Development Fund's position on the role of genetically modified plants in improving food security

The Development Fund works to fight hunger and poverty among one of the world's most vulnerable groups - poor small scale farmers in developing countries. These make hundreds of millions of people that depend entirely on agricultural production to survive. They are constantly facing challenges due to climate change, and strive to adapt food production to an unstable climate with frequent periods of drought and floods. Under such conditions, access to high quality seeds of locally adapted crop varieties that are also tolerant to the challenges related to climate change is essential to produce enough food for consumption and a surplus to sell.

For the Development Fund, it is important to assess the usefulness of genetic modification[1] to combat hunger and poverty in general, and to our target groups in particular. Our position is based on assessments of the extent to which genetic modification contributes to increased food production, and hence increased food security and better nutrition. Furthermore, we have considered whether genetic modification can be a threat to food safety and food quality, whether it has economic benefits, social and cultural factors related to food production, political ripple effects particularly on smallholder farmers' rights to seeds, and environmental consequences. We have then compared this to other tried and tested solutions and experiences.

Background

Development Fund's position is based on our target group's - poor smallholder farmer's - needs, conditions and rights. We also base our position on the experience of more than forty years of work in Africa, Latin America and Asia, where we have tested different methods to find the ones that are most suitable for our target group. One of our most important lessons is that there is rarely a single solution that is suitable for everyone, and that complex challenges often require complex solutions. The reasons why poor smallholder farmers are among those who have the greatest difficulty in meeting their basic food needs are various. Small farm sizes, poor soils, production methods that are not suitable for a changing climate, farming that is often dominated by one or two plant species, limited or no access to irrigation, little or no access to technical advice are some of the reasons. At the same time, these farmers' fields are one of the world's most important gene banks. Many small-scale farmers take care of the huge diversity of plant genetic resources by growing and developing local or traditional varieties - varieties that have important traits and that are not found in any gene banks. Farmers preserve this diversity by constantly adapting and selecting crop varieties through use. These are often varieties that

[1] With genetic modification, the genetic material is altered through various methods. These methods are constantly evolving and include from the classic gene splicing methods (so called cut and paste method at molecular level) to the more recent genome editing methods. With gene splicing, parts of a foreign DNA (coding a desired trait) from one organism is inserted into the genome of another. Transgenic plants have foreign pieces of DNA from unrelated species (for example, Bt corn with DNA from the bacteria *Bacillus thuringiensis*) while cisgenic plants contain DNA of the same or closely related species. Genome editing encompasses all methods (including CRISPER / Cas9) that add artificial genes with desired traits, or that repair or knock out genes with undesired function. With these technologies, a plant variety with resistance to pesticides, plant diseases, pests or better nutritional content can be developed.

are not used commercially, but are equally valuable in terms of use and nutritional value - and not the least as sources for plant breeding in the future.

Opportunities and challenges with genetically modified plants

Genetic modification of food plants has long been promoted by many as a solution to food security and the fight against hunger. The different methods of genetic engineering make it possible to change traits of plants much faster than through conventional plant breeding. There are still some uncertainties associated with the positive and negative effects of genetic modification, partly because of little independent research on its utility and possible negative effects.

Today, there are few genetically modified food plants. These are primarily maize and soya bean varieties cultivated in large-scale / industrial agriculture in countries like the United States, Brazil and Argentina. There is widespread skepticism about genetically modified plants in Norway and in Europe in general. The use is largely directed towards large-scale and capital-intensive fodder production and therefore has limited relevance for small scale farmers and poor people's food security. It has been difficult to show with certainty that genetically modified plants give higher yields on their own. This must be seen in light of factors such as weather conditions, agronomic practices and soil quality. Some genetically modified varieties have been developed with better food quality and food safety, while there is some uncertainty about possible allergens, toxins and the safety of food from genetically modified food plants.

There are concerns about the environmental impact of genetically modified crops, particularly those modified to withstand pesticides or contain proteins that are toxic to pests and other insects. Varieties that are tolerant of pesticides encourage repeated spraying. This leads to increased environmental pollution and the risk of developing so called pesticide resistant super weeds. The use of genetically modified plants that express toxic proteins is also disputed, as there is uncertainty surrounding the effect these proteins on beneficial insects and other organisms. This is also linked to uncertainty around allergens and toxins from genetically modified food plants. In addition, there are fears and risks of genetically modified plant species spreading in the wild, causing genetic contamination and becoming invasive alien species.

Are genetically modified plants an alternative for smallholders?

Today's genetically modified cultivated plants are primarily fit for large-scale production and are unsuitable for the conditions under which small scale farmers grow their plants. Smallholders are the guardians of diverse plant genetic resources and their production is largely based on local seed systems. Traditional varieties provide stable yields even when cultivated under poor conditions and on poor soils. Traditional varieties are genetically diverse, which contributes to increased resilience and reduces the risk of complete crop failures. This diversity is an important safety net, particularly for small scale farmers who have poor access to agricultural inputs in the face of climate change and increased prevalence of plant diseases and pests. Traditional varieties also meet farmers' preferences in terms of taste, use, and local food traditions. The traditional varieties safeguard valuable plant genetic diversity, and are an important source for all forms of plant breeding.

Evaluation and dissemination of the existing diversity has also proved to be an important method for increasing climate adaptation capacity. The world's capacity to meet climate change

depends on this plant genetic diversity. The need to develop new varieties will be constant, and conventional plant breeding has proven to be suitable for breeding new varieties with tolerance to drought, adaptation to poor soil fertility, and resistance to diseases and pests. Modern varieties developed through conventional plant breeding may give higher yields than traditional varieties, given that they are grown under the conditions for which they were developed. Participatory plant breeding and selection among traditional varieties have also proven to be methods that contribute to the development of varieties adapted to local conditions and give higher yields.

Right to seeds

Farmers' seed systems are the most reliable seed sources and cover up to 90% of the local seed demand in developing countries, where small scale farmers produce 70-80% of the food consumed locally. These systems work by farmers selecting, propagating, using, storing, exchanging and selling seeds of traditional and modern varieties freely. Farmers' rights are embedded in the International Treaty on Plant Genetic Resources for Food and Agriculture, which sees smallholders' traditional management of seeds as an important precondition for safeguarding biodiversity. Today, the vast majority of genetically modified plants are patented (or subject to strict plant variety protection laws), which limits farmers' rights to preserve, use, exchange or sell this type of seed. Introducing patented genetically modified seeds into the seed system will complicate this practice and thus limit farmers' opportunities to develop and maintain the diverse genetic resources.

Farmers' rights to seed are under considerable pressure in many developing countries. The introduction of strict plant variety protection laws is often done through strong pressure from the seed industry, which has great interest in the fact that more and more farmers are switching from traditional varieties to modern patented varieties. There is also great pressure on many countries to change the regulations around genetically modified food plants. As genetically modified plants are difficult to combine with traditional varieties, increased use of genetically modified plants can lead to reduced diversity in agriculture. The use of patents also places great restrictions on further research of the genetic material in genetically modified varieties.

Development Fund's position on genetically modified plants

The Development Fund has promoted for decades holistic approaches to the complex challenges small scale farmers face. We promote methods and approaches that consider the entire ecosystem in general, where the use and conservation of biodiversity, access to locally adapted high quality seeds, and soil and plant health are central. These approaches produce good results and are well suited for use by small scale farmers. Participatory and conventional plant breeding that take into account farmers' needs and preferences, evaluation and distribution of existing diversity, integrated pest management for handling of plant diseases and pests, use of organic and / or mineral fertilizers, cultivation of plants that grow in symbiosis with nitrogen fixing microorganisms to increase soil fertility, and conservation and use of local biodiversity through community seed banks are some of the methods the

Development Fund employs to increase food security in rural areas in developing countries.

Developments in genetic engineering and genetic resources are happening quickly and this brings with it several questions that are important to consider. Genetic modification is a tool that may help deal with some challenges in agriculture. At the same time, there are obvious uncertainties about the effects of the use of genetically modified plants. The Development Fund does not deny that genetic modification can bring benefits. However, in view of the Development Fund's target groups, our position is that today's genetically modified cultivated plants do not meet the needs of smallholder farmers. Genetic modification does not solve the problem of poor soils, unpredictable climate and other challenges many small-scale farmers face. The Development Fund believes that there are already other good agronomic and technological solutions that strengthen the capacity of small-scale farmers to meet these challenges. Both participatory and other forms of conventional plant breeding have led to the development of new varieties that both give higher yields and cope with new diseases or other stresses. Many of these are better adapted to the needs and interests of the small-scale farmers. At the same time, their use must be seen in the context of other measures that safeguard the soil and improve cultivation methods.

The Development Fund believes that a holistic approach with diversity at the center is the most suitable route to increased food security and increased climate adaptation for small scale farmers in developing countries. We emphasize on the importance of farmers' rights to seed and conservation of biodiversity. Increased efforts and focus on participatory and conventional plant breeding have proven to be effective in developing new plant varieties better adapted to the needs and interests of smallholder farmers, and with less risk than those associated with genetic modification.

Farmers' choice to grow own and preferred varieties will be reduced by the introduction of genetically modified cultivated plants, which can also increase their vulnerability. As long as there is uncertainty about the utility of genetically modified plants and what negative effects these may have, the Development Fund applies the precautionary principle for the use of genetically modified plants. It is possible that genetic modification may become part of an holitistic approach in the future given that patents and plant variety protection laws related to genetically modified plants that limit farmers' rights are changed, and that the uncertainties associated with the negative effects of using such plants have been clarified. As of today, we do not consider that genetically modified plants as part of the solution in our efforts to increase food security of smallholder farmers.