

CLIMATE CHANGE, MACROECONOMICS AND THE GLOBAL UPSURGE OF QUINOA

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Cereal is cultivated from grasses and is primarily the edible elements of its grain, namely endosperm, germ and bran. In their raw form as whole grain, cereals are a rich source of the nutrients that humans need for daily life. This is especially relevant in developing nations, where rice, wheat, and maize constitute the majority of the population's diet. In developed countries by contrast, cereals have moderate consumption levels, commonly via food eaten for breakfast or indeed bread.

The word 'cereal' is derived from Ceres, the Roman goddess of harvest and agriculture. It has been farmed since the earliest periods, with evidence pointing to agricultural practices as long as 11,000 years ago. Modern production figures since 1960 show that the yields of cereals have grown three and four fold in some cases. The increase in global population has placed a higher demand on farmers who have responded; a trend that is set to continue for the foreseeable future. Maize wheat and rice together accounted for 90 percent of all cereal production in 2012 and 43 percent of all food calorie intakes in 2009.

Despite the pressures of a growing population, the latest market forecast for cereals is slow. Climate challenges and macroeconomics have been attributed as the reason for this projected stasis in production levels. Sergey Avramenko, head of the global markets research team at IndexBox, who referenced IndexBox's recent report which examined trends in the market until 2025, is quoted on bakeryandsnacks.com as saying, "We expect the persistence of the growing global grain consumption trend with an average growth rate of about two percent with no significant acceleration or deceleration."

Global output figures for 2017 show that maize enjoyed 36 percent share, rice and wheat accounted for 26 percent, barley occupied 26 percent with other crops taking the final six percent. By comparison, the market value in 2025 is expected to top US\$735 billion with maize reaching US\$295 billion, rice gaining US\$290 billion and wheat projected at a value of US \$150 billion.

With regard to the projections, Breakfast cereal, one of the most common forms of diet enhancement, certainly within Western cultures, has felt the impact of production factors and consumer choice. Sales of processed cereals were down £78 million in 2016 as people opt for cereal bars or takeaways from coffee shops.

Research has revealed that some of the cereals available in supermarkets are not as healthy as consumers expect, which has driven choice.

The amount of sugar and salt contained with the processed cereals has come under fire. Some UK cereals have 11.1g of sugar per recommended 30g serving; this is the equivalent of almost three teaspoons of sugar. In the larger 100g serving, there are 37g of sugar.

The revelations are compounded by the fact that cereals are promoted as healthy and are heavily marketed to children. In 2015 the projected global spend for advertising was US\$600 billion. To put this in context, this figure is comparable with the global annual spend on alcohol. The difference being that alcohol isn't directly marketed at children, and the adverse health effects are generally common knowledge.

Graham MacGregor, Professor of cardiovascular medicine at Queen Mary University of London and Chairman of WASH, said to 'Cornwalllive', "It is shocking that breakfast cereals still contain extremely high levels of salt and sugar. In response, the industry has pledged to make changes."

One of the largest manufacturers said, "We are proud of the progress we've made against our global sugar and sodium reduction targets we set to achieve by 2020." In addition, the manufacturers have made efforts to remove 2,000 tonnes of sugar in cereals and 7,000 tonnes of salt.

Whilst these changes are welcome, consumers, as well as external bio-agricultural influences, will determine the future for cereal.

Resurrection of once forgotten grains

Scientific research has enabled the resurrection of once forgotten grains such as quinoa. The grain's genome has been successfully mapped to identify a way to remove the natural bitter taste opening up the possibilities of wider commercial use. Quinoa grows in harsh conditions; high elevations and cool temperatures meaning it can flourish where other crops such as wheat or rice would struggle.

Plant scientist Mark Tester of King Abdullah University of Science and Technology in Saudi Arabia said to 'Reuters', "It is highly nutritious, with a high protein content that, importantly, has a very good balance of amino acids, which is unusual for our major grains. It is gluten free and high in vitamins and minerals, too."

Quinoa can be used in the same manner as rice and wheat leading to good prospects for consumer uptake, and it has enjoyed a growing status as a health food in Western markets.

Cereal, past and present, will play a vital part in not only the amount of future food we have available, but in the quality as well. One of the critical elements is the balance of nutrition, whilst grains themselves can vary widely such as some are deficient in essential amino acids and it is common for vegetarian cultures that exclusively eat these, to substitute their diet. Other grains provide daily levels of vitamins in one sitting.

An example of this can be seen in Kenya. Scientists have unveiled a way to enhance the levels of available vitamin A to combat the growing problem of child blindness.

A bio-fortified Sorghum crop, which is a grass grown for a variety of things including grain, is genetically modified to improve both food and nutritional security. In addition to the nutritional benefit, Sorghum needs very little rain, and is much more hardy than for instance traditional crops such as maize, making it ideal for drought prone counties like Africa.

Dr Magomere, a lecturer in biotechnology at Kenyatta University and his team has already increased the Vitamin A available in sorghum test plants.

He explained to 'Devex' "This is the first step, the second has been to increase availability of iron and zinc and this has been done by reducing the levels of a protein that binds iron and zinc in the plants. We hope once the product is ready, a meal of sorghum, which will be available to the local farmers, will reduce nutritional deficiencies significantly." ☺