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Stakeholder attitudes towards cumulative and aggregate exposure assessment of pesticides

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ABSTRACT

This study evaluates the attitudes and perspectives of different stakeholder groups (agricultural producers, pesticide manufacturers, trading companies, retailers, regulators, food safety authorities, scientists and NGOs) towards the concepts of cumulative and aggregate exposure assessment of pesticides by means of qualitative in-depth interviews (n = 15) and a quantitative stakeholder survey (n = 65). The stakeholders involved generally agreed that the use of chemical pesticides is needed, primarily for meeting the need of feeding the growing world population, while clearly acknowledging the problematic nature of human exposure to pesticide residues. Current monitoring was generally perceived to be adequate, but the timeliness and consistency of monitoring practices across countries were questioned. The concept of cumulative exposure assessment was better understood by stakeholders than the concept of aggregate exposure assessment. Identified pitfalls were data availability, data limitations, sources and ways of dealing with uncertainties, as well as information and training needs. Regulators and food safety authorities were perceived as the stakeholder groups for whom cumulative and aggregate pesticide exposure assessment methods and tools would be most useful and acceptable. Insights obtained from this exploratory study have been integrated in the development of targeted and stakeholder-tailored dissemination and training programmes that were implemented within the EU-FP7 project ACROPOLIS.

1. Introduction

The use of chemical pesticides has been a standard practice in European conventional agriculture (European Commission, 2007). Use of pesticides increases the yields of agricultural crops by protecting them against weeds, pests and diseases (Oerke and Dehne, 2004; European Commission, 2007). However, pesticides could also have undesirable effects on humans and on the environment (European Commission, 2007; Damalas and Eleftherohorinos, 2011), which is a major issue of concern for the general public (Verbeke et al., 2007), the involved food chain actors and stakeholders and hence also the European Commission (EC). Pesticides have been found to be the top concern in the largest number of countries in the European Union (EU) as compared to other food-related hazards (European Commission, 2010). A recent study indicated that pesticide residues are ranked among the top-three food safety issues of concern by a wide variety of stakeholders involved in the fresh food supply chain (Van Boxstael et al., 2013). In line with this, the European Food Safety Authority (EFSA) identified pesticides as one of its major thematic areas for risk communication and flagged increasing stakeholder participation in the risk assessment process as a priority area (Gassin, 2013). The objective of this study is to evaluate stakeholder attitudes and perceptions towards cumulative and aggregate pesticide exposure assessment by means of a qualitative and a quantitative study within ACROPOLIS, an EU-funded research project that aims to improve current risk assessment strategies for pesticides in Europe. According to Erdem et al. (2012), the investigation of perceptions of different stakeholder groups, when done at an early stage of strategy development (pesticide risk assessment strategies and related methods and tools in our case) can provide useful insights to support policy and other decision makers.

All active substances, which are the essential components of the pesticides are evaluated at the level of the EU by means of a detailed risk assessment before being introduced in the market. The EC approves the use of crop protection products if it has been scientifically proven that the products have no harmful effect on consumers, farmers, local residents and bystanders; the products do not cause unacceptable effects on the environment; and the products are sufficiently effective against pests (European Commission,

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2009a). To protect consumers from unacceptable high levels of pesticide residues in their food, the EC has set maximum residue levels (MRLs) (European Commission, 2009b) in its Regulation (EC) No 396/2005 and farmers are requested to apply pesticides following the guidelines of good agricultural practice (GAP).

Several deterministic and probabilistic consumer exposure assessment studies show that the chronic exposure of adult European populations to pesticide residues from fruit and vegetable consumption is generally under control (i.e. several times lower than the Acceptable Daily Intake or ADI) (e.g. Claeys et al., 2011; Nougadere et al., 2012). Nevertheless, public opinion surveys reveal a continued high level of concern about the possible adverse health impact of the use of pesticides and the possible presence of pesticide residues on food products (Rutsaert et al., 2013). The Eurobarometer study on food-related risks (European Commission, 2010) reported that consumers who are concerned about possible food-related risks tend to worry more about chemical contamination of food than about bacterial contamination or health and nutrition issues. The presence of pesticides and chemical and toxic substances was the most common concern. Pesticide residues were spontaneously mentioned as a major concern by 19% of the European Union (EU) citizens. "Pesticide residues in fruit, vegetables or cereal" was reported as the highest concern with more than 70% of the EU citizens reporting to be concerned about this issue (31% very worried and 41% fairly worried). Comparing the 2010 with the 2005 Eurobarometer surveys, it was observed that EU citizens were even more concerned about pesticide residues in 2010 (an increase of 4% points since 2005) as compared to 5 years before (European Commission, 2010).

Individuals may be exposed simultaneously to several chemicals and through several routes. However, current risk assessment practice might not sufficiently account for the so-called cocktail effect resulting from cumulative and/or aggregate exposure. Cumulative exposure is the exposure to a group of pesticides that contribute to a common effect on human health (e.g. Jensen et al., 2013). Aggregate exposure is the exposure to a single chemical through all relevant routes and relevant sources of exposure. The lack of a harmonised and recognised methodology to address the cumulative and aggregate risk assessment is a concern to many stakeholders and policy makers. Several authorities acknowledge the need to address cumulative risks. For example, U.S. authorities require cumulative risk to be considered (USA Food Quality Protection Act of 1996). The European Regulation EC 396/2005 also requires cumulative exposure assessment if Minimum Risk Levels (MRLs) are set. Although EFSA published a guidance document in 2012 on the use of probabilistic modelling for dietary exposure assessment of single and multiple active substances (EFSA, 2012), current European risk assessment procedures still evaluate chemicals separately and the issue of multiple residues remains unaddressed pending the adoption of a commonly agreed methodology.

Furthermore, the existing consumer concerns in combination with targeted campaigns by non-government or consumer organisations (NGOs) have led a number of major food retailers to introduce stricter (than legal) criteria on pesticide residues, also called secondary standards. Although such secondary standards are not legally binding, producers are virtually obliged to comply to what has become an unofficial kind of licence to produce and right to engage in national and international trade. While stakeholders are generally aware of the complexity associated with multiple residues, the present uncertainty and lack of communication by food safety authorities increases the pressure to adopt similar secondary provisions throughout the food supply chain. As a result, producers and suppliers are faced with different specifications regarding multiple residues which are increasingly hard to cope with and cancel out the positive effects from the harmonisation of MRLs. As a consequence, food safety risks become an instrument of competition and differentiation between retailers whereas it should be an instrument of protection for consumers. In general, the lack of consumer confidence has had – and will likely continue to have – potential detrimental effects on the consumption of fruit and vegetables (Rutsaert et al., 2013), despite the overwhelming health benefits of a diet rich in fruit and vegetables relative to possible risks (Reiss et al., 2012), and related information campaigns by public and private institutions.

The pesticide industry is obliged to follow procedures for testing the safety of the new pesticides for which they want to obtain authorisation. For a clear understanding, and as flagged by Ferrier et al. (2002), it is essential that regulators and the pesticide industry share the same methodology, which includes access to the same exposure data and analytical models and tools. Differences in cumulative risk assessment methodologies in different parts of the world, in addition to unclear scientific criteria regarding the cumulative and aggregate risk assessment may hamper the future investment in pesticide development. The EU-funded project ACROPOLIS had the aim to improve current risk assessment strategies for pesticides in Europe. The project developed a framework, model and tool for cumulative (Boon et al., this issue) and aggregate (Kennedy et al., this issue) risk assessment of pesticides as advised in the 2012 EFSA guidance on probabilistic modelling. The tool enables stakeholders to address multiple adverse effects (so-called 'cocktail effects') of exposure to groups of pesticides in pesticide risk management (Acropolis, 2014). It consists of a web-based information technology (IT) tool that includes models for calculating exposure distributions to pesticides through a Monte Carlo Risk Assessment (MCRA) system (van der Voet et al., 2014, this issue). In connection with the IT tool, platforms with national food consumption and pesticide concentration data were established. A practical application of the tool for the case of cumulative dietary exposure to triazole pesticides has been presented by Boon et al. (2014, this issue), while Kennedy et al. (2014, this issue) have illustrated the aggregate exposure assessment model.

Although the new risk assessment method would be scientifically sound, it was of major importance that stakeholders approved the concepts and methods, as well as understood the tool for it to be successful (Delcour et al., 2011). Keeping this in mind, it was important to evaluate and take into account stakeholder attitudes towards pesticides in general, pesticide risk assessment in particular, as well as towards the newly developed and proposed ACROPOLIS risk assessment concept and tool. The involvement and participation of relevant stakeholders during the development of the tool was crucial. As indicated by Briggs (2009), there is a need to engage stakeholders and to ensure better communication and understanding of the stakeholders' interests and views. It is essential to understand the view of the different stakeholder groups and to encourage dialogue. Involvement of the stakeholders in an early stage of the project offers the opportunity to address the risk assessment in a way that is accepted by stakeholders and is relevant to their needs and concerns (Jamieson and Briggs, 2009). Furthermore, engagement is likely to transform relevant stakeholders from passive recipients of information to more active players in the policy making and strategy development process (Houghton et al., 2008). This approach is likely to result in a greater trust and acceptance among stakeholder groups, as well as a higher likelihood of adoption of the proposed strategy in the future.

In the present study, first, representatives of different stakeholder groups were consulted and personally interviewed, including industry representatives (such as manufacturers of pesticides, vegetable producers, traders, retailers), consumer groups, non-governmental organisations (NGOs), and national food authorities and regulators. Based on the insights obtained from the personal in-depth interviews, a survey questionnaire was developed to quantitatively assess stakeholder attitudes towards pesticides and their