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Why do humans need to do battle? Social representations of alternative pest control approaches

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Abstract

Alternatives to synthetic pesticides are often presented by experts and policy makers as responses to citizens' concerns about these products. However, few studies have examined how these alternatives are conceptualized by citizens. Using social representation (SR) theory and focus groups, we examined SRs of biopesticides, biological control, and integrated pest management (IPM) among Canadian citizens. Strongly influenced by terminology at first, SRs were further elaborated through discursive interaction. The three concepts were differentially anchored according to the antinomies "natural versus man-made", "protection of, versus antagonism towards, Nature" and "protection of Nature versus economic survival". There is a symbolic parallel between biopesticides—and, to a lesser extent, biological control—and synthetic pesticides as human interventions antagonistic towards Nature. Conversely, the anchoring of IPM in an economic survival imperative paradoxically rehabilitates synthetic pesticides. Implications for communication about alternative pest control approaches are discussed.

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Introduction

Rachel Carson's *Silent Spring* (1962) brought about a paradigmatic change in the public's understanding of Man's influence on Nature. Five decades after she described the health and environmental risks associated with synthetic pesticides, these compounds remain among the most feared by citizens. Hence, considerable efforts have been invested to reduce the use of pesticides and develop alternatives which have less impact on human health and the environment (Organisation for Economic Co-operation and Development, 2009). Little is known, however, about how the general public conceptualizes these alternative approaches. Their social acceptability is more often asserted axiomatically, or inferred from the growing citizen and consumer support of organic agriculture, than empirically demonstrated.

Biopesticides and biological control are not very present in the media discourse in Canada, outside of specialized agricultural or gardening papers or programs. There are exceptions, such as the use of *Bacillus thuringiensis* in forestry (Anonymous, 1979, 1983), or more recently, its use for insect control (McIlroy, 1994; Proulx, 1994) or the proliferation of Asian beetles (*Harmonia axyridis*), a species introduced for the biological control of aphids (Curtis, 1995; Gingras, 2002). Integrated pest management is a polysemous concept even within the agricultural and environmental expert community (Bajwa & Kogan, 2002) and it is scarcely covered in general media. Hence, it can be assumed that these concepts are not widely known in the Canadian population; they are however conceptually linked to the highly salient and polemic issue of agricultural pesticides. There is thus ample ground for processes of meaning construction around these concepts, which led us to the use of SR theory as a theoretical framework to study their conceptualization among citizens.

1. Background

1.1 Alternative pest control approaches

The three pest control approaches are defined in variable ways in both scientific and legal discourse. The legal definition of biopesticides differs from country to country. In the

United States, the Environmental Protection Agency (EPA) has adopted the following definition:

> *[…] naturally occurring substances that control pests (biochemical pesticides), microorganisms that control pests (microbial pesticides), and pesticidal substances produced by plants containing added genetic material (plant-incorporated protectants) or PIPs (United States Environmental Protection Agency, 2011).*

whereas in Canada, the legal definition of biopesticides, currently under review, specifically excludes PIPs (e.g., Bt corn).

Similar difficulties emerge when it comes to defining biological control. A consensus has developed around the idea of using a "non chemical" method of biological control, such as the introduction of parasites, predators and pathogens (Huffaker, 1971, p. vii). However, some would restrict this approach to the use of living organisms, while others would also include physical control methods such as crop rotation, weeding, etc. (Vincent & Coderre, 1991). Translation adds to diversity: "biological control," evokes the mastery or the management of pests, whereas the French equivalent (*lutte biologique)* evokes a fight or a battle.[1]

As of 2002, there were 67 different definitions of integrated pest control or management (IPM) in documents emanating from NGOs, governments and scholarly publications (Bajwa & Kogan, 2002). The definitions either focus on the fact that IPM involves a combination of different techniques,

> *[…] It involves maximum reliance on natural pest population controls, along with a combination of techniques that may contribute to suppression- cultural methods, pest-specific diseases, resistant crop varieties, sterile insects, attractants, augmentation of parasites or predators, or chemical pesticides as needed (Council on Environmental Quality, 1972, cited in Bajwa & Kogan, 2002, pp. 4-5),*

that it is based on an understanding of the ecosystem,

> *[…] a structured approach to ecosystem management based on a general understanding of the ecology, uses and interactions of the plant species within it (Johnson, 1987, cited in Bajwa & Kogan, 2002, p. 9),*

or on its managerial dimension:

> *a decision support system for the selection and use of pest control tactics, singly or harmoniously coordinated into a management strategy, based on cost/benefit analyses that take into account the interests of and impacts on producers, society, and the environment (Kogan, 1998, p. 249).*

1.2 Social acceptability of pest control approaches

Studies on the perceived importance of food-related risks consistently report that synthetic pesticides are a medium to high source of concern for citizens (e.g. Hwang, Roe, & Teisl, 2005; Tucker, Whaley, & Sharp, 2006). There is little consensus in the risk perception literature about the influence of socio-demographic factors on the expressed level of concern about pesticides, apart from gender, women tending to express a greater concern with respect to pesticides (Dosman, Adamowicz, & Hrudey, 2001; Hwang, et al., 2005) and be less receptive to the use of chemicals for pest control (McNeil, Cotnoir, Leroux, Laprade, & Schwartz, 2010). Other factors, such as whether a consumer is "green" or holds "pro-environment" values, could have an even stronger influence on a citizen's assessment of the risks associated with pesticides than the citizen's gender, as observed by Frewer et al. (1998) with respect to the risks associated with transgenic crops.

A Danish qualitative study highlights that synthetic pesticides are depicted as an out-of-control, risky technology, associated with such expressions as "awful" or "poison" and with threats to groundwater, biodiversity, animals, plants and human health. This recognition of risks was somehow alleviated by respondents' feelings of social solidarity with agricultural producers and poor people depending on pesticides for food production (Jensen & Blok, 2008).

In a 2005 Canadian survey on biological control and biopesticides (McNeil, et al., 2010), respondents were supportive of pest control using cultural methods (84%), insects (73%), microbes (61%) or soap (56%), but were less receptive to the use of genetically modified resistant plants (47%) or chemicals (25%). A large majority (63%) felt that biological agents were preferable to chemical ones, with 54% asserting that the former were less harmful to the environment and 60% stating that they were less likely to be associated

with food poisoning risks than chemical products. These figures are somewhat contradicted by the fact that 41% of respondents also declared being concerned about consuming foods treated with biological agents such as useful microbes. Such a high percentage is in line with another survey, showing that 86% of Canadians are also concerned about microbial contamination of food (GlobeScan, 2003). Age, education, environmental-consciousness and interest in organic agriculture or modern agricultural technologies were positively correlated with favourable attitudes towards the use of microbes, insects and soaps (McNeil, et al., 2010).

Finally, in a survey conducted in the United States (Govindasamy, Italia, & Adelaja, 2001) respondents were not familiar with IPM, but viewed this approach favourably. Women, higher income households, youth, and people who purchase organic foods all indicated that they are willing to pay a premium of as much as 10% for produce if IPM was used as a pest control approach.

1.3 Social representation theory

Developed by Moscovici (1961) to describe the appropriation of psychoanalysis by a lay public, the concept of social representations (SRs) is the natural lens through which to examine the collective construction of a "common sense" regarding scientific and technical matters. SRs are forms of knowledge that are socially developed and shared, are geared to practical ends, and contribute to the construction of a common reality specific to a social group (Jodelet, 2003, p. 53). The qualifier "common" here means both "shared" and "vulgar," as in relating to the common people, the "vulgus." The common people in this case are in a position of "creative resistance" to scientific knowledge (Bauer & Gaskell, 2008). They recreate it in order to "make something unfamiliar […] familiar" (Moscovici, 1984b, p. 24).

The SR is characterized by a central figurative model, which captures the essence of the concept or idea represented (Moscovici, 1961). The SR is built up around this model via two key processes. *Anchoring* attaches the new object to pre-existing symbolic categories. The act of naming the object, of describing it using thematic metaphors or antinomies (na-

ture/culture, life/death, etc.), makes it possible to situate it with respect to others in a known context (Höijer, 2010; Olausson, 2011). *Objectification*—or ontologization (Olausson, 2011)—consists of making the new object tangible by associating it with images or examples illustrating its fundamental nature.

Scientific or technological objects are often inherently new, abstract, complex and sometimes controversial, characteristics sufficient to trigger their reconstruction in the form of SR (Mariotti, 2003), hence the popularity of SR theory as a framework for the analysis of the public understanding of such objects (Bauer & Gaskell, 2002; Gauthier, 2010; Höijer, 2010; Joffe & Lee, 2004; Olausson, 2011). The three pest management approaches analyzed in this study also have those characteristics. Although not innately controversial, they are conceptually related to the approach that they are designed to replace, namely the systemic use of synthetic pesticides, which in themselves are sources of contention between various groups, particularly synthetic pesticide users and synthetic pesticide opponents.

The collective construction of knowledge also assumes the existence of discussion within "groups," a concept whose definition depends on the analyst. One extreme describes a group as a fairly large category of people (Moscovici and Hewstone, 1983, p. 116), and the other describes it as a "reflexive group," namely one whose members are aware that they belong to the group and have criteria for determining who else belongs (Elejabarrietta, 1996; Wagner, 1995). In all cases, SRs play a role in the definition of the group as a social entity and establish points of consensus that ensure its cohesion (Moliner, 1993). As Moscovici states (2000, p. 62), "material from samples of conversations gives access to the social representations". This was the guiding principle behind our methodological choice, namely qualitative analysis of the discussions within reflexive groups, brought together as focus groups.

2. Methodology

2.1 Participant recruitment and selection

To ensure fluid communication, we recruited participants from pre-existing reflexive groups, namely a community choir and an organic produce purchasing group (ecomar-

ket) in an agricultural region of Canada (St-Hyacinthe, Quebec). The choice of the ecomarket was an attempt to attract participants with strong views in favor of organic agriculture or environmental protection.

Each of these organizations sent invitations to its members. The participants were selected with the goal of ensuring a certain diversity in the points of view within each group and observing the influence of factors and experiences relevant to the phenomenon under study (Lindlof & Taylor, 2010, p. 123). The persons interested in participating in the study were asked to specify their gender and age bracket, whether they worked on a farm, as well as whether they worked for a company producing or selling pesticides. We grouped the adult participants by gender and recruitment group, to facilitate the observation of inter-group differences based on gender or "pro-environmental values", making sure that each age bracket was represented in each group. None of the persons interested worked in the pesticide industry. During the discussions, we took note of participants who had not claimed to work on a farm during the selection process, but were familiar with agriculture for other reasons (gardeners, persons who had lived on a farm, persons associated with veterinary or agronomical organizations).

The composition of the groups is summarized in Table 1. In the results section, participants are identified by an individual code in which the first element designates the recruitment pool (C or E), the second element refers to the person's gender (M or F) and the third element is the individual's personal identification number. An asterisk indicates reported familiarity with agriculture.

Table 1: Composition of the four focus groups

	Gender	Age group	Familiarity with agriculture	
Recruitment pool			No	Yes
Choral group (C)	F	18 - 30	1	
		31 - 60	3	4
		61 <	1	
	M	18 - 30	1	1
		31 - 60	2	3
		61 <		1
Ecomarket (E)	F	18 - 30	2	2
		31 - 60		5
		61 <	2	1
	M	18 - 30	2	1
		31 - 60	2	2
		61 <		1

2.2 Focus groups and results analysis

The meetings lasted approximately 2 hours each and were held in French over a two-week period in October 2010 at a local hotel. A research team member served as facilitator. A semi-directed interview grid was used (Appendix 1) in which certain elements (italicized in Appendix 1) and a diagram (Appendix 2) were displayed on a screen. Participants were introduced to the three concepts, first on the basis of the terminology, then with a set of standard definitions. They were then asked to discuss the attributes of these three approaches. This process allowed us to observe initial impressions and then the gradual construction of SRs within each group. Transcripts of the discussions were submitted to a computer-assisted qualitative analysis. The basic data for SR analysis, i.e. examples, images, models, and verbal metaphors (Bauer & Gaskell, 1999), and the lexicon with which the participants associated the three concepts were used to identify the symbolic content of the representations and the anchoring and objectification processes at work within each group.

Moscovici (2000) pointed out the largely consensual nature of SRs. Without overlooking divergent elements, we sought to identify intragroup points of consensus, while exposing intergroup differences.

3. Results and discussion

3.1 Influence of terminology

After a preliminary exposure to the names of the three concepts, the participants quickly developed figurative models based either on the terminology or on prior knowledge. Except where stated otherwise, subsequently reading the definitions did not cause the participants to change the symbolic content of their drafts, but rather enabled them to elaborate on that content, to anchor and objectify it. Three antinomies in particular were used by the participants to categorize (anchor) the three concepts: natural versus man-made, protection versus antagonism towards Nature, and protection of Nature versus economic survival. With the exception of a few intergroup variations which we will outline below, no fundamental differences were observed between the SRs developed within the different focus groups.

3.2 Biopesticides: still pesticides

From the word "biopesticides," the participants quickly picked out the term "pesticides," which they associate—in the case of the ecomarket groups—with "compounds that destroy living things". This word served as the basis for the figurative model; the degree to which it was negatively connoted depended on the group. Hence, the aversion to synthetic pesticides was more marked in the ecomarket groups (see below) than in the choir group, which spoke more of controlling "harmful" or "undesirable" organisms.

> *EM43 […] the only thing that comes to mind is pesticide, which to me means something that's harmful to the environment.*

> *EF10* I really dislike the term pesticide because I associate it with pests! Laughter To me pesticides destroy living things which surely have a reason for being there.*

Some participants then elaborated on the prefix "bio", saying it was overused and misleading.

> *EF10* "Bio" is used to describe many things; I don't like the term bio-opesticide because I get the impression that it's a bit of a cheat. It involves killing, but killing with living things.*

> *EM55* Just because it's organic doesn't mean it's less harmful than synthetic pesticides.*

Others (CH45*, EM18*) thought it referred to biotechnology, which could indicate that the inclusion of PIPs---such as Bt corn--- among the legal category of biopesticides in the United States has permeated the public discourse on biopesticides.

For others, this prefix reduced the negative charge associated with pesticides. The prefix's modulating effect was expressed through the use of attributes such as "organic," (see Note 1)"biological," "positive," "natural," "less harmful, less destructive" or "not chemical" to describe biopesticides.

> *CF25 […] first of all, I think of a pesticide as a product used to eliminate insect pests on crops. So, most of the time it's a chemical product, so a biopesticide would be a product that's organic and would have a similar effect.*

From the outset, biopesticides were associated with synthetic pesticides, likely because of their similar names, though a number of participants said that they did not know what a biopesticide was. After reading the definition of biopesticide, the participants consolidated this figurative model by drawing a parallel between the use of synthetic pesticides and the use of biopesticides, implying a parallel between the risks they entail. They pointed out that these two categories of compounds are likely to cause the same types of environmental and human health problems.

> *EF48 It's labelled as "an alternative to synthetic pesticides." This suggests that it should be used in the same way as a synthetic pesticide, right? And is therefore harmful?*

> *EF6 […] Personally, I still have a concern about biopesticides, that one day we'll see an imbalance that will have been caused with those products, even if they are natural in origin. They're still products that disrupt the ecosystem.*

Members of the male ecomarket group were, however, more concerned about the risks associated with synthetic pesticides. In the female choir group, it was pointed out that synthetic pesticides and biopesticides both originate in the laboratory:

> *CF14* I tend to think of something that is prepared in a laboratory, that probably comes from a living organism but has also been manipulated in order to be useable as a pesticide.*

> *CF47* If it's something that's been tampered with in the laboratory, I'm not comfortable with that; I think that humans still don't know enough about other living beings, regardless of what sort of bug it might be […]*

Finally, gardeners from the male choir group were the first to raise the issue of efficacy, thus establishing another type of parallel between synthetic pesticides and biopesticides: both are expected to "do the job" (CM22*).

The participants therefore consider biopesticides, just like synthetic pesticides, to be tools for fighting Nature—one participant suggested the term "biocombattant", or biofighter (EF10*). At the same time, the participants said that biopesticides "may" be more natural and involve less risk. Certain examples (plant extracts, diatomaceous earth, soap) actually tended to objectify them as harmless compounds. Other analogies (Asian beetles, biotechnology), as well as the use of the metaphor of the sorcerer's apprentice, portrayed them as compounds produced or selected by humans, thus creating distrust.

> *CM12 […] We used it [Asian beetle] to control a certain aphid or something, but the insect survived our winters and, like, multiplied, and then we suddenly had an infestation of it.*

> *EM46* […] it's easy to play the sorcerer's apprentice, but at the end of the day you end up with something worse than the original problem. […] Does the new predator have its own predator to keep it in check?*

> *EM18* […] The words are so charged and open to interpretation […] the same could happen with transgenic plants, where a gene is inserted in the plant to kill a certain insect. […] it's catastrophic.*

3.3 "Lutte biologique": a troubling terminology

In French, the two terms that constitute the concept of biological control ("lutte" and "biologique") evoke the idea of a "battle" on one hand and that of "life" or "organic" (see Note 1) on the other. Interestingly, associations with one or the other of these ideas among participants were gender-based. In the women's groups, the figurative model of the representation was battle, combat. In the men's groups, it was life, the ecosystem.

Battle imagery was omnipresent in the female groups' discussions of biological control. This imagery, as well as the perceived contradiction between prefix and suffix, was troublesome to these groups.

> *CF47* […] I see the battle as a confrontation.*
>
> *CF51 Like a duel!*
>
> *EF33 I see a big plough that's spewing stuff out and people wearing masks! Laughter Like something in a war!*
>
> *EF36 I also have a problem with associating "bio," which is supposed to be something good, with the idea of a battle, which is really about destruction. I don't see how you can destroy something bad with something good.*

Some female participants spontaneously tried to soften the aggressiveness of the term "battle" by referring to plants "defending themselves" or by using alternative terms, such as "control" and "partnership":

> *CF54* It's as though the organism in question is able to defend itself naturally and fend off predators on its own if the right elements are present […]*
>
> *EF10* I wonder why they always use the term "lutte" or combat… Why not look at it as a partnership? If beetles are used to destroy aphids, why not look at the beetle as our partner [...]? We're not fighting, we're joining forces with something else to achieve an end [...]*

In the men's groups, the idea of doing battle seemed less troublesome. They focused on a natural struggle within an ecosystem. In this context, biological control was presented as a normal part of Nature,

> *EM46* [...] I see a struggle, in the Darwinian sense, where species are competing with one another, and out of that struggle a balance emerges.*
>
> *EM26* I get the impression that they're using biology, meaning predators, life cycles, to fight certain things.*
>
> *or as a fight between "living" entities (and their components, such as genes), as opposed to synthetic products. Here, too, the softening concept of self-defence is used:*
>
> *EM18* Things such as companion planting, anything that already exists in nature and using these things more effectively to combat harmful species […]*
>
> *CM12 [...] hybrids are becoming increasingly common – this allows the plant to defend itself with its own genetic resources.*

After the definition was read out, the ecomarket women pointed out that some degree of struggle against Nature is implicit in the activity of agriculture, which is subordinated to a food security imperative.

> *EF5* […] For sure agriculture by definition isn't really natural. We're trying to control our environment, so it's to be expected that there are going to be things we have to fight against in that environment.*
>
> *EF49* […] all over the place we're coming back to those ancient methods and adapting them for modern times. But the major factor is that today you have to produce on a large scale to feed the whole world.*

The reading of the definition caused all groups to reposition biological control as "natural" and place more emphasis on the fact that it uses natural unprocessed materials, as opposed to biopesticides, which are processed by humans.[2]

> *EF49* I think that biological control will contribute a lot more to the environment and the Earth because it's a raw product: it's actual insects. Whereas a biopesticide is not a synthetic pesticide, but it still undergoes processing.*

Furthermore, it was noted that biological control also uses a variety of different techniques—examples given included onions, rhubarb extracts, birds, insects and mites, hand weeding, and burning—giving it a holistic connotation.

> *EF5* It's not just a method, it's a set of methods. So it seems more balanced to me. […] it's seeing the big picture of the issue to try to resolve it as naturally as possible, in quotation marks.*

Participants in the female choir group wondered whether physical methods such as crop rotation were included under the heading of biological control, an indication of the terminological confusion referred to earlier (see Background). The definition we had chosen restricted biological control to the use of living organisms.

The choice of species to control pests was, however, presented as a process of trial and error. The potential for slip-ups—particularly during large-scale application —was objectified by the Asian beetle and other invasive species not necessarily related to agriculture: zebra mussels and rabbits (Australia). To the choir women, the foreign origin of the Asian beetle was antithetical to the idea that biological control methods are traditional and in keeping with the natural order of things.

> *CF15 I think that our ancestors were already doing these kinds of things. […] The difference is that they weren't importing insects from just anywhere – they were using things that were present in their environment.*

> *CF54* […] it's OK because the insects are already there. But importing something from somewhere else, that can be a disaster.*

In the ecomarket men's groups, this approach was seen more like a scientific treatment and elicited analogies to medicine.

> *EM26* […] It's clear that they've drawn their inspiration from the past, but there's still research behind it all […] as a member of the public I want to make sure that the scientists have really done their research, that their knowledge is solid, and that these methods can be implemented without risk.*

> *CM23 […] Biological control […] makes me think of oncology, or cancer treatment. When you receive chemotherapy, good cells also get destroyed.*

In summary, the representation of biological control was symbolically centred on a model of a confrontation. Although the aggressive connotation was emphasized at first, especially among female participants, this battle was increasingly anchored as intrinsic to Nature, with images of Darwinian struggles and natural predators. The participants consid-

ered biological control more "natural" than, and separate from, biopesticides. On the one hand, they said that the compounds and living organisms that they associated with biological control undergo "little processing," unlike biopesticides. On the other hand, the use of a variety of methods seemed more compatible, in their view, with the complexity of natural balances than the unilateral application of a single method. Despite everything, an ambivalence persisted regarding the "naturalness" of biological control. The participants drew a parallel between the use of traditional pest control methods and the introduction of alien species symbolizing, by contrast, scientific or exogenous intervention in Nature.

3.4 IPM: moderate and diverse

Terminology also influenced the construction of the SR of IPM. In the women's ecomarket group, the term "integrated pest management" initially triggered a renewed debate on the semantic implications of the word "lutte" (battle).

> *EF48 [...] there's that word again! [...] where do humans fit in all of this? Why do humans need to do battle?*

But in that group, as in others, the participants particularly sought to construct a common sense around the word "integrated":

> *EM9 […] battle, we know it's a defence, it's a combat, but integrating, integrating… it's internal… Maybe it is a battle, maybe it's within the element […]*

> *CF25 The plant grows, then it struggles, because of that it's, like, integrated, a part of the plant's progress, its life.*

Some participants in the ecomarket groups, who were manifestly more familiar with this concept, proposed a model based on observation and control of Nature through targeted actions.

> *EF49* It means fully grasping what we're trying to do in agriculture […] it's being able to properly manage, control and understand the control process we're using against those insects.*

> *EM18* […] we'll treat it in a focused way, only if there's a serious enough infestation, not treat it "at large". It's not preventive, it's more curative.*

After the definition was read, the discussions in all groups converged on a common figurative model based on the attributes of moderation (i.e. slight antagonism towards Nature), diversity and efficacy.

> *CF13* […] it basically incorporates all the solutions that are possible and that are as little aggressive as possible…*

> *CF24 But including the possibility of looking for something similar that's a little more invasive, that's synthetic […].*

Note that by this stage in the discussion, the need for pest management was accepted in all groups. Participants cited the realities faced by the agricultural producers present in the ecomarket groups and, to a lesser extent, by the gardeners in the choir groups, to illustrate this need and seek the solidarity of the group members.

> *EF27* […] at some point you have to be realistic, and if a woman's artichokes get eaten, well, that wipes out her yield; at some point, all you can do is fight against the natural predator. You have to act.*

> *EF5* [if] we were suddenly told, "Well you're not safe, in 48 hours you might lose all your revenue for the entire year if you don't make the right decision!" Well then! We might be inclined to use pesticides too, telling ourselves that we have to have something left in our pockets at the end of the year.*

IPM was thus also anchored as a tool for solving practical problems and ensuring the economic survival of agricultural producers and, in turn, global food security.

> *CM17* I don't know what I would do if I were a farmer, but I have a huge garden. […] Even if you lose a bit, your life doesn't depend on your little garden, it doesn't matter. But I'd be in trouble. You know, leek moths appear here, then there… then no more leeks.*

> *EF10 Farmers themselves aren't thrilled about hosing down their whole fields with something smelly […] But they have to making a living. It's their livelihood, and it's also a service they're rendering to humanity.*

> *CF54* Five percent of farmers in the population are feeding one hundred percent of the population […] Five percent!*

In terms of efficacy, all of the groups saw a difference between IPM and biological control, which was considered utopian:

> *EF6* […] I don't think it's possible to feed the same number of people with the same land area using only biological control methods. The rational approach, in my view, is integrated pest management, even if one's heart isn't in it completely!*

Lastly, some participants viewed IPM as a gentle transition towards more environmentally-friendly farming methods.

> *CF53 Perhaps integrated pest management is a more gentle means of moving from chemical methods to biological methods [...] A way to do it gradually [...] I feel that there is an element of respect in that word.*

Others, particularly in the ecomarket groups, rejected the idea of IPM as a compromise, as contrary to the idea of a pesticide-free agricultural model. Instead, they saw IPM as a slippery slope towards the abandonment of organic farming methods.

3.5 Synthetic pesticides: a reference point

From the outset, the participants used synthetic pesticides as a reference point. Synthetic pesticides were often described indirectly when comparisons were being made with the other concepts. Biopesticides were thus described as "less destructive" than synthetic pesticides, as "not chemical" (CF51).

Pesticides initially had a negative connotation, which was consistent with the observations of Jensen and Blok (2008). They were described as intrinsically "harmful" and "harmful to the environment," as "killing life." They were categorized as contaminants (Douglas, 1966), both in terms of health, by being associated with disease (the plague), poison (mercury, oil), contamination of breast milk via the food chain, and in terms of morality, by being associated with "greed for money". This negative connotation tainted biopesticides by association, since biopesticides were connected with synthetic pesticides by terminology, usage and, to a lesser extent, tainted biological control, which involved exogenous intervention in Nature.

However, the fact that IPM was anchored in agricultural producers' economic survival imperative not only rendered it acceptable to the participants, but led to a remarkable rehabilitation of synthetic pesticides, owing to their efficacy. They have "proved them-

selves, they're targeted" (CM12), their use is controlled (CF24), they are used "less and less" (CM45*).

> *EM9 […] people are starting to become aware of past mistakes. And, obviously, biology can't fight every single disease. […]*

Even their harmfulness was cast in doubt.

> *EF8* They'll say, "It causes cancer". Will it really do that? We don't know! We rely on tests, we rely on things like that, but up to what point?*

Thus, with the objectifying examples used with respect to pesticides, there was a shift from poisons to remedies that are sometimes vital to a cure.

> *EF6* I would compare this to human health. We want to eat well, we take supplements, eat natural foods, and all that. But in the back of our minds, as a last resort if a problem gets worse, we also tell ourselves: "I can always get a prescription for antibiotics." For me, it's the same thing. Farmers know that they have a final, ultimate weapon if they're at risk of losing everything.*

3.6 Gender and pro-environmental values

Finally, we observed gender-based variations in the conceptualisation of the three pest management approaches, for example the perceived aggressiveness of the concepts of biological control and IPM; however, no marked differences were observed between female and male groups with respect to acceptance or rejection of these approaches. Similarly, the choice of the ecomarket as a recruitment pool was an attempt to attract participants with strong views in favor of organic agriculture or environmental protection. In fact, the desire to protect Nature against human intervention was well distributed among participants in all groups; our experimental design did not allow us to observe any intergroup differences in the "pro-environmental values" of participants.

Conclusion

This study points to a few important considerations for future communications strategies about alternative pest management approaches. First, terminology had a strong and lasting influence on the construction of SRs, which means that subsequently gained knowledge (in this case, the reading of a definition) did not change them very much. Hence, the term “biopesticides” lends itself to analogies to their synthetic counterparts. Similarly, the French terminology for biological control and IPM conveys an aggressiveness that may contradict their environmental purposes in the mind of consumers. The technical aspects -- which largely dominate in expert debates surrounding terminological choices or definitions of alternative pest management approaches -- should not overshadow the influence of the selected terms on the conceptualisation and acceptance of such approaches by the public. The impact of alternative terms on the SRs of pest management approaches remains to be empirically validated.

Secondly, this study reveals a seeming paradox. On the one hand, citizens recurrently associate synthetic pesticides with health and environmental risks. On the other hand, biopesticides are the result of major research efforts to develop alternatives to synthetic pesticides, whereas biological control uses no synthetic pesticides. Yet the representations of these two concepts constructed by the citizens are similar in many ways to their representation of pesticides. In other words, the positioning of these concepts as desirable, natural alternatives to synthetic pesticides does not erase their symbolic kinship with the latter. The common denominators that citizens establish between pesticides, biopesticides and biological control agents—whether based on terminology, usage, application method, origin in the laboratory, or antagonism towards Nature—reinforce the idea that these approaches, like any other intervention in the natural order of things, involve risks. Our results confirm Macnaghten and Guivant’s observation (2011) that the idea of slip-ups seems intrinsically bound up with the language citizens use when talking about technologies, at least in certain industrialized countries.

Thirdly, in this study, representations of IPM are anchored in the economic necessity for measured human intervention in the natural order. This leads us to conclude that the

public acceptance of alternative pest control approaches rests on prior recognition of the necessity of pest control itself, i.e. on recognition of the economic survival imperatives of agricultural producers and, by extension, of food security. Our observations are consistent with those of Jensen and Blok (2008) regarding the link between solidarity with agricultural producers and the social acceptability of pesticides. Our experimental design (pre-existing groups, in which some members were users of pest management methods, i.e. gardeners and agricultural producers, in an agricultural region of Canada) likely even facilitated the expression of this solidarity and increased its impact on the construction of the representations. The impact of this solidarity with agricultural producers on persons without direct ties to them, e.g. residents of large urban centres, remains to be verified. Potential communication strategies regarding biopesticides, for example, could emphasize the limited options available for organic agricultural producers who want to protect their crops, before positioning them as compounds that are less harmful to human health and the environment than synthetic pesticides. Furthermore, pest management methods should be presented as part of a global, diversified approach that citizens feel is more compatible with the complexity of natural ecosystems.

[1] In French, the term biologique also refers to *agriculture biologique* or *agriculture bio* (organic agriculture).

[2] This distinction was made despite the graphic representation of biopesticides as part of biological control (Appendix 2).

Bibliography

Anonymous. (1979, May 5). Natural killer, *The Globe and Mail*, p. B3.

Anonymous. (1983, Dec 19). Quebec to battle bugs with biological spray, *The Globe and Mail*, p. 8.

Bajwa, W. I., & Kogan, M. (2002). Compendium of IPM definitions (CID). What is IPM and how is it defined in the worldwide literature? (pp. 15). Corvallis, OR: Oregon State University.

Bauer, M. W., & Gaskell, G. (1999). Towards a paradigm for research on social representations. *Journal for the Theory of Social Behaviour, 29*(2), 163-186.

Bauer, M. W., & Gaskell, G. (2002). *Biotechnology. The making of a global controversy*. Cambridge: Cambridge University Press.

Bauer, M. W., & Gaskell, G. (2008). Social representations theory. A progressive research programme for social psychology. *Journal for the Theory of Social Behaviour, 38*(4), 335-353.

Curtis, M. (1995, Oct 28). They're here, there and everywhere! Ladybugs invade to cuddle up for winter, *Times - Colonist*, p. 1.

Dosman, D. M., Adamowicz, W. L., & Hrudey, S. E. (2001). Socioeconomic determinants of health- and food safety-related risk perceptions. *Risk Analysis, 21*(2), 307-317.

Douglas, M. (1966). *Purity and danger. An analysis of the concepts of pollution and taboo*. London: Routeledge and Kegan Paul.

Elejabarrietta, F. (1996). Le concept de représentation sociale. In J.-C. Deschamps & J.-L. Beauvois (Eds.), *Des attitudes aux attributions. Sur la construction de la réalité sociale* (pp. 137-150). Grenoble: Presses universitaires de Grenoble.

Frewer, L. J., Howard, C., & Aaron, J. I. (1998). Consumer acceptance of transgenic crops. *Pesticide Science, 52*(4), 388-393.

Gauthier, É. (2010). Social representations of risk in the food irradiation debate in Canada, 1986-2002. *Science Communication, 32*(3), 295-329.

Gingras, P. (2002, Apr 27). Une arme biologique pas encore au point, *La Presse,* p. J13.

GlobeScan. (2003). Food Issues Monitor International Report.

Govindasamy, R., Italia, J., & Adelaja, A. (2001). Predicting willingness-to-pay a premium for integrated pest management produce. A logistic approach. *Agricultural and Resource Economics Review, 30*(2), 151-159.

Höijer, B. (2010). Emotional anchoring and objectification in the media reporting on climate change. *Public Understanding of Science, 19*(6), 717-731.

Huffaker, C. B. (1971). *Biological control. Proceedings AAAS Symposium on Biological Control*. New York: Plenum Press.

Hwang, Y.-J., Roe, B., & Teisl, M. F. (2005). An empirical analysis of United States consumers' concerns about eight food production and processing technologies. *AgBioForum, 8*(1), 40-49.

Jensen, M., & Blok, A. (2008). Pesticides in the risk society. The view from everyday life. *Current Sociology, 56*(5), 757-778.

Jodelet, D. (2003). Représentations sociales. Un domaine en expansion. In D. Jodelet (Ed.), *Les représentations sociales* (7 ed., pp. 47-78). Paris: Presses universitaires de France.

Joffe, H., & Lee, N. Y. L. (2004). Social representations of a food risk. The Hong Kong avian bird flu epidemics. *Journal of Health Psychology, 9*(4), 517-533.

Kogan, M. (1998). Integrated pest management. Historical perspectives and contemporary developments. *Annual Review of Entomology, 43*(1), 243-270.

Lindlof, T. R., & Taylor, B. C. (2010). *Qualitative communication research methods*: SAGE Publications.

Macnaghten, P., & Guivant, J. S. (2011). Converging citizens? Nanotechnology and the political imaginary of public engagement in Brazil and the United Kingdom. *Public understanding of science, 20*(2), 207-220.

Mariotti, F. (2003). Tous les objets sociaux sont-ils objets de représentations sociales? Questions autour de la pertinence. *JIRSO, 1*(1).

McIlroy, A. (1994, Jul 14). Scientists put the bite on bugs, *Calgary Herald,* p. A5.

McNeil, J., Cotnoir, P. A., Leroux, T., Laprade, R., & Schwartz, J. L. (2010). A Canadian national survey on the public perception of biological control. *BioControl, 55*(4), 445-454.

Moliner, P. (1993). Cinq questions à propos des représentations sociales. *Les cahiers internationaux de psychologie sociale, 20,* 5-14.

Moscovici, S. (1961). *La psychanalyse, son image et son public*. Paris: Presses Universitaires de France.

Moscovici, S. (2000). *Social representations. Explorations in social psychology*. Cambridge: Polity Press.

Olausson, U. (2011). “We're the ones to blame”. Citizens' representations of climate change and the role of the media. *Environmental Communication: A Journal of Nature and Culture, 5*(3), 281-299.

Organisation for Economic Co-operation and Development. (2009). OECD Strategic Approach in Pesticide Risk Reduction Retrieved March 14, 2012, from http://www.oecd.org/officialdocuments/displaydocumentpdf/?cote=env/jm/mono(99)7&doclanguage=en

Proulx, D. (1994, May 16). Moustiques, *La Presse,* p. B1.

Tucker, M., Whaley, S. R., & Sharp, J. S. (2006). Consumer perceptions of food-related risks. *International Journal of Food Science and Technology, 41*(2), 135-146.

United States Environmental Protection Agency. (2011). Regulating Biopesticides Retrieved March 14, 2012, from http://www.epa.gov/pesticides/biopesticides

Vincent, C., & Coderre, D. (1991). *La lutte biologique*. Boucherville, Québec: G. Morin.

Wagner, W. (1995). Social representations, group affiliation, and projection. Knowing the limits of validity. *European Journal of Social Psychology, 2*, 125-140.

Appendix 1

Discussion grid

Part I

I'll mention a term and I want you to tell me what it evokes for you. It doesn't matter if you're not familiar with these terms. What we want are your impressions.

1a. What does the term "biopesticide" evoke for you? Follow-up question: Have you heard this term before? Does it evoke something negative or something positive for you?

1b. What does the term "biological pest control" evoke for you? Follow-up question: Is it positive or negative? Is it the same thing as a biopesticide or is it something different?

1c. The last term is "integrated pest management." What does this term evoke for you?

Part II

I'm going to read a definition of the term pesticide. *A pesticide* is a *product used to control harmful organisms, such as insect pests, weeds, plant diseases and rodents*. In agriculture, these organisms constitute a significant economic threat since they can damage crops. In some cases, they are also harmful to the health of animals and humans. Today, I'm also going to use the term "synthetic pesticide" to describe the kinds of industrial chemicals that are most commonly used as pesticides.

2a. Now I'm going to read you a definition of the term biopesticide: *A biopesticide* is a *product of organic origin that is used to control harmful organisms; they are used as an alternative to synthetic pesticides in order to reduce environmental risks*. Many biopesticides are microorganisms such as bacteria, viruses or fungi. Others are plant or insect extracts or substances, such as soaps or diatomaceous earth, that have been approved as biopesticides by Health Canada.

In Canada, the legal definition of biopesticides includes microorganisms that already exist in nature and microorganisms that have been genetically modified. Some international researchers are working to develop genetically modified microbes as biopesticides. According to our research team, none is currently being used as an agricultural biopesticide anywhere in the world and none is expected to be used in Canada in the medium term. Therefore, we would ask you to answer without taking this possibility into consideration. What does the term biopesticide evoke for you now? Follow up question: Has your initial impression changed?

2b. Now let's talk about biological control. *Biological control is the use of living organisms or products derived from living organisms to control harmful organisms; they are used as an alternative to synthetic pesticides in order to reduce environmental risks*. In other words, biological control consists of using the natural enemies of weeds and insect pests. These may be insects or parasites that prey on the organisms one wants to destroy, or they can be plants, birds, or microbial biopesticides such as viruses or bacteria. In agriculture, biological control also includes techniques such as crop rotation or companion planting but does not include synthetic pesticides.

What does this definition of biological control suggest to you?

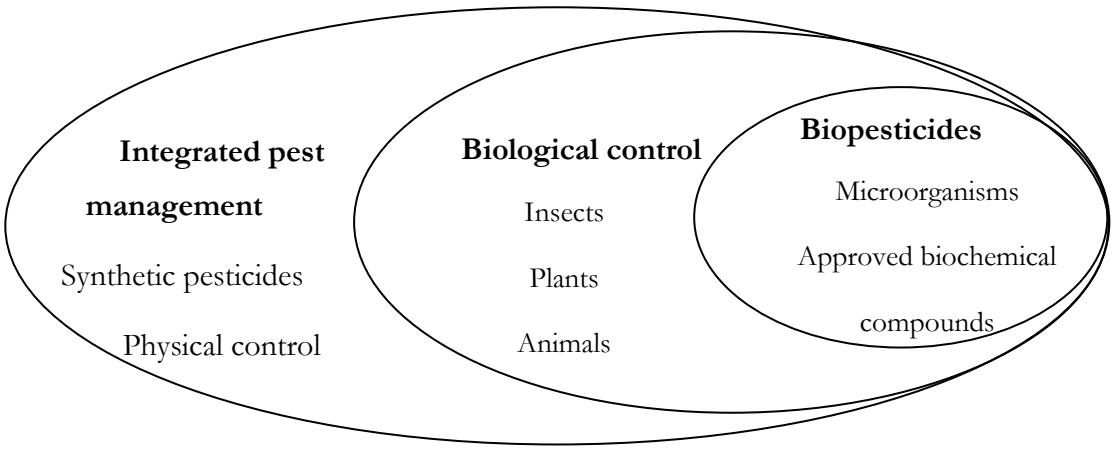
2c. Our last term is integrated pest management. *Integrated pest management involves the use of all appropriate methods to control harmful organisms in a manner that reduces risks to the environment*. In other words, integrated pest management involves the strategic use of all available means of controlling harmful organisms in a specific context; it does not seek to eradicate these organisms completely, but rather to keep the damage they cause below an economically acceptable nuisance threshold. It primarily uses biological control methods, biopesticides and, on occasion, physical control methods, which can include crop rotation and mulching. In integrated pest control, synthetic pesticides are used as a last resort.

What does this definition of integrated control suggest to you?

2d. Can you tell me which of these three methods you prefer: biopesticides, biological control or integrated pest management? Which would be your second choice? As for the method you like the least, what sorts of changes would make it more acceptable to you?

Appendix 2

Diagram



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