

## Introduction

Over the last two decades, trade and environment issues in agriculture have gained increasing prominence at international and national levels alike. At the global level, this interest is principally expressed in the on-going WTO negotiations and the UN World Summit on Sustainable Development, whilst at the micro level, local government and agencies are concerned about the impacts of policies on production and trade, as well as on the local environment.

In the context of OECD's work on *Analysing Approaches towards a more Sustainable Agriculture*, further analysis exploring the linkages between agriculture, trade and environment has been undertaken through in-depth sectoral studies. Studies on the pig sector and on the dairy sector have already been completed (OECD, 2004a; 2003f).

The present study analyses the impacts of these linkages on the arable crop sector. There are a number of reasons for undertaking this study:

- There is great variation in the levels and types of support, including trade measures, provided to arable crops among OECD countries; between arable crop sector; and over time. In addition, a number of OECD countries are reviewing their policies and implementing new ones and the arable crop sector features prominently in such reforms.
- A wide disparity exists between policy approaches taken and measures introduced across OECD countries to address the environmental impacts of arable crop production.
- As is the case in other agricultural sectors, the arable crop sector is witnessing significant structural and technological changes. Technological advances, such as the introduction of new seed varieties, pesticides and larger-scale machinery, have enabled the spread of arable agriculture onto environmentally fragile land in certain regions, but not without entailing some negative consequences for the environment, such as the destruction of semi-natural habitats and increased risks of contamination, resulting from the use of pesticides and fertilisers. At the same time, some arable areas have been abandoned. On the other hand, Global Positioning Systems and the development of precision farming methods are helping to improve the efficient use of inputs such as fertilisers, pesticides and seeds.

- A study by the FAO projects that by 2030 an additional one billion tonnes of cereals will be needed each year to satisfy expected growth in global demand (FAO, 2003). Although, according to the study, there is enough unused potential to meet this demand, in terms of land, water and yield improvements, the expansion of cereal supply, particularly in some developing countries, could entail environmental risks such as deforestation, desertification, resource degradation of cultivated lands and loss of biodiversity.<sup>1</sup>
- Production systems for arable crops range from the relatively extensive to the highly intensive, with varying levels of input use, mechanisation, and monoculture and, consequently, have varying environmental effects. On the one hand, a more concentrated, modern and highly intensive farming system may result in the loss of non-crop habitats, such as grassland, and so have negative environmental implications in terms of the elimination of biodiversity within the immediate production area. On the other hand, lower-yield, extensive farming systems may require more land at the expense of natural areas. While drawing general conclusions is difficult and speculative, extensive and intensive methods of production are associated with different types of externalities.

Obviously, it is not possible for the analysis to be comprehensive in all domains because of the complexity of the issues involved and the inadequacy of some data, particularly on agri-environmental indicators (AEI). Moreover, arable crops include a wide range of annual crops (*e.g.* wheat, barley, maize, rye, rapeseed, sunflower, peas, *etc.*). The following guiding criteria and considerations were considered when selecting which specific arable crops would be most suitable for the analysis:

- The importance of the sector in production, trade and in terms of domestic and trade-related policies;
- The relevance of the sector in terms of environmental impacts;
- The potential for further trade liberalisation in the sector; and
- The availability of relevant data and quantitative models.

For the purpose of this report, analysis of the arable crop sectors in relation to the aforementioned criteria has been limited to the case of cereals and oilseeds. Sugar is not part of the study. In particular, the focus of the analysis is on grains, rice, soybeans, rapeseed and sunflower. Table 1 provides a summary of the varying significance of the economic, environmental and policy relevance of the sectors.

**Table 1. Relative qualitative characteristics of different arable crops**

<b>Economic and Trade</b>	<b>Wheat</b>	<b>Maize</b>	<b>Rice</b>	<b>Rapeseed</b>	<b>Soybeans</b>	<b>Sunflower</b>
%PSE	***	**	***	**	**	**
Tariffs and TRQs	***	**	***	*	*	*
Export subsidies	***	***	*	*	*	*
Main exporters	US, Canada, Australia, EU, Argentina	US, China, Brazil, France, Argentina, Mexico	Thailand, Vietnam, China, US, India, Pakistan, Uruguay, EU	Canada, Australia, EU	US, Brazil, Argentina	Russia, Argentina, US, Hungary
Main importers	Brazil, Egypt, Japan, Indonesia, EU, Korea	EU, Japan, Korea, Russia	Indonesia, EU, Brazil, Iran, Japan	China, Japan, EU, Mexico	EU, China, Japan, Mexico	EU, Turkey, Morocco
<b>Environmental Issue</b> <sup>1</sup>						
Soil (Erosion)	*2	**2	*	*2	***	*
Water						
1) Irrigation	**	***	***	*	**	*
2) Nutrient loss	***	***	**	*	*	*
3) Nutrient demand	**	**	**	*	*	*
4) Pesticides	**	***	***	**	**	*
Nature conservation, biodiversity and landscape	**	**	***	**	**	**
Air Quality (nitrous oxide, methane)	*	*	***	*	*	*

*Notes:*

\*\*\* = high; \*\* = moderate; \* = low.

1. Assuming the crop is dominant in a given area. The comparisons are made among the arable crops considered in the study in terms of their relative importance of the respective issue.
2. Assuming conservation tillage practice.

*Source:* OECD Secretariat.

The report is organised as follows:

- Chapter 1 provides an overview of the relative importance of the arable crop sector in production and trade, examines changes in farm structures and discusses the main driving forces that affect such changes, including changes in area, yields and chemical inputs.
- Chapter 2 addresses the main environmental issues and impacts associated with arable crop farming, as well as management practice approaches aimed at reducing the adverse environmental impacts of arable crop production. A brief review of the main environmental issues associated with transgenic crops is also provided.
- Chapter 3 examines the agricultural support measures provided to arable crop farmers in OECD countries and reviews their evolution over the last fifteen years. The analysis draws extensively on the OECD's PSE/CSE database.
- Chapter 4 discusses agri-environmental and environmental policy measures designed to address environmental issues associated with arable crop farming. The classification of the various types of policy instruments used in the *OECD Inventory of Agri-environmental Measures* is also adopted here.
- Chapter 5 endeavours to analyse the environmental effects of agricultural support policies for the arable crop sector, including shifting support from market price support to direct payments. It also provides an assessment of the cost-effectiveness and efficiency of cross-compliance measures.
- Chapter 6 explores some of the environmental impacts of further multilateral trade liberalisation and reduction in support on arable crops, using a multi-country, global trade model and indicators of environmental quality. The model is based on standard economic theory and it allows consideration of the general equilibrium impact of food and agricultural policies by accounting for inter-sectoral linkages and inter-sectoral competition for land and other resources. Environmental impacts include changes in the scale and intensity of input use for crop production, changes in pesticide use, nitrogen uptake and off-load, and impacts on emissions of greenhouse gases from crop production.

- Chapter 7 provides a cross-country analysis of the trade effects of agri-environmental payments on the arable crop sector and examines the extent to which environmental regulations affect the factor costs for arable crop producers. It also offers some practical suggestions for enhancing the effectiveness of agri-environmental policies related to arable crops in achieving their environmental objectives without “distorting” trade flows.

## Note

1. The FAO projections suggest that, over the next 30 years, developing countries will need an additional 120 million ha for growing crops, an overall increase of 12.5%, and that land expansion will mainly take place in sub-Saharan Africa and Latin America. Overall, land expansion is expected to account for 20% of growth in crop production in developing countries, yield improvements for about 70%, and increased cropping density for the remainder.

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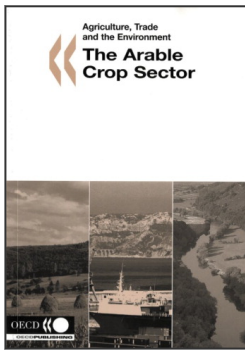
## ACRONYMS AND ABBREVIATIONS

AP 2002	Federal Agricultural Law 2002 ( <i>Politique agricole 2002</i> ), Switzerland
ARP	Acreage Reduction Program, United States
AAFC	Agriculture and Agri-Food Canada
AAPS	Arable Area Payments Scheme, EU
ABARE	Australian Bureau of Agricultural and Resource Economics
AUDIT	National Land and Water Resources Audit, Australia
CAP	Common Agricultural Policy, European Union
CRP	Conservation Reserve Program, United States
CSP	Conservation Security Program, United States
CCP	Counter-cyclical Payments, United States
DEFRA	Department of Environment, Food and Rural Affairs, United Kingdom
DP	Direct Payments, United States
EFTA	European Free Trade Association (Iceland, Liechtenstein, Norway, Switzerland)
ERS	Economic Research Service of the USDA
ENS	Environmental News Service
ESAS	Environmentally Sensitive Areas Scheme, United Kingdom
EQIP	Environmental Quality Incentives Program, United States
EC	European Commission
EEA	European Environment Agency
EU	European Union
FSRI	Farm Security and Rural Investment Act, United States
FAIR	Federal Agricultural Improvement and Reform Act, United States
FAO	Food and Agriculture Organization of the United Nations
IEEP	Institute for European Environmental Policy, London
LEI	Agriculture Economics Research Institute ( <i>Landbouw Economisch Instituut</i> ), the Netherlands
LDP	Loan Deficiency Payments, United States
MLAP	Market Loss Assistance Payments, United States
NRI	National Resources Inventory, United States
NAFTA	North American Free Trade Agreement
PFCP	Production Flexibility Contract Payments, United States
PROCAMPO	Direct support for the countryside ( <i>Programa de Apoyos Directos al Campo</i> ), Mexico
RFISP	Rice Farming Income Stabilisation Programme, Japan
REPS	Rural Environment Protection Scheme, Ireland

SAPARD	Special Accession Programme for Agriculture and Rural Development (European Union, Czech Republic, Hungary, Poland, Slovak Republic)
UNFCCC	United Nations Framework Convention on Climate Change
USDA	United States Department of Agriculture
USITC	United States International Trade Commission
URAA	Uruguay Round Agreement on Agriculture
WRP	Wetland Reserve Program, United States
WHO	World Health Organization
WTO	World Trade Organization

## TECHNICAL TERMS

AEI	Agri-Environmental Indicators
CRAM	Canadian Regional Agricultural Model
ESA	Environmentally Sensitive Areas
ESU	European Standard Unit, EU
GMO	Genetically Modified Organisms
GTAP	Global Trade Analysis Project
GFP	Good Farming Practices
GHG	Greenhouse Gas
HEL	Highly Erodible Land
LFA	Less Favoured Areas, EU
LMO	Living Modified Organisms
NPC	Nominal Protection Coefficient
PSE	Producer Support Estimate
SFP	Single Farm Payment, EU
TRQ	Tariff Rate Quotas
USMP	US Regional Agricultural Programming Model
UAA	Utilised Agricultural Area



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