

Centre for Genetic Resources, the Netherlands (CGN)

Leafy Vegetables germplasm, stimulating use, AGRI GEN RES action 001

co-funded by the European Commission under Council Regulation (EC) N° 870/2004¹



<http://documents.plant.wur.nl/cgn/pgr/leafyveg/>

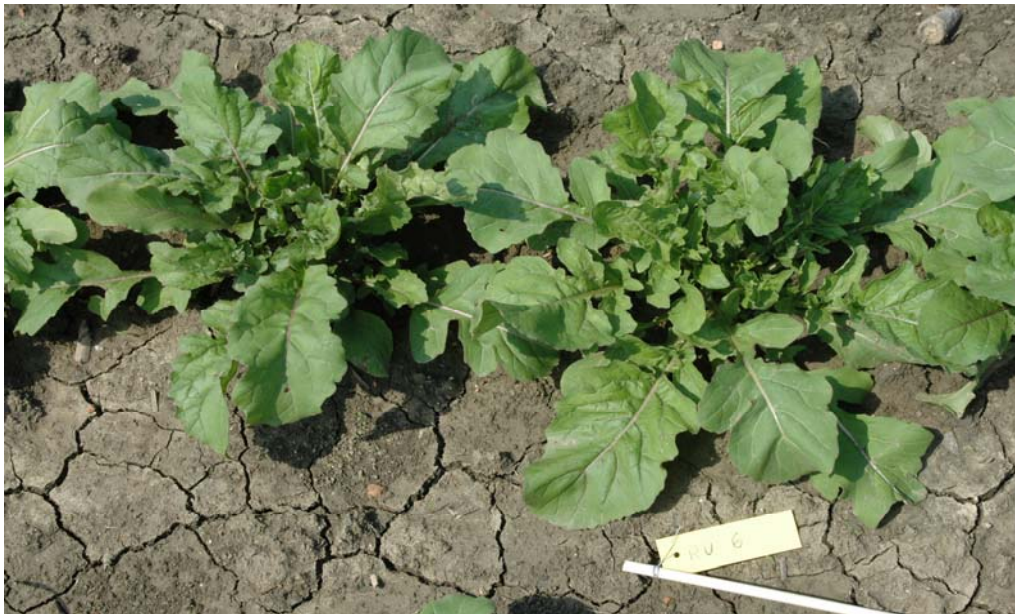
¹ Council Regulation (EC) No 870/2004 of 24 April 2004 establishing a Community programme on the conservation, characterization, collection and utilisation of genetic resources in agriculture. Official Journal L 162, 30/04/2004, P. 0018 - 0028

1. Background

Currently around 7,5 million seed samples are stored in genebanks worldwide and large collections exist of staple crops like cereals and legumes. However only around 50,000 accessions of vegetables are present in crop collections worldwide. Given the fact that so many vegetable species exist, it means that large gaps in collections must be present. However a good overview on the current state of the art on vegetable collections worldwide is currently not present, which hampers the adequate conservation of these crop species.

In the context of the GENRES programme the present project dealt with this important issue. Leafy Vegetables were chosen as a target group as this group consists of economically important crops. The group of leafy vegetables encompasses around twenty crops of which lettuce, spinach and chicory are most known. However there are also a large number of minor leafy vegetables such as Valerianella, *Eruca*, Rheum and *Diplotaxis*. Currently around 4000 leafy vegetable cultivars are commercially marketed in the European Union of which fifty percent consists of various types of lettuce cultivars. Next to an inventory and analysis of leafy vegetables held in genebanks worldwide, key challenges of the project are the regeneration and evaluation of these crops in Europe in order to facilitate the use of these valuable genetic resources in the breeding of new cultivars but also in the cultivation of old leafy vegetable landraces (Figure 1).

Figure 1. An Italian rucola (*Eruca sativa*) variety.



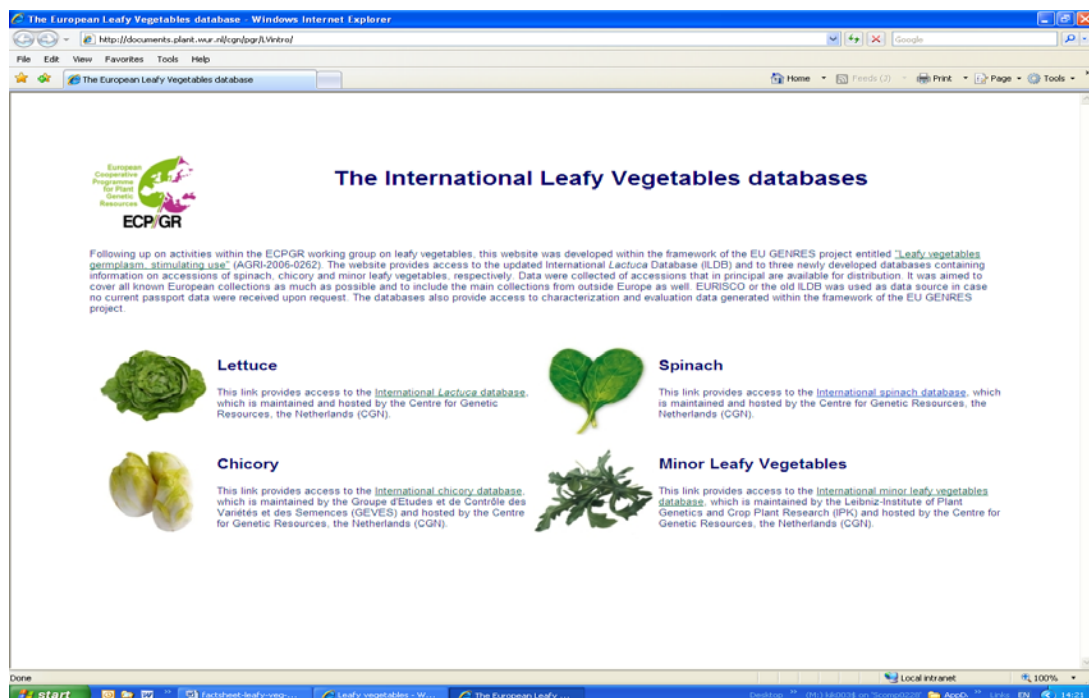
1.1 Project objectives

The Leafy Veg project was necessary due to a number of reasons. First of all there were no adequate crop databases for spinach, chicory and minor leafy vegetables at the start of this project. Furthermore the international lettuce database needed serious updating. This implied that the European genebank community did not have a good overview of their stored leafy vegetables germplasm at the start of the project. A consequence of the lack of overview was that strategies to acquire new germplasm were insufficiently determined. As a third point safety duplication was lacking for part of the collections maintained by the partners, which is very risky. Fourthly there were serious backlogs in regeneration, characterization, and evaluation of the leafy vegetables collections of the partners meaning that collections managed by them were not conserved in an optimal way. Last but not least there was limited access to trait data in leafy vegetables databases which made it difficult for the user to select the right accessions.

1.2 The Leafy Vegetables crop portal

In order to tackle the first objective of the project, namely the development of adequate crops databases, we developed a unique leafy vegetables crop portal on the web (<http://documents.plant.wur.nl/cgn/pgr/leafyveg/introduction.htm>; Figure 2). In this portal most if not all leafy vegetables crops present in genebanks worldwide can be found. Furthermore all the information can be retrieved using the same format for all the crops that are included.

Figure 2: Screenshot of the leafy vegetable crop portal.



The building of the leafy vegetables crop databases also allowed for a detailed analysis of gaps in the collections. We showed that in the case of lettuce large gaps are present concerning their close wild relatives. These crop wild relatives are of significant importance for breeding and research. Therefore recommendations were given which species to collect and where to collect.

The limited access to trait information in leafy vegetables crop databases has been addressed by the implementation of a download utility in the crop portal developed. The download facility constructed by the project allows the easy downloading of passport data, characterization & evaluation data and utilization data of the crop concerned. It will be clear that the Leafy Veg download facility will help users to more efficiently select for accessions and traits in which they are interested.

1.3 Regeneration, evaluation and safety duplication

Regeneration, characterization and evaluation are crucial aspects of proper genebank management. In this project most of the time was devoted to these activities. The targets set for these three activities were overdelivered by the partners: seed was produced on 1386 accessions, 1950 accessions were characterized for morphological traits and 770 accessions were evaluated for disease and pest resistance and organical compounds involved in taste. In summary, the current leafy vegetables genebank collections in Europe have been drastically improved through the GENRES Leafy Vegetables actions.

Figure 3: Regeneration of two types of lettuce at IPK (Germany).



The lack of safety duplication of several leafy vegetables collections maintained by the partners is a threat for the long term sustainability of these collections. After an action to increase the level of safety duplication, all Leafy Veg base collections maintained by the partners are safety duplicated now (Figure 4).

Figure 4. Long term storage facility at CGN (the Netherlands) which is also used for safety duplication of other genebank collections.



2. Communicating value

The information generated by this project can be found on the internet at: <http://documents.plant.cgn.wur.nl/cgn/pgr/leafyveg/introduction.htm>. The site gives an overview of the current state of the art on leafy vegetables genetic resources and consists of a leafy vegetables portal having currently the best database on leafy vegetables genetic resources worldwide.

The users of the Leafy Veg website are various ranging from breeding companies looking for new germplasm which may contain genes which can be used for the development of new cultivars, research institutes who need germplasm for fundamental research, non-governmental organizations who are interested in obtaining forgotten landraces and farmers' varieties with a specific taste, colour or growth habit and

genebanks who are for example interested in filling gaps in their collections.

In this context the work of the non-governmental organizations, like Arche Noah (Austria), Garden Organic (UK) and ProSpecieRara (Switzerland) in the project was important as they had a very direct link with the general public than any organization within the Leafy Veg consortium. This resulted for example in the testing for consumer acceptance for various accessions amongst which landraces (Figure 5).

Figure 5: Consumer acceptance testing at Garden Organic (UK).



3. The Action and the Partners

3.1. Action details

The GENRES 'Leafy vegetables germplasm, stimulating use' project was carried out by twelve partners coming from ten European countries, amongst which three university partners, six partners from public research institutes and three non-governmental organizations (Figure 6 and 7). The Centre for Genetic Resources, the Netherlands (CGN) coordinated the action which took place between January 1 2007 and December 31 2010 with a total budget of € 1,118, 600.

Figure 6: Partners and observers at the final meeting of the GENRES Leafy Veg in Montfavet (France) in November 2010.



Figure 7: Location of the partners in Europe.



3.2 Partner details

Coordinator	Chris Kik PhD Centre for Genetic Resources, the Netherlands (CGN), Droevendaalsesteeg 1, building 107, 6708 PD Wageningen, the Netherlands
Partner no 01	Dave Pink PhD University of Warwick (HRI), Gibbet Road, Coventry CV4 7AL, United Kingdom
Partner no 02	Pascal Coquin MSc Groupe d'Etudes et Controle des Varietes et des Semences (GEVES), Domaine de la Boisselière, 49250 Brion France
Partner no 03	Andreas Borner PhD Institute of Plant Genetics and Crop Plant Research (IPK), Correnstrasse 3, 06466 Gatersleben, Germany
Partner no 04	Ales Lebeda PhD Palacky University, Krizkovskeho 8, 77147 Olomouc, Czech republic
Partner no 05	Svein Solberg PhD Nordic Gene Resource Centre (NordGen), Smedjevagen 3, 23053 Alnarp, Sweden
Partner no 06	Brigitte Maisonneuve PhD Institut National de la Recherche Agronomique (INRA), 147 rue de Universite, 75338 Paris Cedex 07, France
Partner no 07	Franziska Lerch MSc Arche Noah, Gesellschaft zur erforschung der Kulturpflanzenviefalt, deren Erhaltung und Entwicklung, Obere Strasse 40, 3553 Schiltern, Austria
Partner no 08	Phil Sumption BSc Garden Organic, Ryton organic gardens, Ryton-on- Dunsmore, CV8 3LG Coventry, United Kingdom
Partner no 09	Filippo D'Antuono PhD Alma Mater Studiorum Universita di Bologna (UNIBO), Via Zamboni 33, 40126 Bologna, Italy
Partner no 10	Vladimir Meglic PhD Agricultural Institute of Slovenia (KIS), Hacqutova 17, 1000 Ljubjana, Slovenia
Partner no 11	Bela Bartha MSc ProSpecieRara, Pfrundweg 14, 5000 Aarau, Switzerland

Links

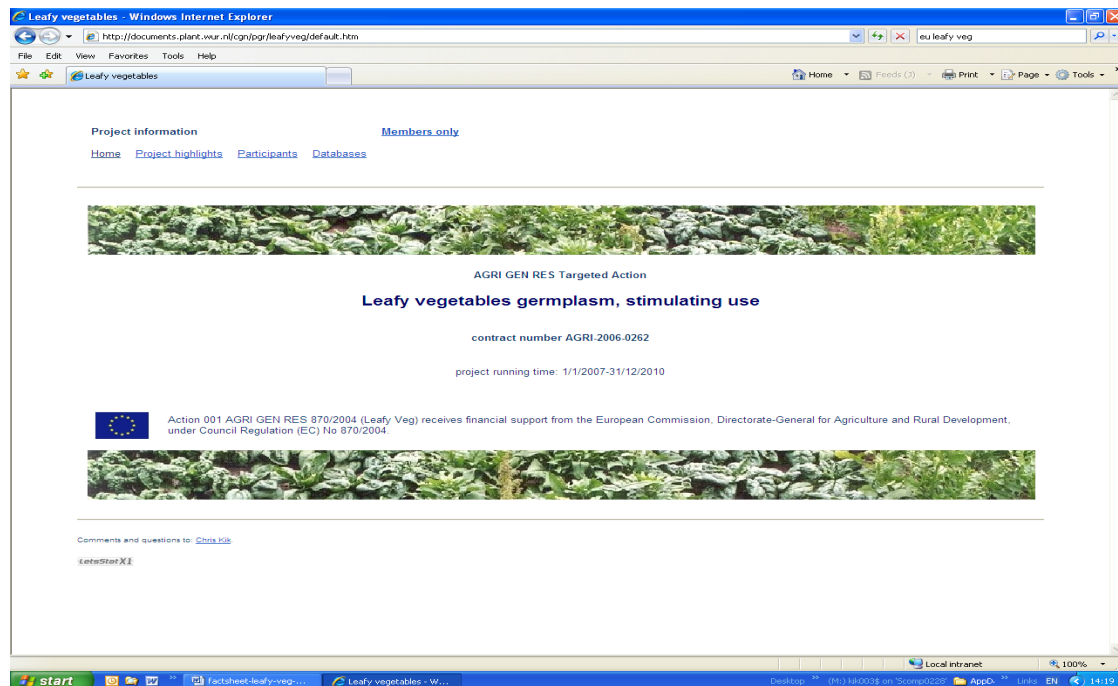
To obtain more information about leafy vegetables this section provides the links to the leafy vegetables portal developed in this project on the web and a list of interesting publications and other links.

4.1 The genetic resources and database

If one wants to have a good overview of what is currently present worldwide in genebanks concerning leafy vegetables, the home page of the GENRES Leafy Vegetables project should be consulted. It can be reached via:

<http://documents.plant.wur.nl/cgn/pgr/leafyveg/introduction.htm> (Figure 8).

Figure 8: Screenshot Leafy vegetables homepage.



4.2 List of project publications

The entire list of publications originating from this project can be found at the website of the Leafy Veg project:

<http://documents.plant.wur.nl/cgn/pgr/leafyveg/introduction.htm>

Key publications:

Kik, C (2007). European leafy vegetables project is not just rocket science. *Bioversity Newsletter for Europe* 34, 17.

Kik C, R van Treuren, D Pink, D Astley, P Coquin, V Cadot, A Boerner, U Lohwasser, S Thumm, A Lebeda, E Kristkova, S Solberg, K Antonius, B Maisonneuve, F Lerch, P Sumption, F D'Antuono, V Meglic and B Bartha (2011). Leafy vegetables GENRES project successfully completed! *Newsletter for Europe* 42, 12.

4.3 Other publications and links

Lebeda A, EJ Ryder, R Grube, I Dolezalova and E Kristkova (2007). Lettuce (*Asteraceae*; *Lactuca* spp.). In: Genetic resources, chromosome engineering, and crop improvement – Vegetable Crops (RJ Singh Ed.). CRC Press, Boca Raton (USA), pp. 377-472.

Other GENRES actions co-funded by the EU Commission can be found at: http://ec.europa.eu/agriculture/genetic-resources/index_en.htm

Figure 9. Various chicory varieties on the field at GEVES (France).

