

WHEAT

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THE ANCIENT AND FUTURE CROP

Wheat plays a crucial part in the everyday life of billions of people around the globe. The cereal is farmed extensively, with yearly production surpassing the high yields of rice. Annual figures for wheat are around 750

million tonnes, cultivated on more than 540 million acres, and that trend is set to increase exponentially as the human population is forecast to rise in the very near future.

Historically, wheat has been part of human culture since the earliest era. References to the grain have been found in ancient Chinese writings and Biblical scripture. Socrates is quoted as saying, “No man qualifies as a statesman who is entirely ignorant on the problems of wheat.” He was of course speaking about the political direction of the period, but it shows what a key cultural influence this grain had to civilization.

Cultivation of wheat began over 10,000 years ago in what James Henry Breasted coined the, “Fertile Crescent” also known as the cradle of civilization, or more commonly, Mesopotamia. Along with Einkorn wheat, Emmer was one of the first crops to be domesticated and actively farmed. As humanity spread through migration and trade, the cultivation of Emmer reached Greece, Cyprus and India by 6500 BCE. Egypt followed shortly after 6000 BCE, and Germany and Spain were introduced to wheat by 5000 BCE. By 3000 BCE, the grain had reached the British Isles and Scandinavia. A millennium later it reached China. From Asia, wheat continued to spread throughout Europe. In the British Isles, the wheat stalks were dried, creating straw and used as thatching for Bronze Age roofing until the late 19th century.

Wheat is part of the *Triticum* genus of grasses, and has a very complex genome. To give some indication of this, wheat diversifies into diploid, tetraploid and hexaploid groups, all of which can separate into three more distinct genomes within the cell nucleus. By comparison, each of these genomes is almost twice as complex as the human genome and consists of around 5,500 million letters.

Today, the major cultivated species is, ‘*T.aestivum*’ which is known as Common wheat. Durum, Hard Red Spring and Hard or Soft Winter variants are the next most popular strains. There have

been successful efforts to genetically alter the DNA of wheat with a view to improving yields and making it more resistant to disease or loss. One such process is dwarfing, which has been used to prevent spoilage. Researchers found that when grain is almost ripe, the heavy ears overcome the natural strength of the grass stem and it bends to come in contact with the wet ground, thus rendering it un-harvestable.

The primary use for wheat is within the food chain. Raw wheat can be ground into flour, durum wheat is used for semolina, and germinated wheat is used for malt. Processed wheat constitutes the core ingredients of staple foods such as bread, porridge, biscuits, pies and even gravy. When eaten as the whole grain, wheat is a healthy food source of multiple nutrients and lowers the risk of several diseases. Its effects on gastrointestinal health and risk of obesity as yet remain unproven, however whole wheat contributes toward lowering the risk of coronary heart disease, stroke, cancer and type 2 diabetes.

As a commodity, wheat is widely cultivated as a cash crop due to the ease with which it can be grown and the high value it holds. Sold in ‘bushels’, which is the equivalent of 8 gallons (within the UK) or 64 pints (in the US), the last 10 years have seen wheat consistently command a price of around US\$6. However, the market is volatile, wheat reached a high of \$10 in 2008 and a low the following year of under \$3. Due to this, farmers are routinely provided with Government subsidies to offset losses and encourage or compensate production. The amount of assistance given will be especially relevant to those in the UK following the upcoming Brexit plans. Farmers receive on average £2.1 billion in direct subsidies and £600 million in rural development payments through the EU’s Common Agricultural Policy. The UK Government has stated it will maintain the funding levels of around £1.8 billion a year, however it is currently unknown how World Trade Organization rules on ‘market-distortion’ may scupper those plans.

Economics and policy are not the only problems faced by wheat farmers. Disease and pest infestation account for yield losses of 30 percent each year, and these are conservative estimates. A new and unusual fungal infection was discovered in Sicily last year, which destroyed tens of thousands of hectares. To make matters worse, there are fears that the spores may infect this year’s harvest. Researchers from the Global Rust Reference Centre (GRRCC) identified the infection as a form of Stem Rust,



known for its characteristic brownish stain and devastating impact. “Stem rust epidemics haven’t been seen in Europe since the 1950s” says Mogens Hovmøller, who leads the GRRC’s testing team. “It’s not a challenge plant breeders have faced for many years,” agrees James Brown, a plant pathologist at the John Innes Centre in Norwich, UK. Speculation on how Stem Rust returned to this area has suggested it could be down to climate change, combined with changes in farming practices, such as sowing earlier in the season. However Hovmøller and others state they will seek support from the European Research Council to establish an early-warning system in a bid to prevent another outbreak.

With these problems in mind, the future of wheat could see a return of once forgotten species such as Emmer, Spelt and Einkorn. The increased consumer demand for high-quality and healthy food, presents an opportunity to reintroduce ancient wheat varieties. These in turn could provide niche markets for small farmers, millers, and bakers. Many of these seed varieties still exist in gene banks all over the world, and scientists

view them as an important source of genetic bio-diversity. Friedrich Longin and Tobias Würschum, from the University of Hohenheim in Germany have noted that, “People are interested in diversity, in getting something with more taste, with healthier ingredients, and ancient grains deliver interesting things.”

Further to their academic and scientific research, there is a growing market for spelt products as an example of how ancient grains can be successfully reintroduced into the food chain. Spelt was the main cereal crop in Southern Germany, Austria, and Switzerland until the early 20th century, where it nearly disappeared. It’s rediscovery started in the 1970’s and only a few millers and bakers were still familiar with traditional spelt recipes such as Swabian seelen, a baguette-like pastry. Today, more than 100,000 hectares of spelt are grown annually in and around Germany, with an annual turnover of €1 billion across Europe and an annual growth rate of more than 5 percent.

This growth has attracted economists and scientists alike. The ambition to introduce these forgotten grains to the food chain will require a concerted co-operative effort from all areas such as plant breeding, nutritional analysis and marketing. The projected end result however points toward a sustainable and self-financing system that can revolutionize the sector and ease existing concerns. ☹