EUROPABIO™

The European Association for Bioindustries

WATER EFFICIENCY FACTSHEET

Water-wise solutions from Agricultural Biotechnology

Fresh water is one of the world's most valuable resources and in the future it is going to be even more precious. Agriculture accounts for 70% of all water use; if current trends continue, predicted water shortages in agriculture have been identified as the single most significant constraint on crop production over the next 50 years. The problem is compounded when put into context with the UN FAO projections that 70 percent more food will need to be produced to feed an additional 2.3 billion people by 2050.

Water stress areas in Europe are expected to increase from 19% today to 35% by 2070

Once water shortages were rarely associated with European climates. Today however, DG Agriculture's report entitled "Adaption to Climate Change: the Challenge for European Agriculture and Rural Areas" clearly outlines concerns for the future. Published in April 2009, the document states that high water stress areas are expected to increase from 19% today to 35% by 2070 implying "significant changes in the quality and availability of water resources". This is contextualised by the information that more than 80% of EU farmland is currently rain-fed.

Too much water, too little water, rarely just the right amount!

The amount of water that a plant is exposed to is critical to its growth; too much water, for example in flood conditions, results in high plant stress, and even a slight water deficit at the wrong time can significantly lower yield. Almost every plant faces some degree of water stress at some point in the growing season. In many areas of the world water is the biggest limiting factor in agriculture production and without adequate supply of water crop yields are severely compromised. In developing countries this can contribute to a downwards spiral of poverty and poor nutrition.

WHAT ROLE CAN GM CROPS PLAY ?

Agricultural biotechnology can play a significant role in enabling farmers to improve yield by using water more sustainably and helping to cope with water scarcity.

The two main ways in which this works are by:

- **Reducing water loss**
- **Improving drought tolerance**

Reducing water loss from agriculture

- Agricultural biotech practices have already been developed that reduce the amount of ploughing required before planting crops.
- This means the soil is not inverted which helps to trap soil moisture. Under drought conditions, this can mean the difference between having a crop to harvest and crop failure.
- Less ploughing also means less fossil fuel use, less carbon dioxide emissions and less soil erosion.

Improving drought tolerance

- Plants react to stresses such as drought by consuming large quantities of stored energy which is normally used for growth and seed production.
- The effects of drought can therefore completely drain the plant's energy reserves. The result can be irreversible damage to the plant or even death.
- Agricultural biotech practices which improve drought tolerance have an immediate positive impact on the resilience of the plant and its energy available for growth to maturity and seed production

Current research projects

> The Water Efficient Maize for Africa (WEMA) partnership led by the African Agriculture Technology Foundation (AATF) is a five-year public-private partnership with the aim of developing new African drought-tolerant maize varieties, incorporating the best technology available internationally.

The varieties developed through the project will be distributed to African seed companies through AATF without royalty and will be made available to smallholder farmers as part of their seed business. The national agricultural research systems, farmers' groups, and seed companies participating in the project will contribute their expertise in field testing, seed multiplication, and distribution. The project will involve local institutions, both public and private, and in the process expand their capacity and experience in crop breeding, biotechnology, and biosafety. The current timing for the availability of the crop is 2017.

Kenya has just announced its intention to commence field trials with this type of maize.

> Hybrid crops such as maize have been developed to tolerate drought and periodic water deficits. During the next decade, a number of companies are planning to introduce GM crops that will further improve drought tolerance. While no plant can grow without water, hybrids and varieties are being developed that use water sources more efficiently and therefore perform better during water deficits. Maintaining yields during water stress will help preserve grower incomes and yield more grain for the food and energy value chain as well as reducing the need for irrigation.

> This is not just at the research stage. Member companies have announced this year that they have made regulatory submissions in the United States and Canada for approval of drought-resistant maize, with the objective of launching the product in 2012.

> Some research focusing on reducing the levels of PARP [poly(ADP-ribose) polymerase], a key stress-related protein in plants, resulted in oilseed rape which was far better able to survive drought than reference plants. Field trial results show relative yield increases of up to 44% compared to non-drought tolerant varieties. Research is currently underway on corn, cotton, oilseed rape and rice, with the objective of developing a new generation of stress-tolerant, high-performance crop varieties.

> Further exciting work in this area involves the use of genetic switches called transcription factors and stress genes from microbial sources. Specific transcription factor genes have been tested that influence multiple other genes involved in the plant's response to stress. Drought tolerance has been improved, increasing productivity by at least two-fold during severe water stress.

EuropaBio's mission is to promote an innovative and dynamic biotechnology-based industry in Europe.

For further information, please contact:

EuropaBio Avenue de l'Armée, 6 - B-1040 Brussels
Tel: +32 2 735 03 13 - Fax: +32 2 735 49 60 - greenbiotech@europabio.org
www.europabio.org

Printed on 100% recycled paper

EUROPABIO™
The European Association for Bioindustries