

# Policy Brief: Food Science in Cambodia\*

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## EXECUTIVE SUMMARY

*People who live in rural areas rely on agriculture, but every year, the value of agricultural produce drops or lacks buyers, causing some farmers not to harvest their crops. The development of the food industry is essential to solving this problem. This paper examines how the development of food science, the role of R&D in the promotion, and the development of the food industry could positively impact the agricultural sector.*

## 1 Introduction

Agriculture has contributed significantly to Cambodia's economic growth since the fall of the Khmer Rouge regime. While its contribution to GDP has declined over time, it remains a crucial component of Cambodia's economy, accounting for about 33.5% of GDP in 2009, decreasing to 28.9% in 2014, and declining further to 22.5% in 2018 (Figure 1). However, agricultural income relative to GDP has increased overtime from 14,420 billion riels in 2009 to 20,985.7 billion riels in 2017 and 21,912.6 billion riels in 2018.

The agricultural sector continues to contribute to Cambodia's economic development and the products of this sector are increasing year after year. However, some farmers experience a lack of demand for their product, leading to products either rotting away after not being bought or being purchased at low prices that make profit nearly impossible (Bundet, 2019; Cheivy, 2019; RFA, 2019). In response to this, government officials continually blame farmers' ignorance of market demand, yet fail to provide a

practical solution (Cheivy, 2019; Tum, 2019). This problem has persisted without any sign of a practical solution. Should the government continue to maintain the situation or make steps towards change?

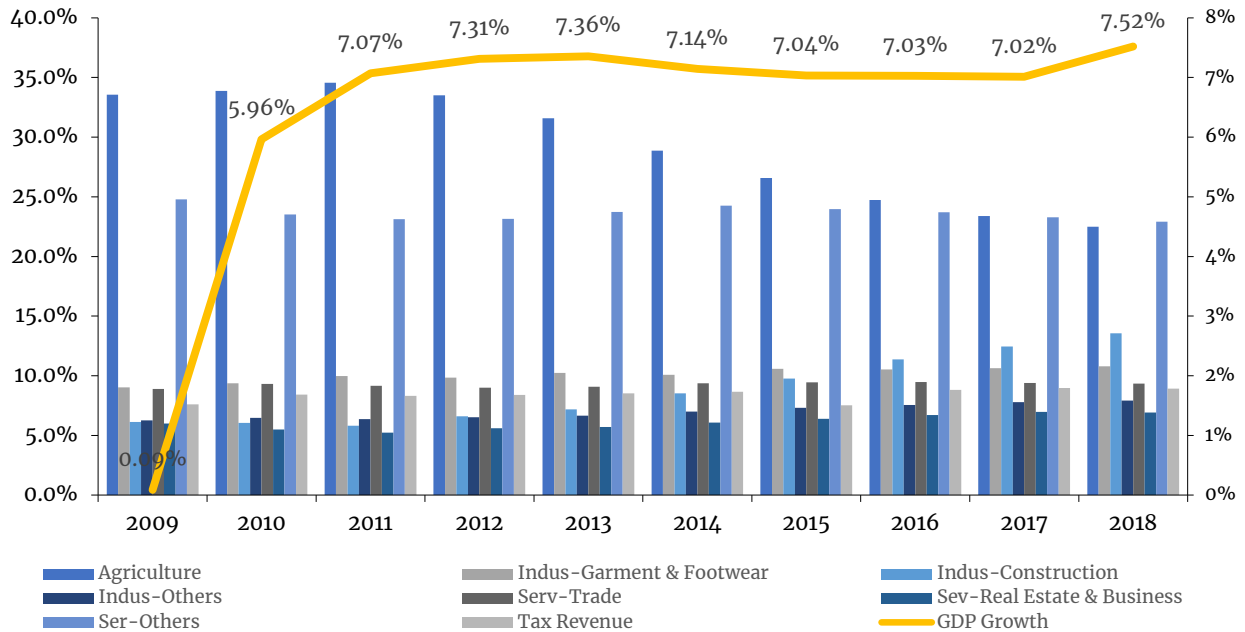
However, what can be done to address the surplus market and non-quality products other than the sale of raw agricultural materials to local and international markets? Usually, the deal of raw materials is cheaper than the purchase of semi-finished products or finished products. To increase Cambodian farmers' profits, agricultural raw materials should be transformed into semi-finished products and finished products (i.e. processed foods). The development of processed foods requires the use of food science and creative innovation. Food science is the basic and applied science of food. Its scope starts at the overlap with agricultural science and nutrition and continues through the scientific aspects of food safety and food processing, informing the development of food technology (Floros et al., 2010; Potter & Hotchkiss, 2012).

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**Figure 1: Percentage Contribution of Leading Sectors to Cambodia's GDP in 2009-2018**



Source: Ministry of Economy and Finance 2018

Should the government consider promoting food science? Yes. Applying food science techniques in Cambodia and developing a processed food industry will increase the economic viability and resilience of the agricultural sector. To achieve this, more significant support for food science projects and research from the government and donors will be crucial.

## 2 Background to the Problem

### Why Food Sciences?

There are many reasons why food science is fundamental in the Cambodian context. Finished products are more profitable than intermediate products and raw materials. Prices within agricultural production are twice as low as prices within the global food industry (Urban, 2014). On the supply side, agricultural production has increased over time (MAFF, 2018) but prices remain a severe challenge for farmers. In fact, in the case of Bavel district, Battambang province, farmers let cucumbers rot due to extremely low prices (RFA, 2019). In the case of rubber, while

prices increased from 2012 to 2016, they have been falling since the end of 2017 (Bundet, 2019). Additionally, the markets for Cambodian farmers are not well established. For example, each April mangoes ripen all at once across Cambodia, skyrocketing past a demand that is already consistently met by imports from Vietnam and Thailand (Cheivy, 2019). Improving food science is essential to create a new demand for agricultural products combatting their trend of decline.

Many farmworkers have moved into other sectors, creating a noticeable reduction in the agricultural labour force. In 2009, agricultural employment made up 57.6% of the total labour force. Since then, agriculture's contribution to the total labour force has only consistently decreased. In 2010, it dropped to 52.4%, in 2013 48.7%, in 2016 36.4%, and by 2019 it had fallen to only 30% of the total labour force. Meanwhile, the labour force in the industrial sector was only 16.9% in 2011 but increased to 19.9% in 2013, reaching 26% by 2019. The service sector workforce was only 37% in 2016 but rose to 42% by 2019 (ILO, 2019). Migration from rural to urban and over-

seas areas has only increased due to the decreasing economic viability of agricultural pursuits. The promotion of food science is way to reverse this pattern by creating more financially viable jobs for farmers.

On the demand side, humans need food security. Access to sufficient amounts of safe and nutritious food is critical to maintain and promote good health. Health needs have led people to prefer organic foods that are consistently available, reasonably priced, fresh, and taste and look good (Shafie & Rennie, 2012). Unsafe food containing harmful bacteria, viruses, parasites or chemical substances can cause more than 200 different diseases — ranging from diarrhea to cancer. Around the world, an estimated 600 million people — almost 1 in 10 people — fall ill after eating contaminated food each year, resulting in 420,000 deaths and the loss of 33 million healthy life years (WHO, 2019). Evidently, food security is significant for humanity. Improving food science with food safety and quality in mind can ensure food security.

The Cambodian agro-processing sector is still underdeveloped, and there are therefore many investment opportunities ranging from research and development to transport and marketing. Currently, the industry is dominated by micro, small and medium enterprises (MSMEs), which hold an 80% market share. The Consequences of Not Developing Food Sciences in Cambodia Long-term economic growth and sustainable development depends on an increasing demand for manufactured products (Acevedo, Mold, & Perez Caldentey, 2009). Therefore, development of the food sector may be a favourable solution for the agricultural demand and supply issues in Cambodia. Many researchers in the food processing industry have highlighted the strategic role of food processing may play in the export markets developing countries in the context of globalisation (Wilkinson, 2012). The demand and supply of food products are contributing to an ever-increasing level of competitiveness (Sarkar & Costa, 2008).

The effects of economies of scale, the new competitive environment, minimum quality and non-traditional perspectives are the opportunities and

challenges faced by SMEs in food processing and related activities. At the same time, the integration of new businesses and new players in existing SMEs, through technical and technological advancements, boosts food production (Wilkinson, 2012). Many researchers believe that the future of the agricultural system and food science will be mainly affected by the trajectory of population and demography, the accessibility and type of energy resources, and the effect of climate on available land, water, and air quality (Malik et al., 2009).

Contemporary food science has contributed significantly to the success of this modern food system by integrating biology, chemistry, physics, engineering, materials science, microbiology, nutrition, toxicology, biotechnology, genomics, computer science, and many other disciplines to solve severe problems, such as resolving nutritional deficiencies and enhancing food safety (Burda, 2012; Floros et al., 2010; Sarkar & Costa, 2008).

## **The Food Industry in Cambodia**

Cambodia is a rice surplus country and also exports products such as natural rubber, cassava, palm oil, maize, sugar cane and fish. It estimated that Cambodia imports 60% to 70% of its vegetables to meet domestic demand, primarily from Vietnam. While fruit, milk and dairy products, livestock and poultry are produced locally, the majority of these products consumed within Cambodia are imports from neighbouring countries. Crops, livestock and poultry, fisheries, forestry and logging are the main sub-sectors contributing to the growth of agriculture in Cambodia. At the same time, the food industry is less developed, contributing only 2.2% to the national GDP in 2008, compared to agriculture's contribution of 32.8%. In 2018 the rates remained similar: the food industry contributed 2.3% to the national GDP, while agriculture contributed 22.5% (Figure 2).

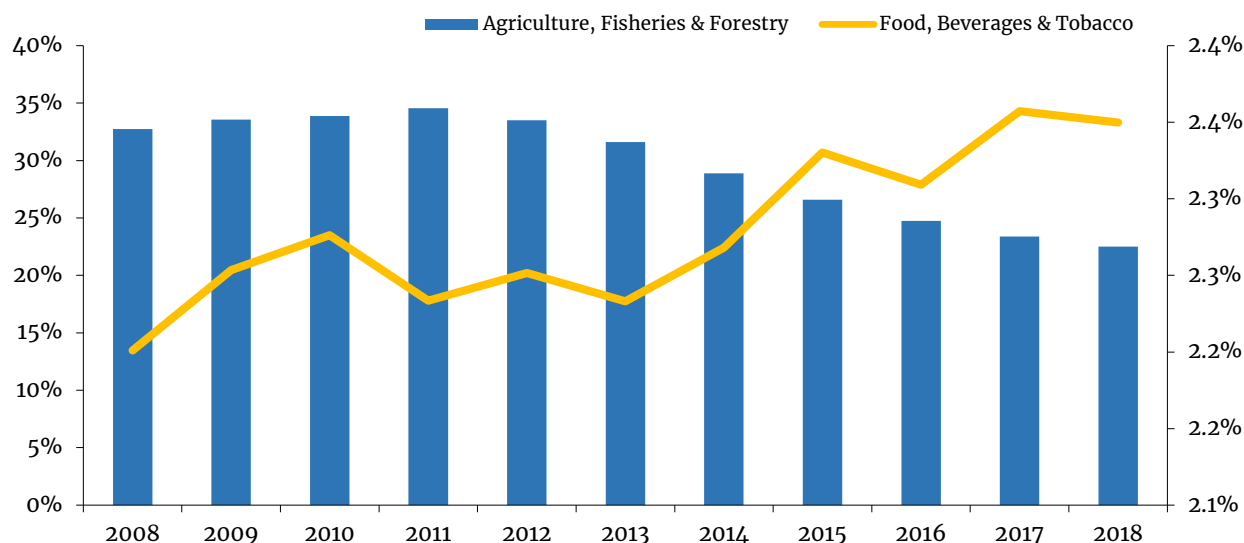
According to the National Institute of Statistics, the share of the food industry in GDP reached only 735.8 billion riels in 2013, increased to 843.4 billion riels in 2015 and continued to rise to 1026.8 billion

riels in 2018 (NIS, 2018).

Accurate data on the number of such enterprises and their activities can sometimes be challenging to assess, as many smaller enterprises may not register with any government ministry, while more significant operations may register with multiple ministries. In 2012, the government recorded 30,600 SMEs carrying out agro-processing in the food, bev-

erage and tobacco industry (BDLINK, 2016). However, the definition of “agro-processing” in these cases can be quite loose. For example, many MSMEs supply local markets with products such as snacks, baked goods, and fried chicken – while these are value-added products, the “processing” is relatively simple compared to a larger commercial enterprise.

**Figure 2: Percent Contribution to Cambodia’s GDP in 2008-2018**



Source: Ministry of Economy and Finance 2018

The SME business industry includes rice millers and exporters, beer manufacturers, tobacco manufacturers, boutique breweries, and specialty food exporters. The Ministry of Industry, Mine and Energy, recorded 45 food enterprises, 17 beverage enterprises, and 12 tobacco factories in 2012 (BDLINK, 2016). However, this does not include enterprises registered with the Ministry of Commerce or Ministry of Tourism, such as restaurants that also produce commercial foods such as coffee or chocolates. Thailand is the leading producer and exporter country for several processed foods including canned tuna, frozen seafood, shrimp, and chicken. The food industry accounts for about 23% of the country’s GDP, allowing for more than 80% of the country’s raw agricultural materials to be used in the food

industry. There are 9,000 food processing companies in Thailand, over 3,000 highly-skilled food researchers, 10,000 food science students, 150 food research laboratories, 20 pilot plants and 11 factories related to Food and Agriculture at major institutions (BOI, 2017).

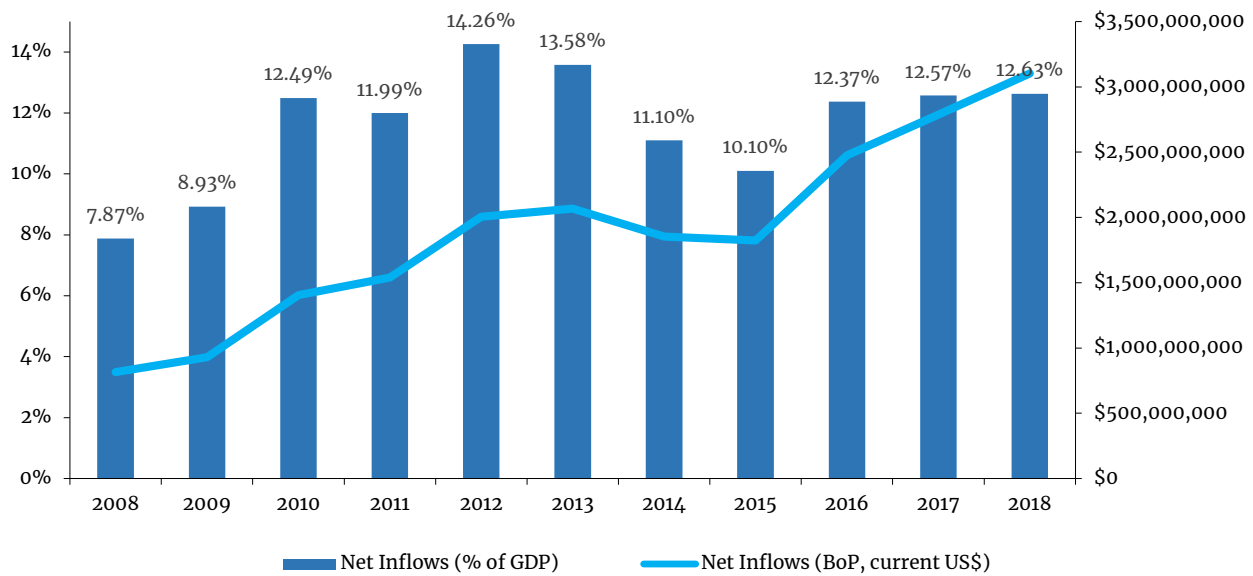
Cambodia exports a large number of unprocessed crops such as paddy rice, cassava, and cashew nuts to Thailand and Vietnam, who often process these raw materials into value-added products that are re-exported to Cambodia. However, the Cambodian government looks forward to promoting the development of manufacturing and agro-processing by encouraging FDI and domestic investment, strengthening the capacity of domestic and foreign SMEs to stimulate their production of goods for both import

substitution and export (RGC, 2015).

In May 2016, a survey conducted by BDLINK (2016) among agro-processing companies and importers of agricultural inputs identified a lack of market information, a weak market information system, corruption, the absence of a reliable market, a lack of supportive policies and encouragement from the government, and high electricity costs as the top constraints to the agro-processing sector. However, other constraints of agro-processing also included ir-

regular and insufficient supply of the raw materials, high cost of transportation, lack of skilled laborers for maintenance and operation of the processing machinery, poor road connections from farm to factory, competition from imported products perceived to be higher quality than local products, advanced technology that needs to be imported, and exporting procedures which are costly and require significant paperwork (BDLINK, 2016).

**Figure 3: Foreign Direct Investment, Net Inflow in 2008-2018**



Source: Cambodia Economic Update (World Bank, 2019a, 2019b).

### Investment in the Food Industry

FDI inflows to Cambodia have increased exponentially in recent years due to sound macroeconomic policies, political stability, regional economic growth and an open investment market, reaching USD 3.1 billion or 12.63% of GDP in 2018, up from USD 2.7 billion or 12.57% to GDP in 2017 (Figure 3).

The total stock of FDI stood at USD 23.7 billion in 2018, representing around 96.8% of the country’s GDP. Foreign direct investment is critical for developing and emerging market countries. The central investor countries are China (Chinese FDI alone surpassed all other sources of combined FDI), Hong

Kong, the US and the Netherlands. The construction industry attracts the largest share of foreign investors, followed by infrastructure, industry (primarily textiles), agriculture and tourism (World Bank, 2019a, 2019b). While it is difficult to obtain precise data on the amount of FDI in the food industry in Cambodia, FDI in the food sector is generally considered to be relatively low.

### Cambodian Food Science in Education

In Cambodia, three public institutes provide courses in the food science field. The first is the Faculty of Chemical and Food Engineering of the Institute

of Technology of Cambodia (ITC), the second is the Faculty of Agro-Industry of the Royal University of Agriculture (RUA) and the last one is the Chemistry Department of the Royal University of Phnom Penh (RUPP). The faculty of ITC and RUA aim to produce the qualified human resources, manage agricultural products by reducing losses and increasing the efficiency of the post-production, promote technology in agro-industry and process products for the local and international market (ITC, 2019; RUA, 2019).

In general, in ITC and RUA, there are only 100 to 120 student admissions annually to study food sciences (Sivcheng et al., 2019). This number is deficient compared to students studying other subjects, like law and economics. The main reasons for this are that there is less knowledge of this field among students and that it has a reputation for less demanding work.

At ITC's Faculty of Chemical and Food Engineering, laboratories play an essential role in student learning, providing hands-on application and experimentation of concepts and theories learned in the classroom (ITC, 2019).

## **Role of Research and Development (R&D) in Promoting Food Science**

Innovation and initiative leads to economic growth in a country, which disseminates to the rest of the world and stimulates the development of the world economy (Modelski & Thompson, 1996; Porter, 1993; Reuveny & Thompson, 2001). R&D in technological innovation is essential to create new solutions in the production, packaging, and labelling of food products and in the development of new foods and conservation methods (Burda, 2012). For example, increased investment in R&D of technological innovations contribute to Thailand's strong global competitiveness in the food industry, which is characterised by low physical costs and flexible manufacturing structures (BOI, 2017). Statistical analyses found that firms with persistent R&D commitments have a 13% higher labour productivity than non-R&D firms, and a 9% higher productivity rate than firms which oc-

asionally make R&D efforts, controlling for differences in past labour productivity. Moreover, a steady R&D strategy corresponds to around a 2% increase in productivity (Börje & Hans, 2010). Advancements in technological infrastructure, legal policies, and technical environments are crucial to R&D activities.

Despite efforts, small and medium-sized enterprises (SMEs) are unable to distinguish fixed costs due to non-specialization, low productivity and low production quality. In contrast, large manufacturing firms have obtained a competitive advantage over small firms by reducing production costs, dropping production time and increasing productivity, increasing industry expertise, and benefitting from a stable market structure due to investments in R&D (Jung & Kwak, 2018; Kafouros, Wang, & Lodorfos, 2009; Reuveny & Thompson, 2001). Due to SMEs' limited cash flow they are unable to invest in labour, capital, or technical progress (Modelski & Thompson, 1996; Peretto, 1999). Thus, the government has an important role to play in helping food industries improve their R&D activities.

## **3 Micro-Implementations**

### **Overview**

Cambodia has the potential for a thriving agricultural industry. The development of the food industry is a critical if we want to tackle surpluses in agricultural products and meet the local demand for food security. To promote the food industry, the following activities should be considered.

### **Justification**

The development of food science depends on the government's development policy. The following policies propose significant improvement and development in the food industry in Cambodia.

## Implementation

### a) Food Science Research and Development

The Government of Cambodia and stakeholders should contribute to the development of food science education. Universities should receive state support to develop laboratories with technical equipment that allows students to do extensive R&D. The laboratories must work together as a R&D centre to discover new technological innovations, new solutions, original production methods and develop new management techniques, policy reviews, legislation and programs to assess practices and progress in the development of the food industry. Laboratories must collaborate with development partners and domestic firms to create innovative projects. Furthermore, to promote and advance R&D in food sciences, laboratories must also partner with other institutes, universities in the country, region, and world to exchange experience and expertise.

### b) Food Science Partnerships

All the technical and technological innovations found by the R&D centre experts must be applied in food industry partnerships. Experts are responsible for presenting and describing their new innovations to domestic firms and must play an essential role in controlling, monitoring and evaluating the firms' application of such new innovations. Trade facilitation and guidance firms must consult with researchers to implement their visions and meet production firms expectations.

### c) Promote and Improve Financial and Fiscal Support

To achieve the long-term development objectives of the food industry, the government must fiscally support SMEs. In December 2017, the Cambodian Prime Minister launched an initiative to create a bank for SMEs in the hope of stimulating agro-firms and SMEs linked to foreign direct investment, tourism, and technology startups with an initial capital of US\$100 million (Kimsay, 2019). This budget is in

adequately small and the government should strategically add more from year to year. Despite this, it is hoped that the SME bank will launch at the end of 2019. The SME bank should be implemented transparently, without corruption or other irregularities in lending to SMEs. To facilitate and promote development of the food science sector, the government should issue a specific tax law for firms within the industry. At the same time, the R&D centre's experts should help to verify tax reviews, audits, financial statements, and fiscal facilitations.

## 4 Conclusion

Improvements in the development of the food industry are essential to solving the current problems in Cambodian agriculture. I believe the three policies above will be the most effective in the improvement and promotion of the food industry in Cambodia. Food science R&D is the first thing to do in the short, medium and long-term. Collaborations between food science and commercial firms are the second thing to do in the short and medium-term in food R&D, to encourage food firms to try new products sought and developed by the R&D centre. The final priority for food R&D is the financial and fiscal support of food firms to help them in the short and medium-term.

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