Risk Indicator selection and Quantitative Targets to meet Sustainable Use Directive objectives

OPERA Guidelines for implementation

OPERA

RESEARCH CENTER

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OPERA is a young, growing think tank and a research centre of the Università Cattolica del Sacro Cuore, a major European private university.

It is an independent, non-profit scientific organization, committed in supporting the successful implementation of the agri-environmental measures within the European legislation.

Within this context OPERA reviews, advises and promotes the sharing of knowledge in the implementation and measurement of risk reduction methodologies, which are crucial for the successful implementation of the Directive on Sustainable Use of Pesticides. The fundamental contribution of OPERA is to use the potential of existing scientific researches as well as the existing expertise and knowledge to support the stakeholders in their political and technical decisions concerning agriculture, and particularly the management of agricultural risks relating to pesticides and the environment. One objective is to provide a series of pragmatic recommendations to policy makers to bridge the interest and objectives of agriculture and environment as well as to ensure efficient implementation of the agriculture related policies in the EU.

Opera wishes to thank all the experts of the indicators working group for their collaboration, providing information, comments and clarifications in the preparation of this document.

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FOREWORD

During the past few years, we have seen many changes in the legislative framework that governs the agriculture activity. For example, there has been rising concern on balancing demand in production with the need to reduce environmental impact; the introduction of several measures to mitigate agricultural risk to deliver public goods; the revision to the way plant protection products are registered. All of these changes have led to much greater complexity, making it increasingly difficult for different stakeholders to provide their contribution.

The new, complex legislative framework makes it difficult for stakeholders that are not part of the political arena to actively participate in the debate. And this is where the Agriculture Faculty of the Università Cattolica del Sacro Cuore (UCSC) saw an opportunity to increase its visibility and contribution to sustainability by being part of a process of shaping EU legislation to benefit both intensive agriculture and the environment.

At the time, UCSC was not directly involved in the discussions and needed to find a way to communicate scientific insights beneficial to the EU decision makers and influence the development of best practices in agri-environmental measures. The UCSC Agricultural and Environmental Chemistry team saw the gap of a holistic, scientific forum at EU level to actively participate as a stakeholder in the consultation process and enable UCSC to become part of the political debate to help shape future perceptions of agriculture in Europe. The team recognized that it could not go at it alone; and soon it discovered that others faced similar difficulties in finding simple and pragmatic ways to communicate science.

So, taking on board our ideas and acknowledging the lack of such a platform at EU level that could bring together scientists, policy makers and stakeholders and deliver valuable insight, the Università Cattolica del Sacro Cuore created the OPERA Research Centre.

And so, OPERA was born. OPERA is a growing independent not-profit scientific think tank committed in supporting EU 'decision making' through providing a transparent platform to debate the right approaches for sustainable agriculture.

Our vision at Opera is to provide high quality information and analysis of the latest developments in EU agri-food policy-making to promote balanced dialogue between interested stakeholders. We are developing clear and pragmatic approaches for improving intensive agriculture together with simple and transparent solutions for all our stakeholders through useing both existing research and developing new research in collaboration with partners to support the ongoing sustainability of the European agriculture.

The think tank achieves its goals through the following types of activities: bringing together relevant stakeholders to debate difficult agricultural issues; formulating policy recommendations; producing documents and scientific papers with possible solutions that adopt new techniques and technologies.

So far, OPERA has been focused on the pressing issues of sustainability, the establishment of prevention and mitigation measures and pesticide risk management. Although the think tank is currently dealing with agricultural policy and the pesticide framework implementation, OPERA may in the future expand to different policy areas of interest to its stakeholders.

In the short time since its conception within the last year, OPERA has established itself as an important, new player in the European arena. Through its office in Brussels it has organised a series of events dedicated to the debate on policy solutions for the numerous problems faced by CAP and SUD. It has created an informal platform of opinion exchange for stakeholders at EU level; each of its roundtables and conferences has brought together high level speakers and participants to focus on specific topics.

OPERA was able to take advantage of the debate relating to the implementation of the Sustainable Use Directive (SUD) seizing the opportunity to step in and organise an informal expert group. It invited all stakeholders involved: Member States representatives; the Commission; the plant protection industry; NGO's; international organisations; scientific research institutes. OPERA subsequently facilitated the exchange of information as well as provided know-how and alternative solutions toward balanced, risk reduction-based implementation.

The event was very well received. Many representatives across the spectrum of EU decision making acknowledged the need for additional work on certain aspects of the Directive. OPERA was asked to create the opportunity of further debate on specific provisions of SUD implementation.

Following this successful experience OPERA has been even more intensively working to produce documents able to offer simple and pragmatic solutions to meet the objectives of the SUD implementation. These risk indicators guidelines are a tangible output of this work.

Now that OPERA is perceived as a stakeholder in EU policy discussion, this independent think tank, I believe, will play an increasingly important role at EU Presidency conferences and Commission events. As a result of OPERA's success, UCSC today has a greater opportunity to be part of EU discussions and can better position itself among high level EU decision makers.

Ettore Capri
Director of the OPERA Research Centre

INTRODUCTION

The EU Sustainable Use of Pesticides Directive requires Member States (MS) to develop a legislative framework and National Action Plan (NAP) that includes the aim of reducing the potential risk associated with pesticide use. This national legislation is required to be in place by the end of 2011.

Over the past year, the OPERA Research Centre has been actively involved in identifying indicators and strategies to meet the objectives of the Sustainable Use Directive (SUD). This process started with the publication of the first paper on indicators "Selecting the right risk indicators to successfully implement the Sustainable Use Directive" which opened the dialog to experts from all fields to acknowledge the need to develop new risk indicators to answer to the new legislation's provisions. In this sense OPERA initiated an EU-wide consultation, drawing on experts from the fields of agriculture, industry, trade, academia, environment and consumer protection, to produce a document that supports the transposition process of the Directive and the drafting of NAPs. It focuses on the proposal of a package of national indicators of risk, practical measures and the potential benefit they have in meeting the objectives of the SUD.

The toolbox of practical risk indicators proposed by OPERA facilitates positive pragmatic measures to address:

- Environment - water; soil and biodiversity
- People - consumers; bystanders and operators
- Social factors
- Economic costs

RISK INDICATOR SELECTION

In implementing the SUD, it is important to clearly define goals in the NAP, and instigate measures to reach these goals.

Risk Indicators are expected to help national regulatory bodies to assess trends in pesticide risk reduction and to judge the effectiveness of their programmes.

The choice of mitigation measures, approaches and possible solutions is inextricably linked to the risk indicators selected. Therefore, the two topics - risk indicators and mitigating measures - have to be addressed in parallel.

Any set of indicators selected should reflect a minimum number of economic, social and environmental aspects (including biodiversity), to cover all implications and effects of the measures. In many instances selected risk indicators can evaluate the relative success of a number of proposed measures. Risk Indicators can, in turn, highlight Environmental, Social and Economic factors of a sustainable strategy.

The pool of risk indicators has to be selected in such a way to respond to the needs to monitor the elements of implementation. Due to the lack of resources to collect new data in the current economic climate, existing indicators would need to be utilised where possible. **However, where existing risk indicators are not sufficient to provide adequate information, new indicators may be required.**

In the development of indicators it was *a priori* assumed that under the current regulatory scheme in the EU the **use of any pesticide following the recommendations in the label is considered safe.** Due to the fact that products are approved after an exhaustive risk assessment procedure, any risky situation may come from accidents, strong unexpected situations and over all misuse of the product. For this reason **it is critical to be sure that indicators allow to measure how products are used.**

Due to the complex nature of the agricultural activity, it is extremely difficult to identify indicators which reflect only one aspect of the use of the plant protection product or one aspect of the farming practices. One particular risk associated with the use of plant protection products can be and should be reduced by using a number of different measures. Therefore, one indicator may often measure the risk reduction result of more than one mitigation measure. Since the choice of measures depends on the specificities of each NAP, we have identified in the table mapping below, first the possible mitigation measures which can be applied and then the associated indicators and targets.

However, regardless of the number of measures covered by the results of one indicator used, for the evaluation of the efficiency of the NAP, the relevance lies in the total progress achieved in risk reduction.

It is also advisable that Member States take as much as possible a harmonised approach on selecting the risk mitigation measures as well as the risk indicators to monitor the progress achieved through the NAPs. This will prevent situations where the efforts of one Member State to reduce the risk in a certain area is affected by the divergent approach taken by a neighbouring Member State (ex. reducing risks in surface waters; use of plant protection products on seeds; etc). There is also the danger that differentiated approaches would create barriers in the commerce with different inputs; seeds; machinery or in the trade with agricultural products.

ESTABLISHING QUANTITATIVE TARGETS FOR THE NATIONAL ACTION PLANS

Art. 4 of the Directive 128/2009 requires that:

"Member States shall adopt National Action Plans to set up their quantitative objectives, targets, measures and timetables to reduce risks and impacts of pesticide use on human health and the environment and to encourage the development and introduction of integrated pest management and of alternative approaches or techniques in order to reduce dependency on the use of pesticides. These targets may cover different areas of concern, for example worker protection, protection of the environment, residues, use of specific techniques or use in specific crops"

While the indicators measure the progress in achieving a risk reduction associated with the use of pesticides, their quantitative changes over time represent a quantitative target which is achieved through the implementation of the NAP.

It is the opinion of the OPERA panel of experts that the most coherent procedure to establish quantitative risk reduction targets is to give benchmark values over time to the most significant of the indicators selected to monitor risk reduction. These values can also represent percentages which reflect the modifications over time for the selected indicators.

This approach allows also a dynamic change of the quantitative targets based on the results of the monitoring activity and the efficiency at a certain point in time of different mitigation measures to address risk reduction.

Based on the evaluation of the actual situation in each Member State and the priorities set for the risk reduction in the National Action Plan, these quantitative targets can be developed in relation to the indicators reflecting risks related to environment, worker protection, use of application techniques, etc.

Since the development of such target is entirely related to the specific circumstances in the Member States, OPERA can only suggest some examples of risk reduction quantitative targets to be included in the NAPs.

THE RISK INDICATOR AND MEASURES TOOLBOX

Following the consultation process, OPERA has sought to prioritise strategies and Risk Indicators that can be pragmatically implemented and achievable by all stakeholders.

The focus for policymakers and stakeholders using the Toolbox should be on the most appropriate measure that will deliver the greatest benefit, along with selecting the Risk Indicator measures that can quickly and clearly identify which tools are working most effectively, and are best capable of achieving the desired effects for each individual Member State.

OPERA recognises that measures targeted at any one goal may, simultaneously, achieve beneficial effects in fulfilling other goals and the overall objectives of the SUD. For example, restoration of field margins with a goal of increasing biodiversity may also play a role in protecting water sources from contamination and the public, by way of buffer zones. Multi-functional measures and the fulfilment of Risk Indicators need to be considered.

Within the spirit of the Directive to achieve sustainable use of pesticides, risk reduction targets have to be set up on the bases of the indicators chosen to monitor the identified priority items.

These targets should be set in accordance to each MS's specific policy and data collection already achieved, prior to the application of the NAP, or if new measures are envisaged, to set up new measurable goals. The targets should be quantified against the existing monitoring data, such as the current level of residues in water, existing number of trained farmers, areas of buffer zones already in place and implementation of best agricultural practices etc.

The targets suggested in the tables below are a hypothetical example of how MS's may consider achieving a certain level of risk reduction through the appropriate measure taken and its corresponding indicator. The targets for each measure shall vary from MS to MS, even if the overall quantitative target of the plan is the same.

The provisions of the SUD require Member States to establish targets related to the reduction of risk associated with the use of pesticides; hence some economic and social indicators do not need quantitative targets as they measure the impact on the agricultural activity and not a variation in the risk. However, a general recommendation to include economic and social targets to evaluate the impact of the measures on the agricultural production, after and during NAP implementation, is appropriate to be considered by all Member States.

As MSs are required to achieve risk reduction by setting up quantitative targets and timetables in the NAP, it is very important that nationally transposed legislation of the SUD provisions provide sufficient flexibility to give operators the choice to engage in voluntary initiatives within the framework of the legislation. It is also very important for decision makers to acknowledge and take into account all the available preventive and mitigation measures taken up by operators when monitoring the results in achieving the targets. Such measures include, for example, training courses of best practices in pesticide use provided by private companies, voluntary initiatives taken by farmers in extending the compulsory size of buffer zones, reports from poison centres and pesticide packaging disposal programs.

IDENTIFICATION OF THE SPATIAL SCALE

Different spatial scales require different questions to be asked and consequently different indicator sets are required to monitor the progress made in achieving the objectives of the Directive.

At the national scale – to which we refer in the Toolbox below - the interest is mainly focused on policy development or evaluation, and identification of "Hot Spot". The approach is "top down" and usually at this scale data used are generally available, produced trough monitoring programs or national surveys.

However, at a farm level, questions frequently refer to specific problems, for example choosing the right pest strategy. **This approach is "bottom up" and should be taken into account when defining the measures set to reach the main goals.** This means that the implementation of supporting decision systems and associated indicators or forecasting instruments and programs have to be seen as "bottom up measures" that could lead to changes and improvements of the system.

Member States shall ensure that farmers have available both the information and tools for pest monitoring and pest strategies, as well as ensuring they are able to use them.

ENVIRONMENT

The potential risk of contamination of a water body can often be significantly reduced by appropriate prevention and mitigation measures that in turn lead to the reduction of diffuse sources (e.g. run-off from fields, spray drift, drainage, soil movement or leaching) and point source pollution (e.g. spillage during filling a sprayer or from containers).

It is essential to take into consideration that not only what we measure is important but how the measurement becomes a proactive tool of risk mitigation; this would lead to control the effects in addition to the presence of the substance.

Reducing risk to water resources - Measures, Risk Indicators and examples of Quantative Targets

Measures	Indicators to reduce risk of pesticide use		Examples of Quantitative Targets
Specialised training and advice on spray preparation, application and maintenance	■	Number of sprayer inspections and independent calibrations	*E.g.: Increase number of compliant sprayers by 5% within the next 3 years*
	■	Number of recorded incidents of point source contamination from equipment	*E.g.: Reduce the number of incidents by 10% over the next 5 years*
	●	Number of farmers attending training courses	*E.g.: Train 1000 farmers each year*
	●	Number of jobs created	*No target required*
	▲	Financial cost for users	*No target required*
Spray drift reduction technology (SDRT)	■	Level of residues in surface and groundwater	*E.g.: Reduce the incidence of non compliant levels of residues in water for a list of substances below 4% in the next 3 years*
	■	Impact of spray applications on non-target organisms	*E.g.: Increase the use of spray drift reduction nozzles by 10% over the next 5 years*
	■	Recording of diffuse source contamination incidents	*E.g.: Reduce the number of incidents by 10% over the next 5 years*
	●	Number of reported incidences of spray drift	*E.g.: Reduce the number of incidents by 10% over the next 5 years*
	▲	Number of reduced spray drift nozzles sold	*No target required*
	▲	Recorded use of Personal Protective Equipment (PPE)	*No target required*
	▲	Impact on farm productivity and profitability	*No target required*

■ Environmental Indicator ● Social Indicator ▲ Economic Indicator

Measures	Risk Indicators		Examples of Quantitative Targets
Multi-functional Field margin buffer zones	■	Measured reduction in run-off into water courses	*E.g.: Increase the number of fields with buffer zones on controlled farms by 15% by 2013*
	■	Level of residues in water	*E.g.: Reduce the incidence of non-compliant levels of residues in water for a list of substances below 4% in the next 3 years*
	■	Level of residues in soil	*E.g.: Reduce the incidence of non compliant levels of residues in soil for a list of substances below 4% in the next 3 years*
	■	Populations of pollinating insects	*E.g.: Increase the number of fields with buffer zones on controlled farms by 15% by 2013*
	■	Impact on biodiversity: presence of indicator species in field margins	*E.g.: Increase the presence of plant indicator species in field margins by 10% the over the next 5 years*
	●	Impact on food supply	*No target required*
	●	Number of reported incidences of spray drift	*E.g.: Reduce the number of incidents by 10% over the next 5 years*
	●	Effect on tourism and landscape use	*No target required*
	▲	Impact on farm productivity and profitability	*No target required*
Specialist training for application in desig-nated protected areas	■	Incident monitoring of non-compliance with Natura 2000 legislation	*E.g.: Reduce the number of incidents by 8% over the next 10 years*
Certified professional operator schemes and knowledge proof tests	■	Number of certifications issued	*E.g.: Achieve 10,000 operators certified by 2014*
	■	Number of farmers meeting continuous professional development targets	*E.g.: 1500 farmers every year passing the knowledge examination*
	●	Impact on rural jobs market	*No target required*
	▲	Additional costs and administrative burden on farmers and businesses	*No target required*
Training on Integrated Pest Management (IPM)* programmes	■	Number of farmers attending courses and implementing IPM programmes	*E.g.: 1500 farmers attending IPM courses every year*
	■	Impact on biodiversity: presence of indicator species in field margins	*E.g.: Increase the presence of plant indicator species in field margins by 10% over the next 5 years*
	●	Number of jobs created/lost	*No target required*
	▲	Impact on farm productivity and profitability	*No target required*
Pesticide container recycling schemes	■	Cases of container related point source contaminations reported	*E.g.: Increase the number of recycled containers to 75%*
	●	Number of jobs created	*No target required*
	●	Volume of plastic recycled	*No target required*
	▲	Cost of container disposal	*No target required*

■ Environmental Indicator ● Social Indicator ▲ Economic Indicator

Measures	Risk Indicators		Examples of Quantitative Targets
Biobeds/on-farm water management/ wetlands	■	Level of residues in surface and groundwater	*E.g.: Reduce the incidence of non compliant levels of residues in water for a list of substances below 4% in the next 3 years*
	■	Number of recorded incidents of point source contamination	*E.g.: Reduce the number of incidents by 10% over the next 5 years*
	▲	Investment cost and maintenance	*No target required*
Reduced use of substances of particular concern	■	Level of specific pesticide residues in water	*E.g.: Reduce the incidence of non compliant levels of residues in water for a list of substances below 4% in the next 3 years*
	●	Effect on road safety and aesthetic appearance from reduced use of herbicides	*No target required*
	▲	Impact on farm productivity and profitability	*No target required*

■ Environmental Indicator ● Social Indicator ▲ Economic Indicator

The Risk Indicators suggested by the OPERA consultation experts focus primarily on monitoring data to identify trends in water quality. It must be recognised that environmental monitoring is an *a posteriori* approach (after the event has happened), without any possibility for prevention. Without knowledge of the distribution and transport patterns of a chemical, any monitoring data represents only single points in space and time, providing little opportunity for the original application and use.

However, the data from monitoring can be seen as "indirect measure of progress". **The effectiveness of management measures and the ability to follow up depends on the quality of the analytical monitoring and data interpretation.**

INTEGRATED ENVIRONMENTAL MANAGEMENT AND PESTICIDE MONITORING DATA

Integrated management of the wider environment is required by the new environmental European policies, including surface water and groundwater, along with soil and sediments that may act as a reservoir for many pollutants and thus create a source of water pollution.

Coupling models and Geographical Information Systems (GIS) assessment could be valuable in identifying sensitive areas and lead to the adoption of correct monitoring plans both from a scientific and an economic point of view. It should be emphasized that these tools have to be used to predict risk scenarios at different time and different spatial scales.

These tools, associated to monitoring data from national monitoring programs or to passive samplers that could provide a measure of average conditions in a body of water of extended periods of time, can give a more representative picture of water quality, compared to a few instantaneous measurements of pollutant levels taken at intervals of time over a year

Pesticides are just one of the factors that could affect the status of aquatic ecosystems. The effect of pesticides is often difficult to isolate from other stressors and to establish a cause-effect relationship . However, the implementation of adequate monitoring programs is fundamental in order to have an insight of the evolution of the overall water quality, as a part of the Water Framework Directive.

MEASURES AND INDICATORS TO REDUCE POINT SOURCE WATER CONTAMINATION

Evaluation of operating practices can provide earlier knowledge of potential point source water contamination.

Such on-farm practices that can be measured and evaluated include:

- **the location**, size and construction materials of storage areas
- **farm infrastructure -** wells, water reservoirs, drainage systems, irrigation equipments
- **techniques** for the handling, dilution and mixing of pesticides before application
- **plans** for the disposal of tank mixtures remaining after application
- **how equipment** is cleaned after application
- **the process** for the recovery or disposal of pesticide remnants and their packaging, in accordance with Community legislation on waste

A selection of recommendations on Best Management Practices (BMPs) to reduce point source water contamination has been developed by the TOPPS project (http://www.topps-life.org/).

TRACKING WATER MONITORING

A promising development for improved water monitoring is using satellite information to minimize monitoring costs. Using GMES technology (Global Monitoring for Environment and Security – a joint initiative of the European Commission and European Space Agency) it is possible to better understand the correlation between activities - including farming and industry - and the effects on water quality (http://www.gmes.info/).

BIODIVERSITY

In many instances measures proposed and instigated to meet the objectives of the SUD also provide exciting potential to enhance farmlands biodiversity. Transversally, biodiversity measures that are appropriately designed and managed may also minimise risks to water sources and other SUD objectives.

Increasing biodiversity - Measures, Risk Indicators and examples of Quantitative Targets

Measures	Indicators to reduce risk of pesticide use		Examples of Quantitative Targets
Multi-functional field margin buffer zones	■	Populations of pollinating insects	*E.g.: Increase the number of fields with buffer zones on controlled farms by 15% by 2013*
	■	Impact on biodiversity: presence of indicator species in field margins	*E.g.: Increase the presence of plant indicator species in field margins by 10% the over the next 5 years*
	●	Impact on food supply	*No target required*
	●	Number of reported incidences of spray drift	*E.g.: Reduce the number of incidents by 10% over the next 5 years*
	●	Effect on tourism and aesthetic landscape	*No target required*
	▲	Impact on farm productivity and profitability	*No target required*
Training on Integrated Pest Management (IPM) programmes	■	Number of farmers attending courses and implementing IPM programmes	*E.g.: 1500 farmers every year attending IPM courses*
	■	Impact on biodiversity: presence of indicator species in field margins	*E.g.: Increase the presence of plant indicator species in field margins by 10% the over the next 5 years*
	●	Number of jobs created/lost	*No target required*
	▲	Impact on farm productivity and profitability	*No target required*

■ Environmental Indicator ● Social Indicator ▲ Economic Indicator

Measures	Risk Indicators		Examples of Quantitative Targets
Spray drift reduction technology (SDRT)	■	Level of pesticide residues in water	*E.g.: Reduce the incidence of non compliant levels of residues in water for a list of substances below 4% in the next 3 years*
	■	Impact of spray applications on non-target organisms	*E.g.: Increase the use of spray drift reduction nozzles by 10% over the next 5 years*
	■	Recording of diffuse source contamination incidents	*E.g.: Reduce the number of incidents by 10% over the next 5 years*
	●	Number of reported incidences of spray drift	*E.g.: Reduce the number of incidents by 10% over the next 5 years*
	▲	Number of reduced spray drift nozzles sold	*No target required*
	▲	Recorded use of Personal Protective Equipment (PPE)	*No target required*
	▲	Impact on farm productivity and profitability	*No target required*
Biobeds/on-farm water management/wetlands	■	Level of pesticide residues in water	*E.g.: Reduce the incidence of non compliant levels of residues in water for a list of substances below 4% in the next 3 years*
	■	Number of recorded incidents of point source contamination	*E.g.: Reduce the number of incidents by 10% over the next 5 years*
	▲	Investment cost and maintenance	*No target required*
Specialised training courses regarding applications in protection areas	■	Incident monitoring non-compliant with Natura 2000 legislation	*E.g.: Reduce the number of incidents in selected protected areas by 3% in the next 3 years.*

■ Environmental Indicator ● Social Indicator ▲ Economic Indicator

Environmental management of farmland demands a new set of skills to commercial food production. One early indirect indicator of how the measures to restore field margins might be successfully implemented is the attendance of designated training programmes or the involvement in a recognised project designed to meet the goal of increasing biodiversity.

The new protection goal of 'biodiversity' is currently only measured directly by a bird index. However, the OPERA consultation group acknowledged that, since bird numbers may fluctuate for a number of reasons, e.g. lack of habitat, food availability, weather or predators, it is very difficult to establish a cause-effect relationship for any one criteria when measuring biodiversity.

Clearly biodiversity monitoring needs to cover more than birds, and the whole ecosystem service needs to be addressed. Therefore, it is proposed that several different criteria could be measured and combined; indices on butterflies and plants, for example, are available but are, as yet, only vaguely validated.

As discussed previously, the effect of any pesticide use is often difficult to isolate from other stressors in the environment, making it difficult to establish a cause-effect relationship.

MULTI-FUNCTIONAL MEASURES

The OPERA working group recognises the value of multifunctionality. Therefore some of the measures proposed fulfil not only the SUD requirements but provide multiple benefits.

It should be considered that multi-functional measures may provide better value-for-money where economic support is provided to compensate farmers and growers for costs and losses in productivity incurred. Furthermore, multi-functional measures that can deliver a range of benefits from one economic cost imposed on farmers and growers may be more readily accepted and adopted.

For example:

Field margins create the opportunity to protect soil and water through a number of mechanisms, including reduced risk of run-off and, where appropriately managed, creating a physical barrier to spray drift. Such field margins therefore provide a function in reducing risk to bystanders. Furthermore, where appropriately designed and managed, field margins provide food sources and habitat for positive environmental gain and enhanced biodiversity.

***Integrated Pest Management (IPM)** that utilises natural control mechanisms and agronomy techniques to optimise plant health - alongside the judicious use of pesticides where required to assure crop yields and produce quality – could deliver significant benefits for every goal of SUD policy. IPM should be considered the cornerstone of initiatives, with priority on the adequate training and assistance to enable growers to achieve the highest levels of implementation.

PEOPLE

Minimising potential exposure of people to pesticides has been a key objective of legislation and the approval process for pesticide registration and use. EU and National legislation addresses these issues. However, the OPERA working group recognises that the SUD provides a further opportunity to reinforce these goals and, where appropriate, mitigating measures can help to meet complimentary objectives.

Reducing consumer exposure to pesticide residues in food - Measures, Risk Indicators and examples of Quantitative Targets

Measures	Indicators to reduce risk of pesticide use		Examples of Quantitative Targets
Training of farmers in application techniques, particularly post-harvest treatments	●	Residue monitoring in food produce	*E.g.: Reduce the number of products where MRLs exceedance is found*
	■	Attendance of designated training courses	*E.g.: 200 farmers trained every year*
	▲	Adoption of precision application equipment	*E.g.: Increase by 10 % the use of precision application equipment*
	●	Participation in recognised professional bodies and adherence to their guides of practice	*E.g.: Increase by 10% in 3 years the number of farmers adhering to professional bodies*

■ Environmental Indicator ● Social Indicator ▲ Economic Indicator

Measures	Risk Indicators		Examples of Quantitative Targets
Training on Integrated Pest Management (IPM)* programmes	■	Number of farmers attending courses and implementing IPM programmes	*E.g.: 1500 farmers attending IPM courses every year*
	■	Impact on biodiversity: increase the presence of indicator species in field margins	*E.g.: Increase the presence of plant indicator species in field margins by 10% over the next 5 years*
	▲	Number of jobs created/lost	*No target required*
	▲	Impact on farm productivity and profitability	*No target required*
Education in the importance of adhering to approved label recommendations	■	Attendance of designated training courses	*E.g.: 1500 farmers attending designated courses every year*

Reducing bystander and resident exposure to spraying - Measures, Risk Indicators and examples of Quantitative Targets			
Measures	**Indicators to reduce risk of pesticide use**		**Examples of Quantitative Targets**
Multi-functional field margin buffer zones	■	Number of reported incidences of spray drift	*E.g.: Reduce the number of incidents by 10% over the next 5 years*
	●	Number of reported incidences of exposure to sprays	*E.g.: Reduce the number of incidents by 10% over the next 5 years*
	■	Populations of pollinating insects	*E.g.: Increase the number of fields with buffer zones on controlled farms by 15% by 2013*
	■	Impact on biodiversity: presence of indicator species in field margins	*E.g.: Increase the presence of plant indicator species in field margins by 10% the over the next 5 years*
	●	Impact on food supply	*No target required*
	■	Level of pesticide residues in water	*E.g.: Reduce the incidence of non compliant levels of residues in water for a list of substances below 4% in the next 3 years*
	▲	Effect on tourism and landscape use	*No target required*
	▲	Impact on farm productivity and profitability	*No target required*

■ Environmental Indicator ● Social Indicator ▲ Economic Indicator

Measures	Risk Indicators		Examples of Quantitative Targets
Spray technology to minimise drift	■	Sprayers fitted with drift reduction nozzles	*E.g.: Increase by 5% the sales of drift reduction nozzles*
	■	Sprayers sold with airbags or other devices to minimise drift	*E.g.: Increase by 3% the sales share of new equipments using drift reduction accessories*
	●	Operators recording wind speed and drift risk during application	*No target required*

■ Environmental Indicator ● Social Indicator ▲ Economic Indicator

The OPERA consultation group acknowledged that bystander exposure to the risk of pesticides is frequently perceived rather than factual. An effective Risk Indicator measure may play an important role in reassuring the public.

Public bystander risk can be effectively countered by suitable spraying application techniques – including nozzle selection or the use of air-assisted sprayers, for example - and timing of spray applications to avoid windy conditions. The aim of such measures is to minimise drift out of the field.

Participation in application training courses or an assessment of spraying equipment fitted with appropriate drift-reduction technology would provide a risk indicator measure.

Furthermore, the creation of a vegetative barrier may intercept spray drift and significantly reduce potential exposure to bystanders or neighbouring residents.

Vegetative buffers designed to enhance habitat and food sources to increase biodiversity may provide a multi-functional role in minimising spray drift; thereby offering additional protection to water resources and bystanders. It should be noted that grass buffer zones offer less potential to reduce risk, compared to specific margins with vegetation of sufficient height to intercept spray drift.

USE OF INDIRECT MEASURES OF PROGRESS

The so called EEA (European Environmental Agency) 'Performance' indicators on changes in driving forces and pressure, are currently the most widely used in the decision making stage of implementation of measures and control strategies. However, given the complexity of the 'real world' condition, there are situations where it is difficult to use performance indicators, for example, calculating risk to residents - more specifically bystanders - or biodiversity.

There is also the need for 'behaviour' or '*indirect*' indicators that are best able to actively measure the progress of any strategies during the process of their implementation. Indicators of the state of the environment, such as pesticide monitoring data in water, should be seen as indirect measures of progress. They are therefore comparable to the performance indicators and linkable to policy response. This adoption of indirect indicators is equally applicable for measuring behavioural changes of farmers or public, or as a measurement of equipment improvement and the success of education programs.

Some comments and feedback were received on aerial spraying. However, since the practice of aerial pesticide application has effectively ceased across the EU, or only occurs under certain highly restricted and regulated circumstances, the potential risk to bystanders has effectively been removed.

Reducing operator exposure - Measures, Risk Indicators and examples of Quantitative Targets			
Measures	**Indicators to reduce risk of pesticide use**		**Examples of Quantitative Targets**
Training of farmers and operators in application techniques and equipment maintenance	■	Attendance of designated training courses	*E.g.:1000 farmers participating every year to designated training courses*
	■	Number of calibrations and inspections of application equipment	*E.g.: Increase number of compliant sprayers by 5% within the next 3 years*
	■	Participation in recognised professional bodies	*E.g.: Increase by 10% in 3 years the number of farmers adhering to professional bodies*
	■	Number of incidents due to point source contamination from equipment	*E.g.: Reduce the number of incidents by 10% over the next 5 years*
	●	Skill tests for operators	*E.g.: Over 80% of the tested operators pass the examination*
	●	Number of jobs created	*No target required*
	▲	Financial impact for users	*No target required*
Use of Personal Protective Equipment (PPE)	▲	Sales of PPE	*E.g.: Increase by 3% the sales of PPE over the next 5 years*
	●	Completion of records of PPE used during spray application	*No target required*
	■	Attendance of designated training courses	*E.g.:1000 operators participating every year to designated training courses*
	▲	Cost of specialist PPE	*No target required*
	●	Number of reported incidences of exposure to sprays	*E.g.: Reduce by 5% the number of reported incidents*
Education in the importance of adhering to approved label recommendations	■	Attendance of designated training courses	*E.g.:1000 operators participating every year to designated training courses*
	■	Number of recorded incidents of point source contamination from equipment	*E.g.: Reduce the number of incidents by 10% over the next 5 years*
Procedures for preparing pesticide handling operations	■	Point source contamination incidents	*E.g.: Reduce the number of incidents by 10% over the next 5 years*
	●	Number of accidents that require medical attention related to pesticide applications	*E.g.: Reduce by 30% the number of incidents*

■ Environmental Indicator ● Social Indicator ▲ Economic Indicator

The indicators for operator exposure proposed by the OPERA expert consultation again focus on in-direct indicators, linked to training of farmers. These include training to advise the operators on both acute and long term risks, better application techniques that can avoid incident during the use phase and the % increase in PPE sold to farmers.

PERSONAL PROTECTIVE EQUIPMENT (PPE) PROTECTION REDUCES OPERATOR RISK

The importance of PPE has been highlighted in previous studies and reports under the HAIR project. Operators wearing the recommended combination of gloves, mask and coveralls during mixing, loading and application reduce their risk of exposure by 90%. Appropriate gloves provide the greatest protection. Improving operator awareness and behaviour to consistently use PPE would have a significant impact in reducing potential exposure.

SOCIAL FACTORS

The OPERA expert consultation clearly identified training and education as one of the key issues for the implementation of SUD. Training courses and the provision of appropriate support advice are integral to the successful uptake of most proposed mitigating measures.

Furthermore, the provision and take-up of training has been seen as a key indirect indicator of potential success of mitigating measures. It provides a key indication potentially years ahead of direct measures of pesticide risk reductions identified in the environment. Training is recognised as essential in encouraging the rapid adoption of new technologies that could be successfully incorporated into agronomy systems to deliver simultaneous achievement in meeting the objectives of the SUD, along with improvements in productivity and profitability that will offset economic barriers that may otherwise hinder uptake.

For example, minimal tillage cultivations systems that have been shown to potentially reduce watercourse contamination with soil that could contain pesticide residues can also reduce farmer's establishment costs and, in some instances, increase yields that together can enhance overall farm profitability. Farmers may require additional training and assistance to gain the confidence to adopt such new techniques.

Providing professional education to reduce risks - Measures, Risk Indicators and examples of Quantitative Targets

Measures	Indicators to reduce risk of pesticide use		Examples of Quantitative Targets
Specialised training courses on reducing environmental risks	■	Incidences of pesticide residues in water	*E.g.: Reduce the incidence of residues for a list of substances by 5% in the next 3 years*
	■	Impact of spray applications on non-target organisms	*E.g.: Increase the use of spray drift reduction nozzles by 10% over the next 5 years*
	■	Recording of diffuse source contamination incidents	*E.g.: Reduce the number of incidents by 10% over the next 5 years*
	■	Populations of pollinating insects	*E.g.: Increase the number of fields with buffer zones on controlled farms by 15% by 2013*
	■	Impact on biodiversity: presence of indicator species in field margins	*E.g.: Increase the presence of plant indicator species in field margins by 10% over the next 5 years*

■ Environmental Indicator ● Social Indicator ▲ Economic Indicator

Measures	Risk Indicators		Examples of Quantitative Targets
Specialised training courses on reducing environmental risks	▲	Records of products used	*No target required*
	▲	Effects on productivity and farm profitability with changes in technology	*No target required*
Specialised training courses for sprayer operators	●	Number of accidents involving sprayer operators	*E.g.: Reduce by 30% the number of accidents*
	●	Number of reported incidences of exposure to sprays	*E.g.: Reduce by 10% the number of incidents*
	■	Attendance of designated training courses	*E.g.: 1000 operators participating every year to designated training courses*
	●	Skill tests for operators	*E.g.: Over 80% of the tested operators pass the examination*
	▲	Cost of specialist PPE	*No target required*
Specialised spray application and sprayer maintenance training courses	■	Number of farmers attending training courses	*E.g.: Train 1000 farmers each year*
	■	Number of sprayer inspections and independent calibrations	*E.g.: Increase number of compliant sprayers by 5% within the next 3 years*
	■	Number of recorded incidents of point source contamination from equipment	*E.g.: Reduce the number of incidents by 10% over the next 5 years*
	▲	Number of jobs created	*No target required*
	▲	Financial cost for users	*No target required*
Training on Integrated Pest Management (IPM)* programmes	■	Number of farmers attending courses and implementing IPM programmes	*E.g.: 1500 farmers attending IPM courses every year*
	■	Impact on biodiversity: presence of indicator species in field margins	*E.g.: Increase the presence of plant indicator species in field margins by 10% over the next 5 years*
	▲	Number of jobs created/lost	*No target required*
	▲	Impact on farm productivity and profitability	*No target required*

■ Environmental Indicator ● Social Indicator ▲ Economic Indicator

Society's expectations of farmers are continually increasing in relation to their environmental performance. One tool identified for achieving the required environmental improvements in agriculture would be the design and promotion of region-specific 'best management practices' (BMPs) that deliver farmers goals for productive and economic prosperity, allied to the objectives of the SUD.

Many scientific studies demonstrate correlations between both farmers' motivations and their risk attitudes, together with the adoption of BMPs. The successful uptake of BMPs and other provisions within the SUD will be dependent on demonstrating that they can enhance the farming operation, along with minimising farmers' risks.

For example, developing low-drift spraying technology that achieves more accurate application and enhanced results delivering higher yields will prove attractive to farmers, whilst simultaneously meeting a number of goals for reduced risks from pesticide use. Adopting Integrated Pest Management practices can deliver higher crop yields and improve quality produce by using precise and well timed pesticide applications for farmers benefits and the SUD objectives.

Many social factors are linked to economic costs. The retention of viable rural communities is dependent on the economic prosperity of farming businesses.

ECONOMIC COSTS

The OPERA SUD consultation group recognise that measures to mitigate pesticide risk that also compromise the economic prosperity of farming businesses may ultimately fail to deliver their goals and overall SUD objectives.

A series of economic goals have been proposed as a test platform to assure the retention of profitable businesses and the continued production of affordable food with a sustainable system.

The Informal Expert Group meeting on Directive 128/2009 (SUD) revealed that the implementation of measures to meet the SUD will have a negative effect on the competitiveness of European food supplies compared to imported products. This reinforces the need for the pragmatic implementation of balanced measures that will limit the potential impact of farm incomes and economic viability of rural communities. The majority of stakeholders consulted believe that farmers and private individuals should not have to pay the costs generated by the directive.

Regardless of the solutions chosen for the implementation of the different provisions of the SUD, attention has to be paid on the implications at every level in the agricultural sector, and the benefits these solutions bring to society and environment. The current economic situation and the availability for rural funding within EU Member States require that any implementation solution has to be judged against both the economic and the social implications.

The general trend of rising food prices, and increasing world population together with the lack of progress globally towards food security can not be ignored. Adoption of new solutions and promoting the use of efficient ones, can pave the way towards reaching the objectives of the directive, without excessive negative impact on the productive sector.

SUSTAINABLE USE DIRECTIVE TIMELINES

The Sustainable Use of Pesticides Directive requires Member States to develop a national legislative framework to transpose the EU Directive provisions and implement through national action plans its objectives.

The Directive states that reducing the risk associated with pesticide use is one of the most important elements of sustainability. The focus for the national authorities is therefore on the reduction of risks.

National Action Plans (NAP) are the tools that transform EU policy, into an organized set of national actions. In transposing the provisions of the Directive into national law, MSs will have to align the legislation with the country's specifications, political needs, and existing legislation.

Member States (MS's) are requested to transpose the Directive into national legislation within two years from the entry into force, effectively by the end of 2011.

DRIVERS FOR CHANGE

The OPERA indicators working group and the SUD consultation has identified a number of issues that may hamper progress of initiatives. However, there are also a number of positive points that will facilitate successful uptake of measures.

- ✗ Variability of agricultural practices in MS across the EU
- ✗ Complexity of different environmental ecosystems
- ✗ Variability in professionalism among farmers, operators and distributors
- ✗ Lack of baseline data for assessing progress
- ✗ Priority on blanket volume reduction in pesticide use
- ✗ Need to involve disparate groups, from manufacturers through to consumers

- ✓ Innovation of farmers to adopt new practices
- ✓ Recognition of Good Agricultural Practice in delivering business benefits
- ✓ Realisation among all stakeholders that change is required
- ✓ Strong scientific community supporting change
- ✓ Constructive communication routes through the supply chain
- ✓ Consumer and retailer demand for sustainable food supplies
- ✓ Legislative process drive through change

EXISTING EU SUSTAINABLE USE STRATEGIES

Policies for pesticide risk reduction programme differ from country to country. A number of European countries like Denmark, Sweden, the Netherlands and the UK have already initiated detailed programmes allied to the SUD, like introducing a specific pesticide tax or setting up voluntary initiative measures to meet objectives. However, not all of them have produced such results to set out a trend for a harmonised model.

Most indicators that are currently used include quantitative changes in the volume of pesticides used and application frequencies. It has, however, now become widely acknowledged that such indicators are only very crude proxies for assessing the risk of non-target impacts of pesticides.

Volume indicators fail to acknowledge the positive benefits of any innovative application techniques used or the precautionary measures taken, which will minimise any impact and have far less effect than a smaller volume applied inappropriately.

For example, experience in the Netherlands highlights that a target 50% reduction in the volume of pesticide used was achieved primarily through the elimination of one process of soil disinfection, but limited the effect on any other pesticide use.

In Denmark, the adoption of a Treatment Frequency Index (TFI) provided an assessment of the intensity of pesticide use across the country, but did not include the environmental profile or implication of the specific products used in its overall calculation.

CONCLUSIONS

A key objective of the Sustainable Use Directive is to record step-by-step improvements made from an initial assessment, towards the final goal. The success of mitigation strategies and other measures proposed in the Toolbox of options, and their direct impact in reducing risk to human health and the environment, should be assessed by selecting appropriate Risk Indicators.

The Risk Indicators presently available in Europe all have their specific purpose and methodologies. However, at present there is no universal ideal indicator which can be used for pesticide and environmental policy monitoring and evaluation.

Currently MS's may continue to report information based on their existing risk indicators or establish new indicators, whilst waiting for the harmonised indicators.

Therefore, there is a need for Pesticide Risk Indicators that capture information and trends not directly related to the volume of pesticide used, but that have a significant impact in reducing the risk from pesticide use.

The OPERA working group highlights:

- Working with a long list of indicators can be counterproductive and can lose sight of real priorities
- Adoption of a small and pragmatic set of indicators can better reflect and focus on high priority policy issues
- Robust core sets of indicators are easier to understand and help track progress towards policy goals
- Linking indicators to goals and targets enables their use in tracking performance and helps link them to policy priorities
- In some cases data collected at considerable costs has little apparent relevance or use in decision making
- The value of Indicators may be compromised by the lack of consistent, reliable, high quality data – collected across an appropriate scale and area
- The correct interpretation of monitoring information is crucial in the appropriate implementation of management measures

OPERA again proposes itself as a platform for the sharing and transfer of knowledge and applications, with the aim to promote the harmonization process over the long-term. We would like to continue our activities to provide the opportunity of further debate on indicators and of specific provisions of the SUD, along with its respective implementation solutions.

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ACRONYMS

SUD	Sustainable Use Directive
MSs	Member States
NAP	National Action Plan
EU	European Union
ESA	European Space Agency
EEA	European Environment Agency
EFSA	European Food Safety Agency
MRL	Maximum Residue Limits
WFD	Water Framework Directive
GIS	Geographical Information Systems
BMPs	Best Management Practices
SDRT	spray drift reduction technology
IPM	Integrated Pest Management

PROJECTS MENTIONED

GMES	Global Monitoring for Environment and Security
TOPPS	Training the Operators to prevent Pollution from Point Sources
EuMon	EU-wide MONitoring methods and systems of surveillance for species and habitats of Community interest
EBONE	European Biodiversity Observation Network
SCALES	Securing the Conservation of biodiversity across Administrative Levels and spatial, temporal, and Ecological Scales

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