Soya: From sacred grain to vital modern-day agri-food

By Dr Carmen Muller, Dr Beulah Pretorius and Prof Hettie Schönfeldt

Soya has been around for thousands of years, with its origin speculated to be between 1134 to 246 BC in the Orient, during the Chou Dynasty, where it was considered to be a sacred grain. During this time, soya crops gained increasing popularity once their fermentation potential was discovered and in western civilisation, the crop's agricultural potential became prominent.

In 1804, a ship from the Orient to the United States delivered its first batch of soya to the western world. From there on it spread around the globe and has since been used for both human and animal consumption.

The miracle crop

Soya has often been referred to as the 'miracle crop' due to its high protein content and application for a variety of uses. Global soya production increased from 27 million tons in 1963 to 218 million tons in 2007, and is projected to rise to 514 million tons in 2050. In South Africa, soya is mostly used as animal feed. In the oilseed industry, however, its use for human consumption is increasing.

Currently, of the 350 million tons of soya produced globally, around one fifth is used for human consumption. Whole beans and their derivatives are found in food such as tofu, soya milk and edamame and account for only 6% of soya consumption, while an estimated 13% of the total crop is produced into soya oil, which is the most consumed oil following palm oil.

The diverse nature of the soya bean makes it an exceptional product that plays multifunctional roles in the food industry. Soya lecithin is a highly functional element of soya that acts as a natural emulsifier in numerous food products. Soya lecithin can improve texture, extend shelf life, assist in the mixing of sugar, fats and oil, and prevents greasiness and graininess in food.

New and innovative products are becoming more prevalent, showcasing soya as a meat extender or replacer in mince, burger patties, sausages, polony and ready-made meals. Soya in the form of reconstructed or hydrolysed protein is commonly found in products such as breakfast cereals, soup powder, fish spread and peanut butter. Soya also aids in adding flavour to food in the case of instant pasta meals and maize chips. Soya flour provides an appealing texture and flavour to baked goods and is commonly used as a coating.

A boost in nutrition

With the increased consumption of soya as a high-quality meat alternative and

its use in the food processing industry, it can contribute to the nutritional status of the population. Therefore, it is important to have a clear understanding of the nutrient quality of soya that is produced and consumed within South Africa.

Soya consists of 40% protein, 25% carbohydrates, 18% oil, and 17% moisture and ash. *Table 1* shows the nutrient composition of 100g cooked soya

Table 1: Nutrient composition of 100g cooked soya. (Source: South African Food Composition Database)

Nutrient	RDA	Cooked soya	% RDA
Calcium (mg)	1 300	102	8%
Iron (mg)	13	5,1	39%
Magnesium (mg)	365	86	24%
Phosphorus (mg)	1 250	245	20%
Potassium (mg)	4 700	515	11%
Sodium (mg)	2 000	1	0%
Zinc (mg)	10	1,15	12%
Copper (mg)	0,9	0,41	46%
Vit A (ug)	800	1	0%
Vit B1 (mg)	1,2	0,16	13%
Vit B2 (mg)	1,3	0,29	22%
Vit B6 (mg)	1,6	0,23	15%
Folic acid (ug)	400	54	14%
Vit C (mg)	100	2	2%
Vit D (ug)	15	0	0%
Vit E (mg)	15	0,35	2%

and its contribution to recommended daily allowance (RDA). It contributes a wide variety of nutrients to the diet, particularly protein, B vitamins and iron.

Quality vs quantity

Consumer trends are shifting towards the consumption of alternative sources of protein. Challenges such as incomplete amino acid profiles and anti-nutrient content, however, limit the value of these alternative sources of protein in the diet. The quality, instead of the quantity, of protein is going to matter more in future.

Currently consumers think only of quantity and rarely of quality – and there's a gap in the market for proteins with a complete profile of amino acids which can compete with that of animal proteins, of which the quality score is higher than that of plant protein.

The recommended RDA for protein refers to high-quality protein or, more specifically, to an amount of absorbed protein having an optimal amino acid balance – a digestible indispensable amino acid score (DIAAS) of 1,0 or >1,0. This means that protein quality needs must be taken into account when matching specific food intakes with recommended requirement levels. Soya has a DIAAS of 0,91 with cysteine and methionine as limiting amino acids.

The South African Food-Based Dietary Guidelines state that one should "eat dry beans, split peas, lentils, and soya regularly". This supports the consumption of soya within a balanced diet. It provides the soya industry with an opportunity to grab and expand new market segments and increase consumption of soya within South Africa. However, over the last few years, issues relating to soya consumption have been noted.

A boost in soya consumption

Soya is a commonly consumed product in the South African National School Nutrition Programme (NSNP). Unfortunately, a study conducted in 2016 found that pupils were unwilling to consume meals on days that soya was served. A more recent study conducted in 2019 found that the soya as served in the NSNP was prepared in an unappealing manner and that there was a negative perception around soya among pupils.

To address this concern, the Oil and Protein Seeds Development Trust (OPDT) supported a study to improve soya meals served in the NSNP. The four newly created recipes were found to be much more appealing, and pupils showed increased willingness to consume these dishes compared to soya as previously served in the programme.

In another study conducted in 2017 (also supported by OPDT), 17% of 1 000 participants reported that they have never eaten soya, 54% said only sometimes, 6% consume it once to twice a month, 13% weekly and 10% daily. It was also found that consumers were unaware of the significant role soya plays as an ingredient in numerous food products.

Concerns relating to why consumers did not like soya included that it is funny tasting, they don't like it, they don't know how to cook it or where to buy it, and to a lesser extent that it causes allergies and flatulence, as well as unfamiliarity with the product. Of the participants, 53% stated that they would be more willing to consume soya if there were enticing recipes available.

Agri-food: A whole new world

The ever-changing consumer market and studies such as the EAT-Lancet Report of 2020, which recommends a decrease in animal-based food products in the daily diet, paves the way for soya to own its place on the plate.

New agri-food trends show an increase in the need for innovation and encourages producers to embrace the shifts seen in consumer preference. Factors such as health concerns, convenience and technology, alternative proteins, sustainability, a reduction in waste, along with new flavours and experiences will pave the way for the next few years.

Soya beans offer a unique opportunity as a high-quality protein to ordinary citizens at an affordable price. However, investment in research is needed to improve the current offering by innovative uses of modern technology. Advertising and consumer education on benefits and uses of the product to appeal to the nutrition-conscious and cash-strapped alike can significantly increase the market.

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For more information, contact Dr Carmen Muller at vanniekerk.carmen@gmail.com, or Prof Hettie Schönfeldt at hettie.schonfeldt@up.ac.za.