

# So much more than just a bean

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**S**oya was first recorded and described as a sacred grain in the Orient during the Chou Dynasty, between 1134 and 246 BC. Soya crops gained increasing popularity once their fermentation potential was discovered, and in Western civilisation the agricultural potential became prominent.

In 1804, a ship from the Orient to the United States delivered its first batch of soya beans to the Western world. From there, soya spread worldwide and has since been used for both human and animal consumption. Soya bean has often been referred to as the 'miracle crop' due to its high protein content and 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, human consumption is increasing. The production and consumption of soya bean oil for human and animal use is on the rise.

## The demand for protein

Soya plays a multifaceted role in the food industry due to its functionality, versatility and nutritional content. Soya is so much more than just a bean and is used in the food industry as lecithin, reconstructed protein, flour and flavourings in baked goods, candies, spreads, coatings and powders, to name a few.

When taking a closer look at ingredient lists of products, it becomes evident that soya can be found in every aisle of the supermarket, where it plays various flavour and structural roles as well as contributing to the diet. Apart from being

a high protein food alternative, studies are showing that soya can be classified as a low GI food, which can further boost this product's market potential.

The demand for protein as a macronutrient that provides energy and essential amino acids is increasing, along with the growing world population. This should be seen against an environment where people are increasingly enabled financially to purchase and consume a varied diet.

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One of these groups experiencing a rise in expendable income is the South African middle class. This group is also the main consumers of protein extenders and replacers. In addition to a growing need for protein, pressure is placed on the food system to be more environmentally conscious.

Although considered globally as a healthy, sustainable, protein alternative to animal-source foods, soya beans for human consumption have not been mainstreamed in South Africa, which creates an opportunity to grow and develop the sector for farmers and consumers.

## Processed for human consumption

Protein plays many functional, structural, metabolic and developmental roles in the

human body. Adequate protein intake and the correct ratio of essential amino acids are necessary for overall health. Plant-based foods have been a source of protein for humans for millennia, providing about two-thirds of total protein intake globally.

Although one of the South African Food-Based Dietary Guidelines of the National Department of Health states that adults and children older than ten years should "eat dry beans, peas, lentils and soy regularly", only 4% of total production in 2012 was processed for human consumption.

Even though this contribution is small compared to oilcakes or animal feed, the human consumption of soya beans has increased fivefold since the early 1980s, indicating a potential to grow and establish this commodity as a modern, healthy, culinary item.

## Importance of protein quality

The total South African soya bean crop was estimated to be approximately a million tons in the 2016/17 production year, which is only 0,28% of global production. It places the focus on the need to prioritise the consumption of these foods, and more specifically soya.

The World Health Organization (WHO) Technical Report on Protein and Amino Acid Requirements in Human Nutrition (2007) states that the best estimate for a population average requirement is 105mg nitrogen/kg body weight per day, or 0,66g protein/kg body weight per day.

In many developing countries protein intake falls significantly short of these values. Apart from protein quantity, protein quality, including bioavailability and digestibility, is currently being discussed on the global nutrition agenda.

The first International Symposium on Dietary Protein for Human Health, held in Auckland in March 2011, and the follow-up Food and Agriculture Organization of the United Nations (FAO) Expert Consultation on Protein Requirements, both highlighted the importance of assessing the quality of protein from different food sources through the determination of amino acid content.

## Soya plays a multifaceted role in the food industry due to its functionality, versatility and nutritional content.

Throughout the developed world, animal products and cereals are the two most important sources of protein, respectively. In developing countries such as South Africa, this order is reversed similar to low income countries where only 3% of total dietary energy as an indicator of diet composition is derived from meat and offal, 11% from roots and tubers, and 6% from pulses, nuts and oilseeds. The remainder of the dietary energy is mainly obtained from cereal-based staple foods.

As countries are developing, the demand and consumption of protein is continually increasing. Undernutrition, including insufficient consumption of protein, remains a persistent problem in developing communities, and although

**Table 1: Type and amount of essential amino acids required to form a complete protein.**

Essential amino acid	mg/g of protein
Tryptophan	7
Threonine	27
Isoleucine	25
Leucine	55
Lysine	51
Methionine+Cystine	25
Phenylalanine+Tyrosine	47
Valine	32
Histidine	18

**Table 2: Protein content of different food groups.**

Food group	One serving (g)	Protein amount (g)
Meat	85g beef, lean cooked	28
	85g chicken, cooked	26
	85g anchovy, canned in oil (solids)	25
Legumes	172g (1 cup) cooked soya beans	29
	196g (1 cup) boiled split peas	16
	256g (1 cup) red kidney beans	13
Dairy	245g (1 cup) milk	8
	28g Cheddar cheese	7
	30g low fat cottage cheese	4
Starch and cereals	185g (1 cup) white rice	9
	219g (1 cup) oat bran	7
	25g (1 slice) wholewheat bread	3
Vegetables and fruit	180g (1 cup) spinach	5
	118g (1) banana	1

many diets within these communities are deficient in the quantity of protein compared to recommendations, the quality of the protein is as important.

### Mixture of plant proteins

In terms of protein quality for dietary adequacy, most plant proteins are considered to be ‘incomplete’ in that they are deficient in one or more of the indispensable amino acids. Even though soya contains all the essential amino acids, which are required in order to be classified as a complete protein (Table 1), it does not contain these amino acids in the correct ratio, due to the low methionine content of plant products.

Mixtures of different plant protein sources may be complementary, with one source providing the amino acid that is limiting in another source and *vice versa*, thereby making the mixture of plant proteins ‘complete’ sources of amino acids. Dietary approaches that combine complementary foods, e.g. a cereal and a legume such as maize and soya beans, will meet protein requirements.

Establishing a baseline on the nutritional profile of current cultivars is therefore essential to prioritise the future improvement of the nutritional

profile. Translating the knowledge on the nutritional profile of soya beans into such tangible recommendations to meet dietary needs is also needed.

Some amino acids commonly limit the nutritive value of different sources of proteins in the human diet. They are methionine, lysine, tryptophan and threonine. These amino acid concentrations are generally lower in plant-based sources of protein.

### Increased opportunities

Even though animal-based foods contain all essential amino acids in the correct proportions, the correct combination of plant-based protein foods could increase the protein quality of the meal (Table 2).

The soya bean consists of 40% protein, 20-30% carbohydrates, 18% oil, moisture and ash. Soya can be a protein substitute in the diet, particularly with its ability to be processed to have a meat-like consistency. The high protein content of soya further aids nutrition in a country where protein energy malnutrition is prevalent.

Further research and consumer education on soya may be the key to unlocking more opportunities for the soya bean industry within the South African consumer market. 🌱