

13 November 2019

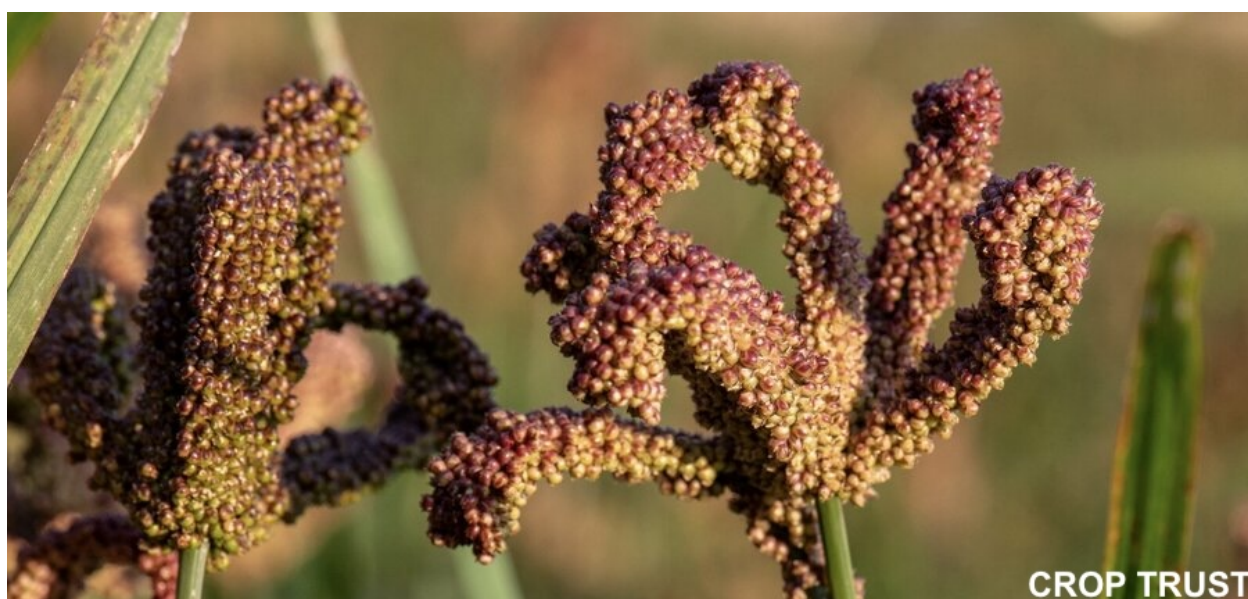
## **Do forgotten crops have a part to play in the transition towards a more sustainable and climate friendly food system?**

**The issue: the reliance of our food system on a small number of species and varieties**

Out of some estimated 250,000 to 300,000 edible plants on earth, it is believed that only 10,000 have actually ever been consumed as food. Today only 150 to 200 are being used and three (rice, maize and wheat) represent 48 percent of average daily calories consumed. This is what the UN Food and Agriculture Organization (FAO) tells us [\[read\]](#).

It is clear from these figures that humanity is only using now a minute part of the edible potential of the planet; worse even, with time, it has reduced the number of plants on which its food is based.

Rural urban migration throughout the world and the associated cultural change, the development of industrial agriculture, the growing importance of trade and food processing and the norms they impose, and consumer preferences have made it that many of the traditional crops that were widely produced and consumed in the past have been marginalised and are in the process of being forgotten; some have actually already virtually disappeared.



Not only has the number of species (both plants and animals) been reduced, but within each species the number of varieties used has shrunk dramatically [\[read\]](#),

the most productive in terms of yields having progressively been promoted to the detriment of other varieties with different advantages (e.g. taste, resistance to drought resistance or disease, valuable by-products, etc.) [\[read\]](#).

## Consequences

This narrowing of the food base has had several consequences, some of which are rather dramatic:

- A homogenisation and artificialisation of production that attempts to create in diverse agroecological environments the optimal conditions for a limited number of highly productive species and varieties by making extensive use of irrigation, fertiliser and pesticides.
- A greater vulnerability of our food system to pests and diseases. Large-scale monoculture of a single variety creates a favourable context for the development of pests and diseases. Outbreaks may be controlled by extensive use of pesticides (or veterinary products, in the case of animals), until a resistance develops among pathogens [\[read on the case of antibiotics in livestock production\]](#). In such situations, the need is then, rather than using fully eventual benefits of an application of excessive doses of remedies, to look for disease or pest-resistant varieties (or species): evidently, the smaller the stock of species and varieties available, the lesser the chance of finding them. In case an acceptable solution (i.e. that has a comparable level of productivity) is not available in the stock, it will take time before an appropriate solution is found, with potentially dramatic implications on short- and medium-term food availability.
- A greater vulnerability to climate change. Here the situation is similar to the preceding point, the question being to find in the available genetic stock varieties that are adapted to new climatic conditions (temperature, light, humidity and rain, in particular). Implications on food availability could be at least as dramatic as in the previous case.
- A degradation of fertility and biological activity of soils. Monoculture and the inappropriate agricultural techniques that are associated to it (use of toxic agrochemicals, cultivation techniques such as frequent deep ploughing, use of heavy machinery, poor crop rotations, elimination of trees and hedges, etc.) are known to have a negative impact on fertility and biological activity of soils that translates into lower future yields [\[read\]](#). Biological activity in the soil and its importance are as yet a little known area (e.g. over 99 % bacteria and protist species remain unknown).
- An impoverishment of diet (reliance on one main cereal or root crop and a very limited presence of vegetable and fruits) that may lead to important vitamin and mineral deficiencies, particularly for children [\[read\]](#). There are many examples showing the replacement of traditional staple crops by more productive but nutritionally poorer staple crops and a reduction of consumption of traditional vegetables that may be linked either to a lack of land and time to grow them (in rural areas) or to a lack of time to prepare them (in urban areas) that often leads to the consumption of unhealthy industrial processed food [\[read for example here\]](#).

- A narrowing of the focus of agricultural research on the few leading crops that reinforces their domination. To illustrate this point, consider that the Consultative Group on International Agricultural Research (CGIAR) is organised in 15 Research Centers disseminated throughout the world: 6 focus on the leading crops (maize and wheat, potato and two centers on rice), while others deal with specific agro-ecological regions (two on tropics, one each on mediterranean or arid areas) or on other matters (livestock, policies, water, forests, agroforestry and fish). At national level, in West Africa, for example, until recently research was mostly concentrated on export crops (e.g. cotton, cocoa) and on rice and maize (two alien crops) but was not doing much research on traditional indigenous staple crops (millet, sorghum, fonio, beans, etc.).



Recently, as a reaction to this evolution, two main solutions have been envisaged.

### **Solution 1: promotion of “forgotten crops”**

During these last years, there has been a renewed interest for the so-called “forgotten crops”. There have been several initiatives to promote them.

- Crops For the Future, an independent international organisation supported by the Government of Malaysia was established in 2009, based in Malaysia. It works “to develop solutions that diversify agriculture using underutilised crops”. It operates through a global research community and is active in promoting the use of these crops.
- In 2012, FAO’s effort to promote quinoa by making 2013 the International Quinoa Year, that triggered a boom in the consumption and production of this crop traditionally cultivated on the Andean Altiplano and that is now spreading on the five continents but still remains of a relatively limited importance (in 2017, international trade of wheat was around 7,500 times that of quinoa!). In the coming years, similar such movements may be expected for crops like finger millet, bambara groundnuts, fonio [read in French], teff, amaranth (a

cousin of quinoa), buckwheat and many others [\[read\]](#). In Australia, millet has seemingly already been “making a comeback”.

- Another important initiative is the African Orphan Crops Consortium that gathers international organisations (World Agroforestry Centre (ICRAF), UNICEF), one international NGO (World Wildlife Fund), regional organisations (the African Union’s New Partnership for Africa’s Development Agency and Biosciences Eastern and Central Africa – International Livestock Research Institute (BeCA/ILRI) Hub), one university (University of California, Davis), and a group of private companies most of which deal with genetics (BGI, ThermoFisherScientific, CyVerse, LGC, Illumina, Google and Mars). “The consortium’s goal is to sequence, assemble and annotate the genomes of 101 traditional African food crops, which will enable higher nutritional content for society over the decades to come”.

As can be seen here, forgotten crops are wetting the appetites of large private companies and one may worry about risks of biopiracy, an illegal business from which some private firms have been making billions of dollars of profit by appropriating living organisms selected by peasant and indigenous communities over thousands of years. This has been happening despite the Nagoya Protocol (signed in 2010 and that became operational in 2014) that determines modalities for protecting the interest of communities in the case of access by private interests to genetic resources. Regrettably, the Protocol does not fix precisely the content of agreements between private companies and communities, leaving the possibility for payments of ridiculously low compensations. This makes that many specialists think that the Protocol is more rhetorical than effective.

In France, there has been an increasing promotion of the consumption of plants such as parsnip, pattypan squash, rutabaga, Jerusalem artichoke, horseradish, black radish, crosne or Chinese artichoke, nettles, black salsify and purslane on the ground of them containing anti-oxydants, minerals and vitamins and/or presenting specific health benefits [\[see one example here, in French\]](#).

However, were you to make a survey among French consumers, you would find that many of these names are unknown to most people (particularly but not exclusively in urban areas), that people have no idea what these products look like and even less knowledge of how to cook them. This is not specific to urban areas of a rich country like France. A few years ago, a study on such crops was conducted in Bhutan to realise that many were disappearing and that the way to cultivate them, prepare them and preserve them during the winter was almost forgotten. The same can be observed in parts of Africa where traditional cuisine relied a great deal on wild plants (in particular on tree leaves) that have disappeared for a variety of reasons (climate change, expansion of monoculture, felling of trees, etc.).

One thing seems to be sure: it will take some time before forgotten crops play an important role in our diet and in agricultural land use. For example it is easy to see that despite the recent and seemingly important boom of quinoa, this grain as yet only occupies a very minor space in our food (approximately 100 grammes per

person per year, compared to more than 100 kilogrammes per person per year for wheat in the case of France!).

## **Solution 2: developing and promoting biofortified crops**

At the other end of the spectrum of reactions to the issue of vitamin- and mineral-deficient diets one finds biofortified crops. The idea here is, rather than diversifying diet and crops, to modify the most popular staples in order to incorporate into them the vitamins and minerals whose absence is source of what has been called over the last years “hidden hunger” [\[read\]](#).

For some decades, deficiencies had been addressed by adding to staple food, at the processing stage, additives bringing the missing elements. Now the intention is to make it that plants themselves contain missing elements such as iron, zinc, vitamin-A and amino acids.

This is being done in three main ways: through specific agronomic practices, through conventional plant breeding (selection), or through biotechnology. The supporters of the plant breeding and biotechnology solutions see in these approaches a way not to change the existing agricultural system based on monoculture and the intensive use of chemical inputs. A wide adoption of biofortified crops would be a step further in the direction of an artificialisation of agriculture.

Harvest Plus has been at the forefront of this approach. Funded by the US and UK Governments, the Gates Foundation and the EU, it is cooperating closely with the CGIAR and is hosted by the Washington-based International Food Policy Research Institute (IFPRI). It partners with all CGIAR research institutes and several universities throughout the world. Success so far has been rather limited. WHO, for example, believes that more research is needed before biofortified foods can be recommended [\[read\]](#).

Major pending issues are the actual bioavailability of nutrients found in biofortified crops and their safety [\[read\]](#). One of the most emblematic biofortified crops is Golden Rice, a genetically engineered rice modified by addition of three genes in order to produce beta-carotene, the precursor of vitamin A. It was “manufactured” by the International Rice Research Institute (IRRI), based in the Philippines, with financial support of the Gates Foundation. It has been the object of controversies and is currently under a process of approval for release in the Philippines and in Bangladesh [\[read\]](#).

At [hungerexplained.org](http://hungerexplained.org) we will come back to the important issue of biofortified crops in a future article.

## **Conclusion**

Over the last century, history of agriculture has been one of a dramatic impoverishment of the genetic base of our food. Our dependency on a small

number of species and varieties of plants and animals has serious consequences in terms of vulnerability to pests, diseases and climate change, and in terms of the degradation of natural resources.

This evolution also resulted in an impoverishment of diets – causing various deficiencies – and in a narrowing down of agricultural research which carries the risk of condemning agriculture (and food) to continue a dangerous headlong rush forward in the artificialisation of food production.

In reaction to this evolution, there has recently been renewed interest for a certain number of “forgotten crops” that have been the object of various initiatives aiming to promote them with the view to diversify diets and agricultural production. One of the advantages one may expect from this movement is a multiplication of different crop associations and more complex rotations in the framework of a more sustainable polyculture that would use more effectively crop complementarity from the point of view of soil fertility as well as of combat against diseases and pests.

The answer to the question asked in the title of this article is therefore “yes”.

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To know more :

- Bélanger, J., and D. Pilling (eds.), The state of the world’s biodiversity for food and agriculture, FAO, 2019.
- Lyon, N., Millet the ‘forgotten crop’ makes a comeback, Grain Central 2019.
- Jha, P., Are forgotten crops the future of food? BBD Future, 2018.
- Discussion paper on biofortification with essential nutrients, Codex Alimentarius, 2014.
- Hernández Bermejo, J.E and J. León, Neglected crops – 1492 from a different perspective, FAO, 1992.

Websites:

- Forgotten Foods Network, website, Crops for the Future.
- 10 légumes oubliés et leurs bienfaits, Fourchette et Bikini, website (in French).
- African Orphan Crops Consortium, website.
- Biofortification of staple crops, WHO website.
- Harvest Plus website.

Selection of past articles on [hungerexplained.org](http://hungerexplained.org) related to the topic:

- The triple burden of malnutrition is getting heavier in the world, says UNICEF, 2019.
- Improved and local paddy varieties in South Asia: governments remain deaf to arguments put forward by farmers while biodiversity continues to decrease, 2019.

- The global food crunch: myth or reality? 2018.
- Genetic resources: acceleration of privatisation of living organisms is a threat to food security and biodiversity, 2013.