



联合国  
粮食及  
农业组织

Food and Agriculture  
Organization of the  
United Nations

Organisation des Nations  
Unies pour l'alimentation  
et l'agriculture

Продовольственная и  
сельскохозяйственная организация  
Объединенных Наций

Organización de las  
Naciones Unidas para la  
Alimentación y la Agricultura

منظمة  
الأغذية والزراعة  
للأمم المتحدة

E

# COUNCIL

## Hundred and Sixtieth Session

Rome, 3-7 December 2018

### Proposal for an International Year of Rye

#### Executive Summary

Rye has the unique capability to grow in environments where other cereals cannot. Rye is climate resilient and able to survive cool temperate zones, semi-arid and high altitude zones and can be cultivated on marginal lands, sandy and poor soils that are relatively infertile. Rye is primarily produced for its grain which is rich in dietary fibre, carbohydrate and also contains proteins and several key minerals and nutrients. Rye is also used for fodder, as mulch to add organic material to soils and for weed control. Grain of rye is used to bake bread and other products through the sour dough process that confers a unique taste with specific nutritional benefits and market opportunities, e.g. rye-derived products benefit from reduced gluten compared to wheat.

Promotion of an International Year of Rye complements both the United Nations Decade of Action on Nutrition 2016-2025, and the recommendation 10 of the Second International Conference on Nutrition (ICN-2), for the need to implement sustainable food systems that promote healthy and diverse diets, which include a variety of foods. The International Year of Rye will promote sustainable farming and production practices to the livelihoods of millions of rural family farmers. Rye benefits from vast genetic diversity that needs to be characterized, conserved and made available through efficient networking between existing gene banks and breeding programmes.

Furthermore, the adaptive capacities of rye to adverse environments can be used as genetic sources for wheat improvement programmes, as rye is a constituent of triticale, a synthesized crop.

The observance of an International Year of Rye by the international community would contribute significantly to raising awareness of the environmental, nutritional and economic benefits of rye production and consumption to diversify cereal-based food systems and to diversify diets.

The observance of an International Year of Rye was proposed by the Government of Estonia at the 31<sup>st</sup> Session of the Regional Conference for Europe and the 159<sup>th</sup> Session of the Council requested further information.

#### Suggested action by the Council

The Council is invited to:

- 1) endorse the proposal by the Government of Estonia to establish observance of an **International Year of Rye** and provide guidance as deemed appropriate;

*This document can be accessed using the Quick Response Code on this page;  
an FAO initiative to minimize its environmental impact and promote greener communications.  
Other documents can be consulted at [www.fao.org](http://www.fao.org)*



CL 160

2) review and amend, as needed, the Draft Conference Resolution presented in *Appendix A*, and submit it for consideration of and adoption by the 41<sup>st</sup> Session of the Conference (22-29 June 2019).

*Queries on the substantive content of this document may be addressed to:*

Hans Dreyer  
Director  
Plant Production and Protection Division  
+39 06570 52040

## I. Background

1. Rye (*Secale cereale*) is a cereal grass (Order Cyperales and Family Poaceae) that was domesticated after wheat, barley and oats but records go back to over 2000 years ago. It potentially originated in present day Turkey.
2. Rye is a relatively major crop in Northern and Eastern Europe, and also China, Scandinavia, Canada, sometimes making up to 30 percent of a country's acreage. However, on a global scale, rye is a minor crop with production being significantly less than five percent that of wheat or rice. Only one major non-producing country, Japan, has become an important consumer of rye.
3. Rye can produce yields under extreme climatic conditions, including low rainfall and low temperatures when other cereals cannot. Rye is also tolerant to poor soils with exceptionally high zinc efficiency. Rye is also recognized as having low requirements for fertilizers or pesticides, which makes it an ecologically and economically sound crop for specific regions.

### A. Rye Production

4. Around the world, the area of cultivated land dedicated to growing rye has decreased. In 1986, according to FAOSTAT, 15.4 million hectares were harvested; by 1996, the figure was 11.1 million and by 2016 4.4 million (a reduction in area cultivated between 1986 and 2016 of 71 percent). During the same period (1986-2016), total production decreased from 30 to 13 million metric tonnes (a reduction of 57 percent).
5. The decrease in cultivated area was partially offset by a significant increase in yield, achieved through improvement of agronomic practices, especially in the use of chemical fertilizers and crop rotation, decline in the use of less fertile land and development of high-yield cultivars.
6. Most rye is grown as an autumn sown annual crop, generally called "winter rye." Because of its superior winter hardiness, winter rye can be grown successfully in areas where the climate is too severe for winter wheat or barley. Some spring rye is grown in areas where the winters are too severe even for the most hardy winter rye cultivars, e.g., in Canada and Central Europe. Spring cultivars are generally inferior in agronomic characteristics (e.g. yield) and end-use quality.

### B. Agronomic Uses of Rye

7. Rye is primarily cultivated for its grain harvest and can be intercropped with other crops to diversify production systems, especially when growing conditions are poor. It is a pasture crop and used to prevent wind erosion of soil. Rye for grain or pasture is particularly suitable because of its winter hardiness and its rapid growth early in the spring in cold climates.
8. Rye is also used for forage. However, rye grain has a relatively low feed value compared with other feed grains. It tends to form a sticky mass in an animal's mouth and can be extremely unpalatable and even toxic if ergot is present. Despite being a less palatable pasture crop, it is readily grazed when other green forages are not available. A main advantage of winter rye as a forage, as compared to winter wheat or winter triticale, is that it is more hardy and reaches optimum harvest maturity 7 to 10 days earlier.
9. Rye has been used as living mulch to prevent weeds when intersown with other crops, such as wheat but also vegetables including tomatoes. Evidence suggests that one of the explanations for the ecological success of rye and its effectiveness to control weeds and also nematodes when used as living mulch or as a harvested green organic mulch is because of its allelopathic properties. When used as a mulch, in addition to contributing organic matter, rye reduces soil erosion and enhances water penetration and retention.

10. Rye is highly desirable for use as livestock bedding. Small quantities of rye straw are also used in the manufacture of strawboard and paper. Over the past decade there has been increasing interest in the use of rye to produce bio-ethanol / bio-diesel.

### **C. Foods Uses of Rye**

11. Rye is generally used in small proportions in mixtures with other grains. On occasion, the price of rye makes it an attractive feed grain despite its low feed value. Recent improvements in animal feed production technology, especially in the use of various enzymes to improve palatability, has led to a substantial increase in the proportion of rye grain that can be included in mixed animal feeds. Rye is also famous for its role in brewing with production of beer and gin, and is best known for vodka (Eastern Europe) and whiskey (USA and Canada).

12. Rye is well known as a flour used for baking bread with different lines possessing different viscosities. Rye flour can also be mixed with other cereal flours, such as wheat, to produce breads of diverse qualities to suit specific markets and tastes. Despite a continuous decrease in global consumption of bread during the last few decades, rye bread still constitutes a fundamental element of the diet in many North, Central and East European countries. Rye bread is distinctively darker, harder and more aromatic than wheat-derived breads and has a characteristic taste due to the sourdough process that acidifies rye flour through activity of lactic bacteria.

### **D. Nutrition of Rye**

13. Rye is unique among grains for having a high level of fibre in its endosperm – not just in its bran. As such, the glycemic index (GI) of rye products is generally lower than products made from wheat and most other grains.

14. Unlike endosperm wheat flour, rye flour usually retains most of its nutrients, since the separation of germ and bran from endosperm during rye milling is very difficult. There is a strong evidence that consumption of cereal foods, especially those that are a good source of viscous and/or gel-forming soluble fibres, may reduce glycaemic response to carbohydrates and lower plasma cholesterol in humans, though the mechanism is not fully understood.

Nutrition credentials of whole grain rye:

- High in carbohydrate (mainly starch), with a lower GI than most other grains.
- Relatively high protein content (around 15 percent), with a lysine content than most other cereals.
- Contains a protein complex which forms gluten.
- Low in fat (most of which is unsaturated).
- High in potassium and low in sodium.
- Excellent source of dietary fibre.
- Rye has more soluble fibre than wheat; however, less is known about the effect of dietary fibre found in rye.
- Contains B-group vitamins such as thiamin, riboflavin, niacin, vitamin B6 (pyridoxine), folate and pantothenic acid.
- Contains vitamin E.
- Contains iron, zinc, magnesium, phosphorus and selenium (depending on the soil content of selenium).
- Contains small amounts of copper, manganese and calcium.
- Contains phytochemicals including lignans, phenolic acids, phytic acid, plant sterols and saponins.

## E. Conservation and Genetic Resources

15. To further develop varieties of rye better suited to different environmental and market demands, genetic resources need to be available. There are several species of wild rye that can be used for breeding programmes belonging to genera; *Secale*, *Leymus*, *Kengyilia* and *Elymus*. The total global holdings of *Secale cereale* (alone) is 16 871 accessions.

16. Rye gene bank holdings are aggregated across the world with Russia having the largest (N.I. Vavilov Research Institute of Plant Industry) with 3931 accessions, USA (Western Regional Plant Introduction Station, USDA-ARS, Washington State University) with 2802 accessions, Germany (Genebank, Leibniz Institute of Plant Genetics and Crop Plant Research) with 2515 accessions, USA (National Small Grains Germplasm Research Facility, USDA-ARS) with 2107 accessions, Poland (Plant Breeding and Acclimatization Institute) with 1918 accessions and Canada (Plant Gene Resources of Canada, Saskatoon Research and Development Centre) with 1501 accessions.

17. Rye germplasm is also used to develop triticale and CIMMYT holds the largest collection with 15 686 accessions, followed by Russia (N.I. Vavilov Research Institute of Plant Industry) with 3997 accessions, Ukraine (Institute of Plant Production n.a. V.Y. Yurjev of UAAS) with 3286, Poland (Plant Breeding and Acclimatization Institute) with 2412 accessions, USA (National Small Grains Germplasm Research Facility, USDA-ARS) with 2020 accessions and Germany (Genebank, Leibniz Institute of Plant Genetics and Crop Plant Research) with 1601 accessions.

18. While every country that cultivates rye has its own discrete sources of genetic resources, there is one major effort to harmonise these through The European Cooperative Programme for Plant Genetic Resources (ECPGR). ECPGR is a collaborative programme among most European countries aimed at ensuring the long-term conservation and facilitating the increased utilization of plant genetic resources in Europe and includes rye and triticale in its portfolio.

## II. Objectives of the International Year of Rye

19. Production of rye has been in decline compared to other cereals such as wheat, rice and maize. However, the benefits of rye compared to other cereals are evident in terms of its ability to be cultivated in cold environments with poor soil fertility and to overcome weeds. Rye is a highly useful grain that can be baked into unique products, low in gluten, with distinctive tastes and market opportunities. There is an urgent need to promote raising awareness of the environmental, nutritional and economic benefits of rye production and consumption to diversify cereal-based food systems and to diversify diets. A key requisite to achieve this is to harness existing genetic diversity of rye for improved conservation, characterisation, coordination and utilisation. Linkages between gene banks, breeders, seed delivery systems, growers and value chain actors is needed. Furthermore, the adaptive capacities to adverse environments of rye can be used as genetic sources for wheat improvement programmes, as rye is a constituent of triticale, a synthesised crop. Efforts should also focus on advocating for national public programmes and public-private partnerships on rye, and generating opportunities for farmers in better connection with value chains and markets, and supporting investment policies for research and development. Estonia proposes that the International Year of Rye would provide the unique opportunity to increase global production, efficient processing and consumption, better utilization of crop rotations, address trade challenges, and encourage better connectivity throughout food systems to promote rye as a key component of the food basket and to ensure sustainable food and nutritional security through climate resilient agriculture. The Government of Estonia requests the Council to endorse the proposal (*Appendix A*).

## Appendix A

**Draft FAO Conference Resolution**  
**International Year of Rye**

**Considering** the urgent need to raise awareness of the climate resilience of rye for cool temperate zones, semi-arid and high altitude zones, where other cereals cannot be grown, through the increased sustainable production and consumption of rye;

**Considering** the urgent need to raise awareness of the tolerance of rye to marginal lands, sandy soils, poor soils with low fertility and for weed control, where other cereals cannot be grown, through the increased sustainable production and consumption of rye;

**Considering** the unique nutritional benefits of rye and the opportunity to consume rye products, made available through the promotion of sustainable production techniques for rye;

**Recalling** the UN General Assembly resolution proclaiming the United Nations Decade of Action on Nutrition 2016-2025, and the need to implement sustainable food systems that promote healthy diets, which include a variety of foods;

**Recalling** recommendation 10 of the Second International Conference on Nutrition (ICN-2) that establishes, inter alia, the promotion of crop diversification to diversify diets;

**Noting** consumer demand for baked products with the unique flavour of rye and the market for baked products with reduced gluten compared to wheat flour;

**Recognizing** the important contribution of rye to the cultivation of staple foods in climate adverse environments;

**Recognizing** the importance of rye as a good rotational crop because of its ability to compete effectively with weeds in poor soils and to be used as a pioneer crop to improve the fertility of wasteland;

**Noting** the importance of sustainable farming and production practices to the livelihoods of millions of rural farm families and small family farmers around the world;

**Cognizant** of the historical contribution of rye to food security, nutrition, livelihoods and incomes of family farmers and its significant role for pasture, hay and as cover and green manure crop;

**Concerned** over the current need to invigorate market recognition of the benefits of rye and to promote efficient value chains;

**Recognizing** the vast genetic diversity of rye and its adaptive capacities to a range of production environments and potential as a genetic source for wheat improvement programmes, being a constituent of triticale, a synthesised crop;

**Recognizing** the need to empower women through education to assure the quality of family diets;

**Recognizing** that the observance of an International Year of Rye by the international community would contribute significantly to raising awareness of the nutritional and health benefits of rye consumption and its suitability for cultivation under adverse and changing climatic conditions, while directing policy attention to improving value chain efficiencies;

**Stressing** that costs for implementation of the Year and FAO involvement will be covered by extra-budgetary resources to be identified;

**Requests** the Director-General to transmit this Resolution to the Secretary-General of the United Nations with a view to having the General Assembly of the United Nations consider it at its next session, declaring (----) as the International Year of Rye.