

land in border strips next to lakes and watercourses. At a secondary level, objectives relating to multifunctional agriculture and forestry will be pursued, including the promotion of organic farming. The two initiatives, together with action to implement existing agreements on environmentally friendly agriculture from previous programmes, will contribute to compliance with the commitments under the EU Natura 2000 Directive and Water Framework Directive.

In the light of the nature- and environment-related challenges expected due to the implementation of the Water Framework Directive and the Natura 2000 directives, a more project-oriented approach will be adopted to fulfil the nature and environmental goals in geographically defined areas.

• *Application of techniques and methodologies for assessing the potential adverse effect of climate change on wetlands.*

Through preservation and development of nature-friendly methods of agriculture and forestry the initiatives will also contribute to fulfil Denmark's commitments in relation to the preservation of biological diversity and the aims of the Kyoto Protocol to limit climate change.

• *Local community-based programmes to sustainably enhance the productivity of land and the efficient use of water resources.*

In addition, an initiative to maintain agricultural production on selected islands with specific obstacles for agricultural production will be continued. A number of small and medium-sized islands have been designated as less favoured areas in Denmark.

Agriculture and climate changes

Adaptation

In the coming 100 year period climate changes are expected, for the most commonly used emissions scenarios, to lead to increases in the annual mean temperature of 3-5 C. The winter precipitation will increase by 20-40% and summer

precipitation will decrease by 10-25%.

Danish agriculture will be favourably positioned with respect to the expected effects of climate changes on production potential. Utilisation of this potential requires adaptation in cropping and management practices.

A distinction can be made between short-term adaptations, which aim at optimising production under current conditions, and long-term adaptations, which involve changes in production structure, land use, irrigation systems etc. and development and adaptation of new crop species and varieties.

Most adaptations can happen autonomously in the sector, i.e. without overall control and planning. However, this requires that the climatic changes occur sufficiently slowly. Furthermore changes in climatic conditions require that older data and experience are used with caution.

A regulated and controlled adaptation is expected to be particularly relevant within drainage of lowlands, irrigation, fertilisation and crop protection.

Increasing winter rainfall and rising sea level will in Denmark in some lowlands give rise to flooding or so high ground water levels, that agricultural land use is made difficult or impossible. This may in particular occur along the coast and river valleys. The problem may in some cases be solved by improved drainage and dike building, which, however, may have negative consequences for nature and biodiversity. Alternatively, these areas will have to be abandoned for agricultural use.

A large proportion of the sandy soils are irrigated. This requires permission for ground water retrieval. Higher

summer temperatures and longer periods of drought may increase the need for irrigation of agricultural crops. This can have negative consequences for the flow in streams and rivers, and there may therefore be a need to revise existing permissions for ground water retrieval.

Under the existing production conditions and environmental regulation climate change in Denmark is expected to lead to increased losses of phosphorus and to some extent nitrogen to the environment.

The Danish Action Plan for the Aquatic Environment will be subject of a mid term review in 2008. In the review the potential consequences of climate changes on emissions from agricultural production will be taken into account and appropriate measures will be introduced. The aim is to secure the environmental goals set by the Danish government.

Most disease and pest problems in crop production are closely tied to the crop type and to climatic conditions. If climatic changes result in changes in crop choice, the extent and the character of the disease and pest problems will change. Higher temperatures will reduce the generation time for both pests and diseases, and milder winters will also improve winter survival of both pests and their natural enemies. It is likely that higher temperatures will increase the crop protection problems in agriculture and thus the need for pesticide use.

The Action Plan on Reduced Pesticide Use will like the plan for the aquatic environment be subject of a mid term review in 2008. The implications on pesticide use of potential new crop protection problems will be analysed as part of the review.

Furthermore the Danish government has initiated a series of projects aimed at giving more solid knowledge on how the

agricultural sector is affected by a changing climate and how to adapt in the most effective way.

Greenhouse gas emissions from Danish agriculture

Denmark has a commitment under the Kyoto Protocol to reduce greenhouse gas emissions by 21 % from 1990 to 2008-12.

The agricultural share of national emissions in Denmark is about 18%. These emissions originate from methane (CH₄) caused by enteric fermentation and manure handling and from nitrous oxide (N₂O) emissions due to the turnover of nitrogen in manure and in agricultural soils. From 1990 till today emissions in the agricultural sector have been reduced by 26 %. (From 13,04 m. t. CO₂ eq./year to 9,60 m. t. CO₂ eq./year).

This is mainly a result of the Danish Aquatic Action Plans, which have resulted in higher nitrogen use efficiencies and thus a reduction in nitrous oxide emissions. There has also been a small decline in fossil energy use in agriculture and a larger reduction in lime consumption, which have also reduced CO₂ emissions.

The continued implementation of the Aquatic Action Plans together with the effect of increasing efficiency in the agricultural sector is expected to cause a further 0,1 – 0,2 m. t. CO₂ eq./year reduction in green house gasses until 2012.

It is estimated that Danish agriculture may contribute to a further reduction of emissions of greenhouse gases in Denmark by 1 to 3 m. t CO₂-eq./year. A number of measures, including energy crops, biogas and changes in cattle feeding, have considerable potential.