

Crop Wild Relatives: Plant conservation for food security

This report explores and presents evidence about the importance to food security of Crop Wild Relatives. These are the wild plant species which are ancestors of, or closely related to, crops. Due to the loss of approximately 75 per cent of crop genetic diversity in the 20th century, Crop Wild Relatives are likely to play an increasing role in plant breeding in the 21st century. No new research was commissioned for this study and the report brings together published findings about the importance of Crop Wild Relatives and the options for their conservation.

What was done

A review was carried out of the peer-reviewed scientific literature and other published sources relating to Crop Wild Relatives. This included material relating to their economic importance, utilisation in plant breeding and conservation.

Results and conclusions

Key messages

Crop Wild Relatives are a vital genetic resource for 21st century food security

In the 21st century food security has become a major issue. In the future we will need to grow crops using fewer inputs of increasingly scarce nutrients, energy and water. Crops will need to grow in changed climates and be resistant to new pests and diseases. The only proven technology able to meet all these requirements is plant breeding.

During the 20th century approximately 75 per cent of global genetic diversity of crops was lost. This is due to the increased use of scientifically bred, high-yielding crop varieties, which have limited genetic variability. An even higher loss of crop genetic diversity is likely to have occurred in England where scientifically bred crop varieties were adopted early by farmers.

As a consequence of these losses of genetic diversity Crop Wild Relatives are a genetic resource which is being increasingly used by plant breeders.

Genetic resources from Crop Wild Relatives have already played a significant role in crop development

A high proportion of crops today contain genes from Crop Wild Relatives, introduced through scientific breeding programmes. These include genetic resources which improve pest and disease resistance, abiotic stress tolerance, yield and quality.

In 1997 it was estimated that the global value of crop varieties containing wild genetic resources was US\$115 billion. The value of such crops has almost certainly gone up since then due to the breeding of new crop varieties.

Significant crop genetic resources occur in wild plant species found in England

Although comparatively modest by comparison with the world's 8 major centres of crop genetic diversity, significant numbers of Crop Wild Relatives occur in the English countryside. In all 303 wild species, subspecies and varieties related to economically important crops have been identified in the UK, all but a

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small number of which occur in England. These belong to 15 different plant families.

Some of these taxa such as Plymouth pear *Pyrus cordata* and least lettuce *Lactuca saligna* are extremely rare, whilst others are common. More than 50 per cent occur in more than 100 10km grid squares of the OS National Grid.

England's Crop Wild Relatives are related to a wide range of crops. A large number are relatives of vegetables including wild relatives of cabbage, radish, asparagus, leek and lettuce, or are wild relatives of fruits including apple, pear, raspberry, gooseberry and strawberry.

Major arable crop relatives include three wild species of barley and sea beet, the wild ancestor of sugar beet. Wild cabbage and turnip are the ancestors of oil seed rape. Particularly found amongst the grasses and clovers are species which are important as forage or fodder crops for livestock.

The objectives for Crop Wild Relative conservation are different to those of traditional plant conservation

Whereas in traditional conservation the objective is to conserve populations and species, the objective of Crop Wild Relative conservation is to conserve the species gene pool in the expectation that some of the conserved genetic diversity will be of economic value. This means it is important to conserve selected populations of common as well as rare species.

A range of mechanism already exist for the conservation of Crop Wild Relatives

Existing mechanisms for the *in situ* conservation of Crop Wild Relatives include for the very rarest taxa listing in Red Data Books and as UK Biodiversity Action Plan priority species. For 5 Crop Wild Relatives legal protection from various forms of disturbance occurs under the Wildlife and Countryside Act 1982.

A much wider range of rare, local and common Crop Wild Relatives are conserved within protected areas such as Sites of Special Scientific Interest (SSSIs) and Special Areas of Conservation (SACs), and by agri environment

schemes. However we have an incomplete understanding of how effective these site based conservation mechanisms are.

Ex situ conservation of Crop Wild Relatives in gene banks, such as the Kew Millennium Seed Bank, Wakehurst Place, is important insurance against the loss of genetic diversity in the wild. It also makes genetic resources more easily available to breeders. The genetic diversity of Crop Wild Relatives is however poorly represented in gene banks at present.

New co-operations are required to secure Crop Wild Relative genetic diversity

No country in the world is today self sufficient in the crop genetic resources it requires. Internationally coordinated action to conserve the genetic diversity of Crop Wild Relatives is required.

In part the lack of communication between those who conserve and utilise crop genetic resources and biodiversity conservationist who have access to the mechanisms for *in situ* conservation of wild plants, particularly on protected areas, explains the lack of co-ordinated action to conserve Crop Wild Relatives. It is intended this report will facilitate this communication and co-ordination.

Natural England's viewpoint

Natural England's viewpoint is that the conservation of plant genetic resources is essential to future food security and that conservation plans and projects should aim wherever possible to secure the conservation of Crop Wild Relatives.

Selected references

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Further information

For the full details of the research covered by this information note see Natural England Research Report NERR037 - *Crop Wild Relatives: Plant conservation for food security*.

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