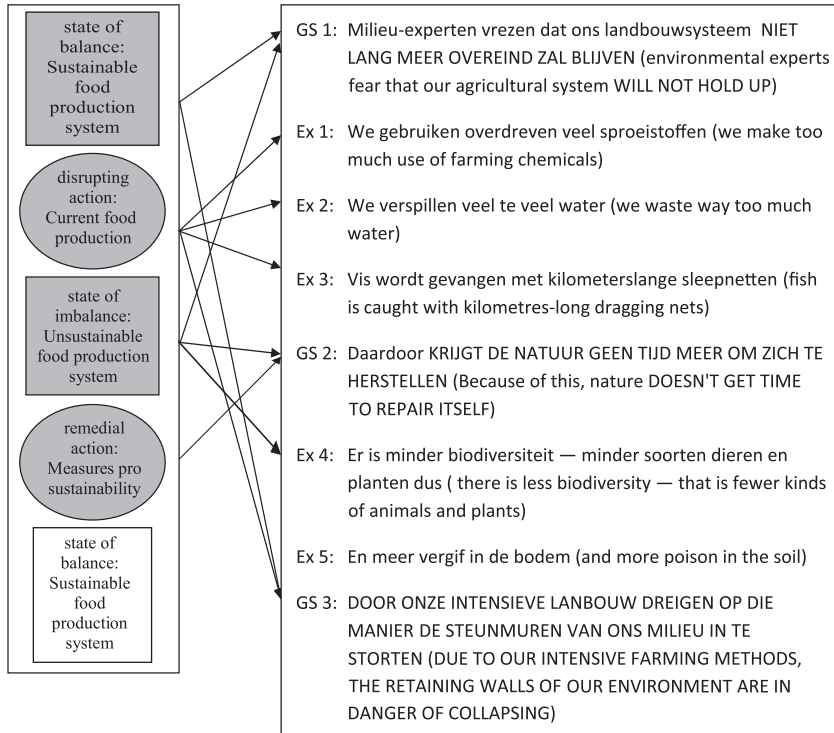
Figure 4.   *Construction of SM 2: retaining walls*

extra and more explicit activation focuses on the left side of the frame diagram (Figure 1), that is on the transition of balance to imbalance. Retaining walls are elements with which anorganic physical structures are balanced. If they crumble, balance is lost. In this sense, the SM can be said to foreground the cause of the imbalance that is central to the frame that is activated. The third SM introduces the concept of illness (Figure 5) and makes some aspects of the right side of the diagram, namely the transition from imbalance to balance, more explicit. It refers to organic physical structures which can regain their state of balance when this state got disturbed. It foregrounds the transition from imbalance to balance.

In both of these cases the SM is introduced explicitly in general statement 3, and incorporated in a more indirect way in general statements 2 and 3.

The four paragraphs construed in this way were used to test whether SMs offer a frame that (1) helps people remember information on sustainability of food production better, and (2) influences the way in which they reason about food production sustainability. More concretely, we tried to show the merits of
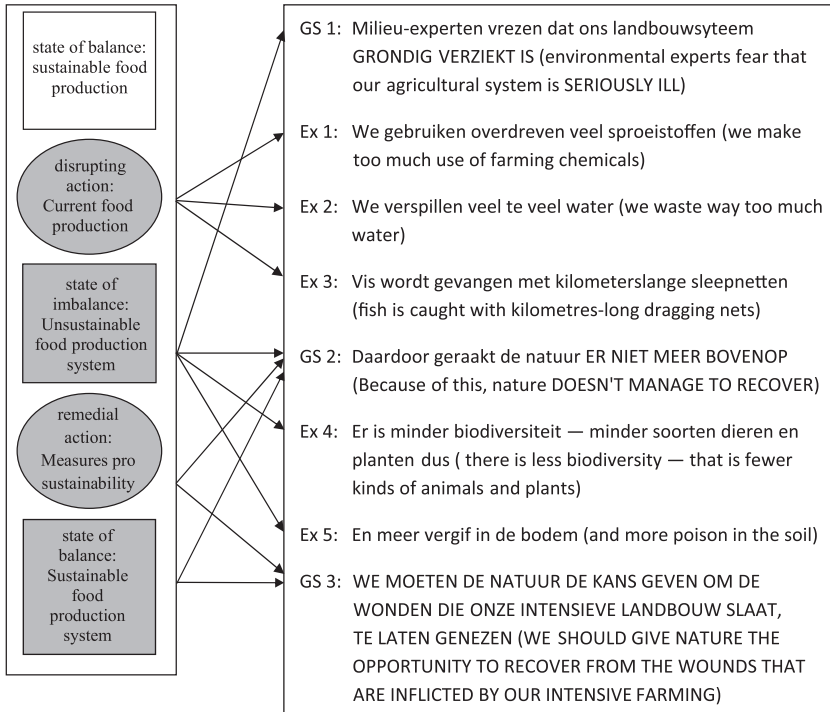
state of balance: sustainable food production		GS 1:	Milieu-experten vrezen dat ons landbouwsyteem GRONDIG VERZIEKT IS (environmental experts fear that our agricultural system is SERIOUSLY ILL)

disrupting action: Current food production

state of imbalance: Unsustainable food production system

remedial action: Measures pro sustainability

state of balance: Sustainable food production system

GS 1: Milieu-experten vrezen dat ons landbouwsyteem GRONDIG VERZIEKT IS (environmental experts fear that our agricultural system is SERIOUSLY ILL)

Ex 1: We gebruiken overdreven veel sproeistoffen (we make too much use of farming chemicals)

Ex 2: We verspillen veel te veel water (we waste way too much water)

Ex 3: Vis wordt gevangen met kilometerslange sleepnetten (fish is caught with kilometres-long dragging nets)

GS 2: Daardoor geraakt de natuur ER NIET MEER BOVENOP (Because of this, nature DOESN'T MANAGE TO RECOVER)

Ex 4: Er is minder biodiversiteit — minder soorten dieren en planten dus (there is less biodiversity — that is fewer kinds of animals and plants)

Ex 5: En meer vergif in de bodem (and more poison in the soil)

GS 3: WE MOETEN DE NATUUR DE KANS GEVEN OM DE WONDEN DIE ONZE INTENSIEVE LANDBOUW SLAAT, TE LATEN GENEZEN (WE SHOULD GIVE NATURE THE OPPORTUNITY TO RECOVER FROM THE WOUNDS THAT ARE INFLICTED BY OUR INTENSIVE FARMING)

Figure 5.   *Construction of SM 3: illness*

the methodological sophistication we introduced by answering the following research questions:

– Do SMs have an effect on the way subjects deal with information that has been presented to them? Do all subjects react to the introduction of SMs in the same way?
– Do subjects who have heard a SM produce more general statements than subjects who did not? Is the production of a general statement related to the frequency of general statements in the paragraph, or to the occurrence of (specific) SMs?
– How complex is the general statement that subjects produce? To which aspects of the frame do they make reference? Is this reference related to the explicitness with which this aspect is included in the paragraph they heard?
– Are subjects able to name measures that would help redress the balance? Is the ability to name measures related to the SM they heard?
– What is the nature of the measures mentioned? Is the nature of the measures mentioned related to the foregrounding or backgrounding of certain

    stages in the paragraphs, or is it related to the occurrence of (specific) SMs?

–   How many examples can subjects remember? Can subjects who heard a (specific) SM remember more examples?

The four paragraphs form the distinctive features of the four conditions in which 354 Dutch-speaking Belgians were interviewed over the telephone. Telephone numbers were selected at random from the official telephone guide. The calls were made with the aid of Skype software, were recorded in mp3 format after the subject's consent, and were later transcribed in a way that allowed for content analysis. Interviews were carried out by 9 different interviewers, who each spread their interviews more or less equally over the four conditions. They were provided with a detailed script of the way the interview was to be carried out.

    The interview itself consisted of several parts. After a short introduction, the subject was first asked 5 questions probing his/her prior knowledge on environmental issues. These questions took the form of statements, like e.g., "the government has decided to raise an environmental tax on plastic shopping bags", which subjects could respond to with "true", "false" or "don't know".[2] Next, one of the four paragraphs was read aloud by the interviewer. Then, the subject was asked to repeat as accurately as possible what s/he had just heard. By way of conclusion s/he was asked to name two measures to redress the balance and make the food production system more sustainable. Also, the subject was asked about his/her age.

    The outcomes of the interview were coded into a number of variables. Apart from the age, gender, and the prior knowledge of subjects about environmental matters, variables were created representing what subjects had retained from the paragraph, and what they suggested as sustainability-enhancing measures. This yielded five dependent variables:

(1)   the inclusion in the summary of a general statement,
(2)   the nature of that general statement,
(3)   the number of examples that were remembered,
(4)   the number of different action types that were mentioned as favouring food production sustainability,
(5)   the nature of these actions.

An example of a general statement (1, 2) would be something like "we exploit the earth and this is not going to work out in the long run". With respect to (2), a distinction was made between general statements focusing on causes of loss

---

2.   The questions were selected as the most indicative of knowledge on environmental matters from a pool of 20 in a preliminary study.

of balance, general statements expressing the state of imbalance and general statements focusing on ways to redress the balance. The actions mentioned in (5) were subdivided in general actions (*the government has to take action*), concrete actions *(farmers should refrain from using pesticides)* and actions making reference to attitudes (*we should all pay more attention to the environment*). Each of these categories was further subdivided in positive and negative actions. Positive actions are those that introduced ways to promote sustainable food production practices whereas negative actions are focused on reducing current non-sustainable food production practices. For instance "We should stop using pesticides" would be an example of a negative action, whereas "We should raise extra taxes on vegetables that have been sprayed with pesticides" would qualify as a positive measure. In a way, actions to be taken can be seen as a counterpart of the examples 1 to 3 that were included in each paragraph. Whereas these examples represent concrete actions that led from BALANCE—the initial, sustainable state—to IMBALANCE, the subjects were requested here to name examples of actions that lead from IMBALANCE to BALANCE—the refound balance. They were asked for new information[3], but that new information can be modelled very easily on the information given in the examples in the paragraph. When a subject turns the given information (*we make too much use of farming chemicals*) around (*we must stop making use of that much farming chemicals*) (s)he recycles, as it were, an explicitly given action. In the same vein, an answer like *we have to stop using antibiotics in raising chickens* is new in that it builds on an action that was not given before, but is construed on the basis of a scheme that is suggested by the make-up of the paragraph. From this perspective a two-way distinction can be made between (a) concrete/negative actions, i.e., actions that imply stopping, obstructing or banning the unsustainable food production methods given as examples in the original paragraph or resembling these examples and (b) concrete positive actions, which cannot be modelled after information given explicitly. This latter group of actions constitutes the bulk of the truly new information given by the subjects. For general actions, the distinction between new information and information modelled on the information given in the paragraph, is less clear.

The data were coded by three raters independently. The raters were collaborators of the research group that were involved at the time of the rating procedure with the practical execution of the study. They were acquainted with the overall aim of the study—to find out whether SMs influenced the verbal reaction of the subjects—but not with the research questions about the specific

---

3. Except for subjects who heard SM 1. They were presented with a general, negative action in example 1.

effects of each model. The interrater correlation was acceptable to high for the scores concerning the general statement and the reproduction of examples (.66 < r < .96; average r between raters .90, .82 and .85). All scores entered in the analyses were based on the judgment of at least two of these raters. For the scoring of the nature of the actions to be taken, there was less agreement among raters (.26 < r < .71). Therefore, raters were brought together in a discussion session and were asked to decide on a systematic way to solve their disagreements.

3.   Results

The data gathered through the telephone surveys were subjected to a number of regression analyses carried out with the aid of SPSS software. For the dichotomous dependent variables (1), (2) and (5) we used a binary logistic regression model, and for the numeric dependent variables (3) and (4) we used a linear regression model.

The response characteristics listed above were entered as dependent variables in a two-step procedure. In a first step, four variables were entered in the regression model as independent variables: the age and gender of the subjects, the results they scored on the prior knowledge test on environmental issues and a variable identifying the interviewer. In a second step, the condition of the treatment, i.e., the SM to which the subject was exposed, was inserted in the model together with the variables that proved significant in step 1. In step 1, a backward procedure was used, eliminating variables that did not contribute significantly to the explanation of variance in the dependent variable. In the second step all conditions were entered, regardless of whether they turned out to be significant. The threshold for significance was set at .05. The difference in explained variance between step 1 and step 2 of the analysis showed whether the use of a SM made a significant difference for the ability of the subjects to recall the contents of the paragraph, or to come up witch actions to enhance sustainability.

For each of these analyses, the effect of outliers on the outcome of the analysis was examined. Subjects with a standardised residual score below −3 or above 3 were considered to be outliers. In each case, the analysis was run twice, the first time with and the second time without the outliers. On the basis of this inspection, it was decided whether to include these outlying subjects in the analysis or not.

3.1.   *General statements*

A general statement was produced by 184 out of 354 subjects (52%). In this general statement, 57 subjects (16.1%) refer to the *cause of imbalance* of the current food production, 162 (45.8%) refer to the *state of imbalance*, and 19

Table 2. *Goodness of fit, logistic regression. Dependent variable: general statement*

	χ^2	df	sig.
step1	19.393	2	.000
step2	16.248	3	.001
model	35.641	5	.000

Table 3. *Logistic regression analysis. Dependent variable: general statement*

	B	S.E.	Wald	df	sig.	Exp(B)
age	−.016	.007	6.074	1	.014	.984
prior knowledge	.273	.110	6.210	1	.013	1.315
SM 1	−.065	.297	.048	1	.826	.937
SM 2	.924	.305	9.197	1	.002	2.518
SM 3	.788	.387	4.147	1	.042	2.199
constant	−.272	.580	.220	1	.639	.762

subjects (5.4%) provide some sort of a remedy, a way to *redress the balance*. 51 subjects (14.4%) produce an internally complex general statement, referring to more than one aspect of the causal structure of the frame.

Table 2 shows that a better prediction model is obtained when age and prior knowledge (step 1) and test condition (step 2) are entered as independent variables in the analysis. Chi-square is calculated on the basis of the log-likelihood statistic, a measure for the relation between the observed values for 'occurrence of a general statement' as a dependent variable, and the expected values. The variables introduced help to predict in a significant way whether the subject will end up in the category of people who produce general statements, or rather in the other category (no general statements).

In order to determine what kind of influence the added variables have, a closer look needs to be taken at the outcomes of the regression analysis (cf. Table 3).

Table 3 shows that the chances of triggering a general statement significantly increase with the subjects' prior knowledge and decrease with their age. Exposure to SM 2 (retaining walls) and 3 (illness) likewise increases the chance of a general statement being produced. The analysis yielded no outliers.

The content focus of the general statements was analysed in a similar way as the occurrence of such a statement. In Table 4, reference to causes, state of imbalance and remedies was treated as a dependent variable in three separate regression analyses. In step 1 age and prior knowledge were added, and in step 2 the three test conditions were included in the analysis as independent variables. In Tables 5–8 the overall results were broken down for the various values of the variables.

Table 4.   *Goodness of fit, logistic regression. Dependent variable: content of general statement*

	cause			imbalance			remedy		
	χ^2	df	sig.	χ^2	df	Sig.	χ^2	df	sig.
step1	11.952	2	.003	14.455	2	.001			
step2	7.497	3	.058	10.893	3	.012	7.478	3	.058
model	19.449	5	.002	25.349	5	.000	7.200	3	.066

Table 5.   *Logistic regression analysis. Dependent variable: cause*

	B	S.E.	Wald	Df	sig.	Exp(B)
prior knowledge	.255	.143	3.199	1	.074	1.290
gender	−.747	.301	6.161	1	.013	.474
SM 1	.981	.474	4.286	1	.038	2.666
SM 2	1.147	.463	6.146	1	.013	3.149
SM 3	.784	.578	1.840	1	.175	2.190
constant	−2.837	.645	19.378	1	.000	.059

Table 6.   *Logistic regression analysis. Dependent variable: cause (minus 9 outliers)*

	B	S.E.	Wald	Df	sig.	Exp(B)
prior knowledge	.488	.169	8.303	1	.004	1.628
gender	−1.089	.340	10.292	1	.001	.336
SM 1	2.917	1.047	7.768	1	.005	18.490
SM 2	3.114	1.039	8.985	1	.003	22.502
SM 3	2.408	1.124	4.587	1	.032	11.110
constant	−5.463	1.188	21.161	1	.000	.004

Table 7.   *Logistic regression analysis. Dependent variable: imbalance*

	B	S.E.	Wald	Df	sig.	Exp(B)
age	−.013	.006	4.198	1	.040	.987
prior knowledge	.242	.109	4.965	1	.026	1.274
SM 1	−.216	.300	.517	1	.472	.806
SM 2	.686	.298	5.296	1	.021	1.985
SM 3	.315	.378	.696	1	.404	1.371
constant	−.427	.574	.551	1	.458	.653

The content analysis of the general statements yielded a number of remark-able results. Focusing on the reference to causes in general statements, it had to be decided whether to include 9 outliers in the analysis or not. Interestingly, exclusion of the outliers led to a notable change in the relation between the

Table 8.   *Logistic regression analysis. Dependent variable: remedy*

	B	S.E.	Wald	Df	sig.	Exp(B)
SM 1	1.708	1.090	2.458	1	.117	5.520
SM 2	1.853	1.079	2.949	1	.086	6.376
SM 3	2.442	1.112	4.827	1	.028	11.500
constant	−4.522	1.005	20.227	1	.000	.024

dependent and independent variables. In the analysis with the outliers, only gender, SM 1 and SM 2 contribute significantly to the explanation of variance, whereas discarding the outliers rendered prior knowledge and SM 3 significant as well, and led to an improvement of the significance of SM 1 and SM 2. The change in the coefficients is probably due to the fact that 7 out of 9 outliers appeared to be subjects from the Model 0 condition, i.e., the group which was read the paragraph without an explicit SM. In spite of the absence of a SM, they produced a causal general statement anyway. Given the consistent nature of this behaviour, it would be ill-advised to simply discard the outliers. They represent a clear subgroup of the control group, who apparently don't need a SM to produce general statements. Discarding them obviously amplifies the difference between the test group and the control group. As we did not see a straightforward reason why the observations at issue should be considered unreliable for the variable 'cause', we decided to include the outliers in our final analysis.

The analysis of references made to the state of imbalance in the general statement did not yield any outliers. For 'remedies', on the other hand, 14 subjects had a standardised residual score of over 3. Again, we were not inclined to remove them from the analysis. If we would have done so, virtually all correlations would have evaporated, as we appear to have a case here of what is known as complete separation of the data. The 14 outliers were all the subjects from condition 0, 1 or 2 that referred to remedies in their general statements cf. Table 9.

Table 9.   *Cross table: condition × remedy*

		Remedy		Total
		.00	1.00	
model	0	92	1	93
	1	100	6	106
	2	101	7	108
	3	40	5	45
total		333	19	352

The 5 other subjects that referred to remedies belonged to the SM 3 group. In such a case, where the category to predict only occurs in one value of the independent variable a logistic regression is not capable of reliably assessing the effect. It seemed wise not to throw the majority of subjects mentioning remedies out of the analysis. In this case as well, we stuck to an analysis that included the outliers.

If we look at the relation between the independent variables and the three kinds of general statements (cause, state of imbalance, remedy), we can see that SM 2 (retaining walls) has a positive effect on the probability of cause and state of imbalance being mentioned, and to a lesser extent also on remedies; SM 1 (runaway train) only encourages mention of causes, while SM 3 (illness) does a better job at eliciting statements in which remedies are mentioned.

A last aspect of the general statements that is worth looking into is the extent to which SMs induce more *complex* general statements, that is statements in which more than one causal component is mentioned. As indicated above, of the 184 subjects that produced general statements, 51 of them (27.7%) mentioned more than one causal component. Table 10 shows none of the variables inserted in step 1 contribute significantly to the prediction of the classification of the subjects in step 2. The introduction in step 2 of the test conditions including SM 1 and SM 2, by contrast, does have a significant effect (Table 11). The analysis yielded 10 outliers outside the [−3, 3] Z residual zone. A reanalysis, ignoring these outliers, revealed a decrease of the effect of the interviewer and an increase of the effect of the SM 1 and SM 2. For the purpose of this paper

Table 10.   *Goodness of fit, logistic regression. Dependent variable: complexity of general statement*

	χ^2	df	sig.
step1	20.219	9	.017
step2	7.678	3	.053
model	27.897	12	.006

Table 11.   *Logistic regression analysis. Dependent variable: complexity of general statement*

	B	S.E.	Wald	df	sig.	Exp(B)
gender	−.495	.324	2.339	1	.126	.609
interviewer			13.802	8	.087	
SM 1	1.044	.506	4.250	1	.039	2.841
SM 2	1.240	.497	6.233	1	.013	3.454
SM 3	1.022	.733	1.942	1	.163	2.778
constant	−1.539	.589	6.842	1	.009	.214

these results can be discarded as they confirm the results of the analysis including the outliers.

3.2. *Reproducing the examples*

The text paragraphs that were presented to the subjects did not solely consist of a metaphor functioning as a SM, but contained a number of examples of non-sustainable food production as well. As the subjects were asked to reproduce the sample paragraph they had just heard, it was expected that they would not only come up with a general statement, but that they would try to reconstruct the specific examples as well. As we have done in our analysis of the general statements in the previous paragraph, we shall first try to determine to what extent the independent variables play a role in the subjects' ability to reproduce examples in general; as a second step, we will investigate the relation between the SMs and the separate examples.

Table 12 presents the number of subjects that gave one, two, three or all four examples.[4] Remarkably, almost half of the subjects do not reproduce any example at all, and only slightly more than a quarter of the subjects recalled two or more examples.

Table 13 presents the results of a linear regression analysis on the numeric variable 'number of examples'. The analysis is built up in the same way as the logistic regression in the previous paragraphs: in a first step age, gender, prior

Table 12. *Frequency distribution: number of examples*

	frequency	valid percent	cumulative percent
valid .00	158	44.6	44.6
1.00	98	27.7	72.3
2.00	51	14.4	86.7
3.00	41	11.6	98.3
4.00	6	1.7	100.0
total	354	100.0	

Table 13. *Goodness of fit, linear regression. Dependent variable: number of examples*

model	R	R Square	adjusted R square	std. error of the estimate
1	.323	.104	.099	1.04630
2	.337	.113	.100	1.04557

---

4. The fifth example ('depleted soil') was not taken into account, because in the few instances this example was referred to, it was combined with reference to the first example (*the use of pesticides depletes our soil*). These answer were scored as reference to example 1.

knowledge and the identity of the interviewer were inserted as independent variables, in a second step test condition is added as independent variable[5]. Again, we checked for outliers.

The table shows that the variables in step 1 explain quite some variation, but step 2 hardly contributes to the explained variance. In other words: exposure to a SM does not improve the subject's ability to come up with the examples just heard.

The same conclusion can be drawn by zooming in on the regression coefficients of the various variables. Again, it can be observed that age and prior knowledge contribute significantly to the explanation of the variance, whereas the three SMs do not (cf. Table 14).

For the analysis of the presence or absence of the individual examples we can make use of the logistic regression analysis that we used for investigating the presence or absence of a general statement (see above). Table 15 shows the predictive force of the model and of each of the separate steps in it.

Table 14.   *Linear regression analysis. Dependent variable: number of examples*

	unstandardised coefficients		standardised coefficients	t	sig.
	B	Std. Error	Beta		
(constant)	.529	.289		1.828	.068
age	−.007	.003	−.115	−2.158	.032
prior knowledge	.277	.054	.275	5.183	.000
SM 1	−.207	.150	−.086	−1.381	.168
SM 2	.020	.151	.008	.133	.895
SM 3	.056	.193	.017	.291	.771

Table 15.   *Goodness of fit, logistic regression. Dependent variable: example 1, example 2, example 3, example 4*

	df	EX 1: pesticides		EX 2: fishing		EX 3: biodiversity		EX 4: water	
		χ^2	sig.	χ^2	sig.	χ^2	sig.	χ^2	sig.
step1	2	20.451	.000	14.626	.001	39.949	.000	9.158	.01
step2	3	3.631	.304	3.486	.323	2.129	.546	4.164	.244
model	5	24.082	.000	18.112	.003	42.078	.000	13.323	.021

---

5.   In contrast to the logistic analysis, the variables interviewer and model were not introduced as categorical variables but with the use of dummy variables. This change does not influence the outcome of the analysis, but may have an effect on the presentation of the results, as the effect of interviewer is now presented separately per interviewer and not for the variable as a whole.

The variables that were included in the first step for each example led to an improvement of the classification of the subjects. In none of the four examples does the test condition, added to the model in step 2, contribute to the explanatory power of the model in a significant way. Inspection of the contribution of each of the SMs shows that this is not only true for the test condition in general, but for each SM in particular as well. Confrontation with a SM does not appear to help subjects to recall examples.[6]

3.3. *Actions*

The subjects were not only asked to repeat the text paragraph they had just heard, but also to come up with two measures to cope with the current problems in agriculture. Some of the subjects did not succeed in this task, while others were eager to cooperate and supplied more than two measures. As outlined in the section about the methods and the research design, the measures have been classified according to whether the subjects suggested *general* or *concrete* actions, or expressed a (change in) *attitude*. Combined with the distinction between positive and negative measures, this distinction yields 6 different types of action that could be mentioned. Table 16 provides the frequency distribution of the occurrence of these action types.

To measure the quality of the subjects' answers to the second TalkBack test, the number of types of action that were given was scored. The number of actions mentioned of each type, was ignored. 138 subjects (39%) could think of no measure at all, 116 subjects (32.8%) provided (a) measure(s) of one type of action, 89 subjects (25.1%) gave actions of two different types, and 11 (3.1%) mentioned actions of all three types. A linear regression analysis with the number of measure types as the dependent variable (cf. Tables 17–18) reveals that subjects that were confronted with SM 2 provided significantly more different action types than the subjects in the control group.

Table 16.   *Frequencies of the different measures*

	general +		general −		concrete +		concrete −		attitude +		attitude −	
	freq	%	freq	%	freq	%	freq	%	freq	%	freq	%
0	269	76	338	95.5	257	72.6	235	66.4	344	97.2	353	99.7
1	85	24	16	4.5	97	27.4	119	33.6	10	2.8	1	0.3
total	354		354		354		354		354		354	

---

6.   The overall picture changes slightly when outliers are taken into account. With outliers omitted, subjects who were presented with SM 1 did not recall the fourth example as well as subjects in the control condition (p = .042). Since we have no good reasons to discard these outliers, we will not take this result into further consideration.

Table 17.   *Goodness of fit, linear regression. Dependent variable: number of action types*

step	R	R Square	adjusted R square	std. error of the estimate
1	.365	.133	.120	.83000
2	.391	.153	.133	.82416

Table 18.   *Linear regression analysis. Dependent variable: number of measures*

	Unstandardised Coefficients		Standardised Coefficients	t	sig.
	B	Std. Error	Beta		
(constant)	.767	.231		3.321	.001
age	−.006	.003	−.130	−2.434	.015
prior knowledge	.152	.042	.187	3.581	.000
interviewer1	−.384	.154	−.131	−2.497	.013
interviewer3	−.370	.141	−.136	−2.617	.009
interviewer6	−.652	.236	−.141	−2.763	.006
SM 1	.026	.119	.014	.223	.824
SM 2	.279	.119	.145	2.340	.020
SM 3	.234	.155	.089	1.510	.132

Table 19.   *Goodness of fit, logistic regression. Dependent variables: measure type*

	general/positive			concrete/positive			concrete/negative		
	χ^2	df	sig.	χ^2		sig.	χ^2		sig.
step1	2.908	1	.088	78.685	10	.000	32.109	9	.000
step2	12.878	3	.005	2.052	3	.562	5.138	3	.162
model	15.786	4	.003	80.737	13	.000	37.248	12	.000

We were also interested in the question whether any correlations could be established between *type of action* and the specific SMs. Three of the six measure types were too infrequent, however, to obtain reliable results. This led us to look separately into the effect of the use of SMs on the production of general/positive, concrete/positive and concrete/negative measures.

Table 19 provides an overview of the predictive value of the model and the contribution of every step for each of the three variables we retained.[7]

---

7. The analysis of concrete/positive yielded two outliers, the one of concrete/negative one. Exclusion of these outliers did not change the outcomes of the analysis in any significant way.

Table 20.   *Logistic regression analysis. Dependent variable: general/positive action*

	B	S.E.	Wald	df	sig.	Exp(B)
gender	−.348	.265	1.730	1	.188	.706
SM 1	−.160	.388	.171	1	.679	.852
SM 2	.722	.349	4.293	1	.038	2.059
SM 3	1.019	.324	6.048	1	.014	2.770
constant	−1.312	.324	16.377	1	.000	.269

Table 21.   *Logistic regression analysis. Dependent variable: concrete/positive action*

	B	S.E.	Wald	df	sig.	Exp(B)
age	−.024	.008	7.712	1	.005	.977
prior knowledge	.412	.146	8.011	1	.005	1.510
interviewer			28.417	8	.000	
SM 1	.357	.382	.876	1	.349	1.429
SM 2	.525	.374	1.968	1	.161	1.690
SM 3	.380	.561	.459	1	.498	1.462
constant	.359	.809	.197	1	.657	1.432

Table 22.   *Logistic regression analysis. Dependent variable: concrete/negative action*

	B	S.E.	Wald	df	sig.	Exp(B)
prior knowledge	.224	.118	3.613	1	.057	1.251
interviewer			23.734	8	.003	
SM 1	.129	.332	.152	1	.697	1.138
SM 2	.459	.325	1.999	1	.157	1.583
SM 3	.970	.503	3.728	1	.054	2.639
constant	−1.541	.617	6.230	1	.013	.214

Step 1 shows the large impact of the variables entered in the first step on the occurrence of concrete measures. In the case of general/positive measures, the variables do not contribute significantly to the correct classification of the subjects. In step 2, the test condition was added to the model. Here we can observe overall significance for general/positive measures only.

The details of the analyses of the variables representing concrete measures (Tables 21 and 22) indicate that it is mainly the variable referring to the identity of the interviewer and the previous knowledge of the subjects that is responsible for the effect in step 1. No SM shows a significant effect on the production of these measures. With respect to general/positive measures (Table 20), they are proposed significantly more often by subjects who got to hear SM 2 and SM 3.

4.   Discussion and prospects

The goal of this article was to investigate empirically whether framing in general, and the use of SMs as a framing tool in particular, have an effect on the way information is activated. Most scholarly studies about framing either take a corpus-based descriptive, discourse-analytic approach or focus on valence-based framing effects from a sociological and communicative perspective. In the broad realm of cognitive linguistics, studies have only recently begun to explore the effectiveness of framing experimentally. The present study proceeds in this new direction by investigating metaphoric discourse as a prominent framing device. It builds, more specifically, on the results of an international study on the effects of SMs in the communication about sustainable food production to develop a methodology that could yield empirical, experimentally controlled evidence of these effects. With the results presented in the previous section in mind, we can go back to the research questions posed in Section 2.

4.1.   *Answering the research questions*

1.   Do SMs have an effect on the way subjects deal with information that has been presented to them? Do all subjects react to the introduction of SMs in the same way?

The results of our analysis of the telephone surveys indicate that the introduction of a SM influences the subjects' performance on a recall test, and induces them to react differently to the question what can be done about the situation.

2.   Do subjects who have heard a SM produce more general statements than subjects who did not? Is the production of a general statement related to the frequency of general statements in the paragraph, or to the occurrence of (specific) SMs?

Exposure to SM 2 (retaining walls) and SM 3 (illness) increases the likelihood of a general statement being produced, in comparison to the control group. The fact that exposure to SM 1 did not result in the production of more general statements than in the control condition, shows that the effect is not caused by the mere number of general statements in the paragraph or by the fact that a double metaphor is used. General statements seem to be triggered by the use of SMs that make explicit reference to different aspects of the BALANCE frame.

3.   How complex is the general statement that subjects produce? To which of the aspects included in the frame do they make reference? Is this reference related to the explicitness with which this aspect is included in the paragraph they heard?

Only a minority of the subjects including a general statement in their response refer to more than one causal aspect of the BALANCE frame. Interestingly, SM 1 (runaway train), though not generating more general statements in comparison to the text without a SM, yields a larger number of statements in which more than one component is mentioned. Regardless of the individual condition, subjects including a general statement most often refer to the state of imbalance that is seen as the problem. Subjects who have heard SM 2 (retaining wall) do so even more frequently than others. Cause of imbalance is referred to more often by subjects in the SM 1 and SM 2 condition, redressing the balance by SM 3 subjects. There is thus a clear link between the aspects of the frame being foregrounded, in terms of explicitness or through the linguistic make-up of the information in the paragraph (see shading and formulation details in Figures 2–5), and the nature of the general statement produced by the subjects. Aspects that are made explicit or are foregrounded stand a better chance of being included than other aspects.

4. Are subjects able to name measures that would help redressing the balance? Is the ability to name measures related to the SM they heard?

SMs can help people to think of possible measures to overcome problems with our current food production practices. Subjects confronted with SM 2 are significantly better at this task.

5. What is the nature of the measures mentioned? Is the nature of the measures mentioned related to the foregrounding or backgrounding of certain stages in the paragraphs, or is it related to the occurrence of (specific) SMs?

As could be expected, the most frequent action category is the concrete/negative one, i.e., the category with actions that can be modelled after the examples given in each paragraph. No experimental group differs significantly from the control group in the amount of actions of this type mentioned. With regard to other action categories, SM 2 and SM 3 yield more general/positive actions. This finding leads to the conclusion that the confrontation with SM 2 and SM 3 helps the subjects to consider the bigger picture, i.e., in this case the causal chain perspective of the BALANCE frame, and come up with information that fits in slots in this frame that were not explicitly referred to. As was pointed out earlier, the introduction of these two SMs resulted in stronger explicit reference to different stages in this causal chain. It seems as if that kind of reference facilitates further explicit elaboration.

6. How many examples can subjects remember? Can subjects who heard a (specific) SM remember more examples?

Whereas SMs clearly enhance the production of general statements or influence the mention of measures to be taken, there is no effect on the recall of the examples. Note that this does not mean that the subjects do not succeed in giving any examples, but only that they do not do this at a higher rate than in the control condition.

4.2.   *General conclusion*

Our study shows that SMs have a clear effect on the way in which people deal with information on a complex topic like sustainable food production. The effect of the models turned out to be partly related to the explicitness with which information was provided, but was certainly not limited to it. Clearly, the successful SMs enabled subjects to take aspects of the underlying BALANCE image schema into account that were not explicitly present in the information given to them. Even in an artificial research setting, caught off guard by a stranger conducting a telephone survey, without a reward of any kind, and after having heard the sample paragraph just once, subjects turn out to be able to deliver richer answers in a simple recall test and provide more relevant information fitting into the overall frame that was introduced. It seems plausible that in a more natural setting, with repeated exposure to the metaphor, in everyday settings, in actual discourse, and perhaps with the aid of visual support, these effects will even be stronger.

Keeping in mind that the SM was presented at the end of the paragraph, these findings suggest that the SM offers a frame that causes a structuring not only of the information that was given before the introduction of the model, but to some extent also of the information that the subject already had. In other words, the introduction of a certain frame has a direct significant effect on the way subjects structure information they already had, leading to effects on the (short term) retention and application of that information.

All these facts lead us to the conclusion that carefully constructed and applied SMs could be powerful instruments in helping people to see the bigger picture in complicated matters.

4.3.   *Questions for further research*

Given the foundational finding that the use of SMs does indeed lead to empirically observable effects on the way in which test subjects cognitively construe a given topic, a number of questions present themselves for further research. In the first place, future research will be needed to get a more precise insight of what exactly makes SMs work. As we mentioned in Section 1 and 2, in this study we tried to develop a more rigorous methodology for studying the effects of SMs. One of the elements of rigorousness we introduced was the consistency of the test paragraphs. As our main aim was the demonstration of the

usefulness of a more sophisticated methodology for the exploration of the effects of SMs, we opted for test paragraphs that included different kinds of variation in as systematic a way as possible. Our results, showing that different forms of variation seem to be responsible for part of the effect of SMs, beg the question which aspects of the variation in our paragraphs led to which effects. Follow-up studies in which the rigorousness of paragraph construction is increased further, can offer interesting insights in this matter. Such studies could, e.g., focus on the effect of the place of the SM in the paragraph. Because of the placement of the SM at the end of the paragraph that was read to the subjects, the framing effects that were observed required a reorganisation of information. By starting the paragraph with the SM, one could also to some extent introduce SMs as an organisation tool rather than a reorganisation tool. It would be interesting to investigate in further research whether this use of SMs would yield the same result.

A second observation that can be made with regard to this study is that the results obtained here involve short-term effects. We do not know yet to what extent the exposure to SMs influences the longer-term cognitive construal of the test subjects. Needless to say, this is a crucial question for the practical usefulness of SMs.

In the third place, another topic that requires further research is the question why SMs did not have an effect on the retention of examples. One would expect that the SM offered a frame that could also be used as a reorganisation tool for the information contained in the examples, resulting in effects on their retention. One possible explanation for the lack of effect is that the information contained in the examples may not have been suitable for reorganisation on the basis of the frame structure offered by the SMs. As a matter of fact, it takes a number of reasoning steps to see the connection between fishing with long nets, or the use of pesticides and sustainability of food production. In that sense, the frames that were activated by the examples and by the SMs may have been too incompatible for the SM frames to have a reorganising effect on the information from the examples. Here again, further research, making use of examples that relate more straightforwardly to the frames offered by the SMs, may inform us further on the way SMs affect the (re)organisation of the information a subject has access to.

A final remark needs to be made about the relation between the results of this study and those of the earlier studies on SMs in communicating about sustainable food production that were carried out it the US, UK and France. As was pointed out earlier, the runaway train model, which seemed to work best in the US context, did not really work in France. As it turns out now, it does not seem to work in the Flemish context either. On the other hand, the retaining walls model that worked best in Flanders, was reported to work well in the UK as well. It is tempting to interpret this as a sign of a European—US difference,

suggesting a form of cultural dependency in the way framing works. It does not seem too far-fetched to assume that certain metaphors are embedded to a different extent within different cultures, causing differences in their efficacy as information (re)organisation tools. Or it could be that not the metaphor but the way the BALANCE scheme is framed differs between cultures, causing the SM that gives expression to certain aspects of that frame to work better in one culture than in the other. In that case, not the image of the runaway train, but the focus on control as a way to maintain balance could be what causes the runaway train model in the US to work. One should keep in mind, of course, that as it stands now, this link between framing through a SM and culture is pure speculation. As was pointed out earlier, the research methodology used in the US, France and the UK differed in a number of important ways from the methodology used in the present study. There is, therefore, no way of being certain that the difference between the effects of the models that is found now, would survive when the research in the US were to use the methodology developed in this study. What we are left with here is, again, a challenge for further research, in this case research into the relation between culture and framing effects.

All in all, the study presented here demonstrates both the power and the importance of an empirically rigorous methodology into the effect of framing. In the future, questions like the ones just mentioned can (and should) be decided on a more solid basis than theory and descriptive evidence alone.

References

Andor, Józef. 1985. On the psychological relevance of frames. *Quaderni di Semantica* 6. 212–221.

Aubrun, Alex, Andrew Brown & Joseph E. Grady. 2006. *Conceptualizing US food systems with Simplifying Models. Findings from TalkBack testing*. Report prepared for the FrameWorks Institute. http://www.frameworksinstitute.org/foodsystems.html [accessed 30 November 2009].

Aubrun, Alex, Andrew Brown & Joseph E. Grady. 2007. *Towards a cross-cultural Simplifying Model for food systems*. Cultural Logic LLC.

Aubrun, Alex & Joseph E. Grady. 2006. *Towards a cross-cultural Simplifying Model for food systems: Findings from French Talkback research*. Report commissioned by the King Baudouin Foundation. http://www.sustainablefoodlab.org/filemanager/filedownload/phpAYC6gg/CrossCultural-SimplifyingFood.pdf [accessed 30 November 2009].

Bateson, Gregory. 1972. *Steps to an ecology of mind*. New York: Ballantine.

Bednarek, Monika A. 2005. Frames revisited: The coherence-inducing function of frames. *Journal of Pragmatics* 37. 685–705.

Bhatia, Aditi. 2009. Discourses of terrorism. *Journal of Pragmatics* 41: 279–89.

Brown, Brian, Brigitte Nerlich, Paul Crawford, Nelya Koteyko & Ronald Carter. 2009. Hygiene and Biosecurity: The Language and Politics of Risk in an Era of Emerging Infectious Diseases. *Sociology Compass* 2 (6). 1–13.

Charteris-Black, Jonathan. 2005. *Politicians and Rhetoric: The Persuasive Power of Metaphor*. Palgrave Macmillan, New York.

Chilton, Paul. 2004. *Analysing political discourse*: *Theory and practice*. London: Routledge.

Cienki, Alan. 2007. Frames, idealized cognitive models, and domains. In Dirk Geeraerts & Hubert Cuyckens (eds.), *The Oxford handbook of cognitive linguistics*, 170–187. Oxford: Oxford University Press.

Croft, William. 2009. Connecting frames and constructions. A case study of *eat* and *feed*. *Constructions and Frames* 1 (1). 7–28.

Croft, William & D. Alan Cruse. 2004. *Cognitive linguistics*. Cambridge: Cambridge University Press.

Dirven, René, Roslyn Frank & Cornelia Ilie (eds.). 2001. *Language and ideology. Vol. 2: Descriptive cognitive approaches*. Amsterdam: John Benjamins.

Dirven, René, Roslyn Frank & Martin Pütz (eds.). 2003. *Cognitive models in language and thought: Ideology, metaphors and meaning*. Berlin & New York: Mouton de Gruyter.

Dodge, Kenneth A. 2008. Framing Public Policy and Prevention of Chronic Violence in American Youths. *The American Psychologist*. 63 (7). 573–590.

Evans, Vyvyan & Melanie Green. 2006. *Cognitive linguistics: an introduction*. Edinburgh: Edinburgh University Press.

Fairclough, Norman. 2003. *Analysing discourse: Textual analysis for social research*. London: Routledge.

Fillmore, Charles. 1977. Topics in lexical semantics. In R. W. Cole (ed.), *Current issues in linguistic theory*, 76–138. Bloomington: Indiana University Press.

Fillmore, Charles. 1982. Frame semantics. In The Linguistic Society of Korea (ed.), *Linguistics in the morning calm*, 111–137. Seoul: Hanshin.

Fillmore, Charles. 1985. Frames and the semantics of understanding. *Quaderni di Semantica* 6 (2). 222–254.

Fillmore, Charles. 1987. A private history of the concept 'frame'. In René Dirven & Günter Radden (eds.), *Concepts of case*, 28–36. Tübingen: Günter Narr Verlag.

Fillmore, Charles. 2006 [1982]. Frame semantics. In Dirk Geeraerts (ed.), *Cognitive linguistics: Basic readings*, 373–400. Berlin & New York: Mouton de Gruyter.

Geeraerts, Dirk. 2006. Methodology in cognitive linguistics. In Gitte Kristiansen, Michel Achard, René Dirven & Francisco Ruiz de Mendoza Ibáñez (eds.), *Cognitive linguistics: Current applications and future perspectives*, 21–49. Berlin & New York: Mouton De Gruyter.

Geeraerts, Dirk. 2010. *Theories of lexical semantics*. Oxford: Oxford University Press.

Geeraerts, Dirk & Hubert Cuyckens (eds.). 2007. *The Oxford handbook of cognitive linguistics*. Oxford: Oxford University Press.

Goffman, Erving. 1974. *Frame analysis*. New York: Harper and Row.

Gries, Stefan Th. & Anatol Stefanowitsch (eds.). 2006. *Corpora in cognitive linguistics. Corpus-based approaches to syntax and lexis*. Berlin: Mouton de Gruyter.

Holleman, Bregje C. & Henk L. W. Pander Maat. 2009. The pragmatics of profiling: Framing effects in text interpretation and text production. *Journal of Pragmatics* 41. 2204–2221.

Holmgreen, Lise-Lotte. 2008. Biotech as 'biothreat'? Metaphorical Constructions in Discourse *Discourse Society* 19 (1). 99–119.

Johnson, Mark. 1987. *The body in the mind. The bodily basis of meaning, imagination, and reason*. Chicago: The University of Chicago Press.

Kövecses, Zoltán. 2002. *Metaphor. A practical introduction*. Oxford: Oxford University Press.

Kristiansen, Gitte & René Dirven (eds.). 2008. *Cognitive sociolinguistics. Language variation, cultural models, social systems*. Berlin & New York: Mouton de Gruyter.

Lakoff, George & Mark Johnson. 1980. *Metaphors we live by*. Chicago: Chicago University Press.

Lakoff, George. 1987. *Women, fire and dangerous things. What categories reveal about the mind*. Chicago: Chicago University Press.

Lakoff, George. 1996. *Moral politics: What conservatives know that liberals don't*. Chicago, Illinois: University of Chicago Press.

Lakoff, George, Howard Dean & Don Hazen. 2004. *Don't think of an elephant! Know your values and frame the debate. The essential guide for progressives*. White River Junction, Vermont: Chelsea Green.

Levin, Irwin P., Sandra L. Schneider & Gary J. Gaeth. 1998. All frames are not created equal: a typology and critical analysis of framing effects. *Organizational Behavior and Human Decision Processes* 76. 149–188.

Li, Juan. 2010. Transitivity and lexical cohesion: Press representations of a political disaster and its actors. *Journal of Pragmatics* 42 (12). 3444–3458.

Nerlich, Brigitte, Brian Brown & Nick Wright. 2009. The Ins and Outs of Biosecurity: Bird 'flu in East Anglia and the Spatial Representation of Risk. *Sociologia Ruralis*. 49 (4). 344–359.

Nerlich, Brigitte, Craig Hamilton & Victoria Rowe. 2002. Conceptualising foot and mouth disease: The socio-cultural role of metaphors, frames and narratives. *Metaphorik.de* 2. http://www.metaphorik.de/02/nerlich.htm [accessed 30 November 2009].

O'Malley, Mary-Pat. 2009. Falling between frames: Institutional discourse and disability in radio. *Journal of Pragmatics*. 41. 346–356.

Petruck, Miriam R. L. 1996. Frame semantics. In Jef Verschueren, Jan-Ola Östman & Jan Blommaert (eds.), *Handbook of pragmatics*, 1–13. Amsterdam: John Benjamins.

Reddy, Michael J. (1993). The conduit metaphor: A case of frame conflict in our language about language. In Andrew Ortony (ed.), *Metaphor and thought*, 164–201. Cambridge: Cambridge University Press.

Rojo López, Ana María & María Angeles Orts Llopis 2010. Metaphorical pattern analysis in financial texts: Framing the crisis in positive or negative metaphorical terms. *Journal of Pragmatics* 42 (12). 3300–3313.

Schank, Roger C. & Robert P. Abelson. 1977. *Scripts, plans, goals and understanding*. New York: Wiley.

Stefanowitsch, Anatol & Stefan Th. Gries (eds.). 2006. *Corpus-based approaches to metaphor and metonymy*. Berlin: Mouton de Gruyter.

Tannen, Deborah. 1985. Frames and schemas in interaction. *Quaderni di Semantica* 6 (2). 326–335.

Tannen, Deborah. 1993. *Framing in discourse*. New York: Oxford University Press.

Van Dijk, Teun A. 2008. *Discourse and context. A sociocognitive approach*. Cambridge: Cambridge University Press.

Wodak, Ruth & Michael Meyer. 2009. *Methods of Critical Discourse Analysis*. London: Sage.