# LEgume GEnetic REsources as a tool for the development of innovative and sustainable food TEchnological ABSYS

## OBJECTIFS

The goal of the project proposal has been the identification and valorization of genotypes with high agronomical, technological and nutritional value, together with the development of innovative legume-based food applications of the selected accessions on semi-industrial scale. These food applications, with high service value, will be able to induce the increase of legume consumption. The proposed approach, based on increasing the knowledge and subsequent introduction in the food chain for preserving the biodiversity of legumes, can be applied to the preservation of other vegetable or animal genetic resources, and could represent a step towards increasing the food system sustainability.

The principal scientific questions/statements and relative results/solutions given through the LeGeReTe project are listed below:

Q1: Is the knowledge of the chemical composition and of the technological properties of legume flours helpful for the identification of their best application as raw material or ingredient?

Q2: The potential beneficial effect of pulses on human health, is translated in in-vivo effect? Considering the differences among the pulse's species and, within the species among the difference accessions, are there also differences in the human health effects?

Q3: Are there solutions to increase the legume consumption that means, for some traditional accessions, the prevention of risk of genetic erosion?

Q4: Are pulses suitable for the use in innovative products, or their utilization and consumption is related only to traditional foods?

Q5: Are the solutions proposed sustainable and are the consumers ready for this new trend?

Q6: Could the project be considered the starting point for establishing new collaborations with research groups or private enterprises? Were young researchers trained?

## ACTIONS

The project worked at different steps of the legume chain :

- agronomic resources : Starting from the in-field trials, the principal aim was the selection of the core panel of accessions (about 200) representative of the legume biodiversity present in the project starting collection (encompassing 665 accessions). Performing this step was of crucial importance because the availability of genetic diversity increases the chance to find individuals displaying superior traits and genes of interest for plant breeders. We addressed this aim by performing a selection in the field based on morphological descriptors poorly influenced by the environment, such as and the flower color, and based on the characterization of DNA.

The core collection has been evaluated from a chemical

## RESULTATS

This project has shown that it is possible to use legume types/accessions (even the neglected ones but with interesting characteristics) for producing foods with high nutritional and service values (ready-to-cook and/or ready-to-eat), leading to the promotion of the consumption of these valuable crops. The project proved that a multidisciplinary approach (agronomical, nutritional, technological, and socio-economical) is a fundamental preliminary step for the introduction of new genetic resources in the food chain.

There are some "barriers" that we have observed towards legumes, in particular regarding consumer attitudes:

Taste and price hamper the consumption of legume-based foods.

There is a preference for unprocessed legumes; legume-based processed foods are not perceived as particularly healthy.

Health-concerned and environmentally conscious consumers are more likely to consume and buy legume-based products. Women and heavy meat reducers are more inclined to accept such products.

More information should be provided on the benefits of legumes to attract more attention, as their use is not part of some culinary habits.

## PERSPECTIVES

The results of the project constitute the basis of further researches according to the Sustainable Development Goals.

From a genetic point of view, significant genetic redundancy was found among accessions conserved in germplasm collections, thus indicating that further studies using molecular markers will be of great value for the rational management of material stored in gene banks. The use of genotyping-by-sequencing proved to be a cost-effective strategy for the genetic characterization of legume germplasm, and thus might be exploited.The detection of individuals and markers associated with superior traits (such as adaptation to drought and cold stresses, flowering time, seed chemical composition) might fuel new research addressing the characterization of genes and molecular mechanisms underlying these features. There are several technological issues that must be solved for the introduction of the legume genetic resources in the food chain. First of all, the sensory characteristics of legume-fortified food need to be improved and this is true especially for the traditional products. As also showed from the consumers studies, the taste hampers the consumption of legume-based foods.As new legume-based foods will become more popular, it is reasonable that this discrepancy will fade out. However, further study can investigate how to smooth the flavor of legume-based food, by using technological or biotechnological approaches. The acknowledging of the