From Farming to the Dining Table: Exploring Agrotechnopreneurship in the Food Business

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Abstract. Agrotechnopreneurship adopts technologies in agricultural practices, such as the use of sensors and remote monitoring. The study aims to explore the role of agrotechnopreneurship in the food business, from farming to the dining table. This study identified trends, innovations, challenges, and opportunities related to agrotechnopreneurship in the food business. The research method used is a comprehensive library study to gather information related to the concept of agrotechnopreneurship, the implementation of technology in the food supply chain, and its impact on efficiency, sustainability, and added value for consumers. Research results showed that (1) agrotechnopreneurship had great potential for transforming food business processes. Implementation of technologies such as IoT, big data analytics, artificial intelligence, and image processing could improve production efficiency, improve monitoring and prediction systems, and improve food quality and safety, (2) agrotechnopreneurship provided opportunities to improve the accessibility of agricultural products, improve environmental sustainability, and provide added value to consumers through product innovation and better consumer experiences. The study also identified several challenges that need to be addressed, including limited access to technology, a lack of expertise and understanding among farmers, and non-supportive policies. In this context, the study provides policy recommendations to encourage the adoption of agrotechnopreneurship in the food industry. In addition, this research can be valuable insights for business actors, stakeholders, and decision-makers to understand the potential and benefits of agrotechnopreneurship in advancing food from farming to dining tables, as well as accelerating the transformation of the food industry towards sustainability and innovation.

Keywords: Agrotechnopreneurship, Farming, Food Business.

1 INTRODUCTION

The food industry plays a crucial role in meeting the growing food needs of the global population. However, challenges such as climate change, environmental degradation, and food access gaps remain issues that need to be addressed seriously. In addition, the

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increasing consumer demand for sustainability, food security, and transparency in the food supply chain is also a major focus [1].

In the era of globalization, a competitive advantage from innovative entrepreneurs is more required rather than a comparative advantage that has low added value. Innovative entrepreneurs will integrate technological, market, and organizational changes simultaneously in their strategic planning. To obtain business success from technological innovation, a competence-based approach to technology management is needed, which requires an analysis of organizational structures and processes [2].

In this context, agrotechnopreneurship has emerged as a promising approach to addressing such challenges. Agrotechnopreneurship integrates agriculture, technology, and entrepreneurship into the food business to increase production efficiency, improving food quality and safety, and providing added value to consumers [3].

However, the implementation of agrotechnopreneurship in the food business still faces some obstacles. Restricted access to technology, a lack of expertise and understanding among farmers, as well as non-supportive regulations and policies, can hinder the development and adoption of agrotechnopreneurship.

The implementation of agrotechnopreneurship in Indonesia has made a significant contribution to transforming agricultural output into innovative and value-added products. Some examples of the implementation of agrotechnopreneurship that can be highlighted are processing of products, marketing and distribution, technology-based agriculture, agriculture, and education.

The implementation of agrotechnopreneurship in Indonesia has helped to increase the added value of agricultural products, improve the quality of life of farmers, reduce the loss of farm yields, and expand market access. However, challenges such as limited access to technology, a lack of education and training, and market expansion still need to be overcome so that the potential of agrotechnopreneurship can be fully realized in Indonesia.

This research conducted in the region of Tasikmalaya district, West Java, tried to explore agrotechnopreneurship in the food business. Agriculture is one of the sectors that contributes significantly to the economy because the majority of its territory is rural and about 80 percent of its population is agricultural. Therefore, to recover from the impact of the COVID-19 pandemic, the government paid special attention to the agricultural sector, among other things, by supporting farmers with facilities that support the productivity of farm yields [4].

Table 1 shows the extent of harvest, planting, provision, and production of food crops in the Tasikmalaya district. Of the eight types of food crops developed in the area of Tasikmalaya with the use of technology, the most widespread species of peaches provides a fairly significant yield and quantity of production. Several other agricultural commodities are also developed in the district of Tasikmalaya so that they can increase the added value of organic rice, coffee, palm sugar, and moringa leaves.

This research explored the uses of agrotechnopreneurship along the agricultural chain, from farmland to dining tables, thereby increasing the value added of agricultural yields. The research methods used were literature study, case studies, and field surveys.

This research has made significant contributions in the fields of agriculture and food business. Through this research, it is expected to find solutions and innovations that can increase added value in the food supply chain.

Table 1. Recapitulating a Large Plant and Harvest Providing and Producing Food Plants Kab. Tasikmalaya since 2021-2022.

No	Type of	Plant (ha)		Harvest (ha)		Harvest (kw/ha)		Production (ton)	
		2021	2022	2021	2022	2021	2022	2021	2022
1	Paddy Field	110.705	108.024	117.930	106.825	68,51	68,52	809.854	733.860
2	Paddy Field	1.179	285	2010	459	20,41	11,94	9.532	2.191
3	Corn	4.784	4.539	5.229	2.431	53,39	51,70	35.699	24.394
4	Soya bean	2.294	1.872	1.841	936	7,04	4,97	3.655	4.712
5	Peanuts	775	521	951	676	16,59	14,25	2.081	1.482
6	Mung beans	8	521	9	676	0,54	14,25	10	1.482
7	Cassava	1.340	864	1.857	965	245,94	240,07	57.693	29.707
8	Sweet potato	594	439	689	501	162,31	150,82	16.650	12.118

2 METHODS

The research methods used in this research related to the title "From Agriculture to the Dining Table: Exploring Agrotechnopreneurship in Food Business" were as follows: studies in literature, case study, survey of the field, and data analysis.

3 RESULTS AND DISCUSSION

3.1 Literature Study

In literature studies, it was found that agrotechnopreneurship is an important approach to addressing the challenges of today's agriculture and food industries. Previous research has shown that the use of technologies such as agricultural sensors, artificial intelligence, data analytics, and geographic information systems can improve productivity, efficiency, and sustainability in agriculture. In addition, there are key trends such as urban farming, sustainable agriculture, and decentralized food supply chains that need to be considered in the development of food businesses [5]. The results of the

research showed that most farmers in savage land have implemented technological innovations such as legowo savage systems intensively, and farmers in dry savage villages are quite intensive in the implementation of innovation systems and the processing of agricultural products (on the farm). The application of this technology is positively correlated with the food security conditions of farmers' households, i.e., farmers who implement more intensive technological innovation have a higher level of food security [6]. In addition, to realize sustainable agriculture needs through a digital approach, digitalization in the agricultural sector drives agricultural technology innovation to boost agricultural income and economies [7].

3.2 Case Study

Through case studies, several agrotechnopreneurship companies that have successfully implemented technology in the food business were analyzed. The samples include companies that use e-commerce applications to market agricultural products, use innovative food processing technologies, and implement sustainable agricultural practices. This case study provides insight into successful business strategies, the challenges faced, and their impact on sustainability and efficiency in the food business.

In the ASEAN region, the achievements of the Chia Brothers (the Jiaravanon family) in raising the Charoen Pokphand Group not only boast Thailand but also bring the good name of ASEAN to the agribusiness and agro-industrial worlds. The same thing happened with H. Nasuha Kesian, who bears the good name of Malaysia for its herbal, biopharmaceutical, and spice industries. In Indonesia, Dr. Martha Tilaar, Ir. M. Najikh, and the Sosrodjojo family also succeeded in bringing Indonesian products and good names to the global market.

Founder of Martha Tilaar Group (MTG), Dr. (H.C.) Martha Tilaar, who has been dedicated for more than 40 years in the field of cosmetics and groceries in Indonesia, also wants a sustainable application of resources at the time of product development and manufacture, as well as in the end results of this kind of product. To meet this, Martha Tilaar Innovation Center (MTIC) has also developed a green science concept tree to be applied in the Martha Tilaar Group, in particular PT Martina Berto, Tbk [8].

1. The first stage of the concept of green science is a green resource consisting of green knowledge, green cultivation and organic farming, standardization of plant raw materials, green research, and recycling packaging.
2. The second stage is green development, which includes environmentally friendly technologies, compliance with applicable regulations, efficient processes not tested on animals, minimalist and simple packaging design, as well as green collaboration.
3. The third phase includes safe operating processes, efficient production processes, waste reduction, energy savings, and environmental control.
4. After passing through the three steps above, green products that are environmentally friendly, safe for humans, and produce environmentally friendly waste are produced. In addition, it also preserves rare plants and biodiversity.

3.3 Survey of the Field

A survey of agrotechnopreneurs and stakeholders in the food industry in the Tasikmalaya district was also conducted. The survey aims to understand their views on agrotechnopreneurship, technology adoption in agriculture, and the barriers faced in implementing these technological innovations. The results of the survey showed that the majority of respondents were aware of the importance of agrotechnopreneurship in improving the efficiency and sustainability of the food business. However, they also identified barriers such as high costs, limited access to technology, and a lack of knowledge and skills as major barriers to adopting technology in the food business.

Technology-Based Agriculture.
The Internet of Things (IoT) in Tasikmalaya district has great potential to be implemented in agrotechnology, such as monitoring agricultural soil moisture. The Agricultural Extention Center (Balai Penyuluh Agricultural) of Cigalontang is one of the examples that applies a soil moisture sensor (FC-28) and Arduino Uno that can detect range values for soil conditions wet, wet conditions, and dry conditions a shown in Figure 1. The sensors used are connected to the integrated irrigation system so that automatic watering occurs under certain conditions and times when the plant needs it. The soil moisture monitoring system can be connected using a soil conductivity sensor, soil humidity sensor, ground temperature sensor, rainfall sensor, speed and wind direction sensor, evaporation sensor and other sensors to measure the soil condition in real time so that farmers get the best choice about the cultivation they are doing.

Figure 2 shows the display on the monitoring application used in one of the Agricultural Extension Center of (Balai Penyuluh Agriculture) Departments of Food Safety and Fisheries in Tasikmalaya district. The application can generate information such as agricultural data tables, line charts, progress, control relays, and soil data such as temperature, humidity, light intensity, and others.

Paddy plants are one of the food plants that require special attention in terms of water supply arrangements. These plants require a sufficient water supply at the time of planting but should not remain in the water for too long. Errors in irrigation on paddy plants can result in not optimal harvest yields, damage to the plant stems, loss of plants, and failure to harvest. This occurs due to unpredictable weather and is not always consistent with the planting time of the plants. Therefore, a system is needed that can monitor soil humidity and regulate the flow of water in the basin so that peasants can optimize their harvest.

The Internet of Things (IoT) system for irrigation can help farmers monitor subsoil conditions by controlling unnecessary water flows and pumping water in amounts appropriate to the needs and conditions of crops. Through the use of soil moisture sensors and weather stations connected to the IoT system, farmers can monitor soil humidity, rainfall, and other factors that affect crop water needs. With the information obtained from these sensors, the IoT system can automatically regulate the flow of water entering the basin, thus keeping soil moisture optimal without excessive water stagnation.

In addition, the IoT system can also provide notifications or warnings to farmers if the soil conditions are too dry or too wet, so they can immediately take the necessary

action. With the IoT system for irrigation, peat farmers in the Tasikmalaya district can improve the efficiency of water use, reduce the loss of harvests due to irradiation errors, and overall maximize their peat harvest.

Fig. 1. Applications in BPP Cigalontang.

By using IoT systems for irrigation, peat farmers in the Tasikmalaya district can optimize the water arrangement in the basement, avoid crop losses, and improve overall agricultural productivity. Agricultural Technology Business Opportunities: The development and application of IoT systems for irrigation can be a business opportunity for entrepreneurs in the field of agricultural technology. Communities can create innovative solutions, such as the development of hardware and software connected to IoT systems, the creation of more sophisticated soil moisture sensors, or the provision of branch management and monitoring services through online platforms. With the development of the agrotechnology industry, entrepreneurship in this sector can provide additional economic value for the Tasikmalaya District.

IoT can help boost farmers' exchange rates by helping them manage agricultural resources such as water, energy, and fertilizers more efficiently. A farmer's exchange rate refers to the economic outcomes or benefits obtained by a farmer from an agricultural enterprise that can be measured in a variety of aspects, including income, profitability, efficiency, and market access. By using soil humidity and temperature sensors, farmers can optimize irrigation and avoid excessive water use. Real-time monitoring also enables the identification of soil zones that require special care or a more targeted fertilizer supply. This reduces resource waste and helps increase the productivity of food crops.

With the implementation of IoT, spending can be more efficient. The costs incurred by peanut farmers can vary depending on a variety of factors, including location, scale of business, cultivation methods, technology used, and other economic and social factors. The cost components that generally have to be borne by peat farmers are the costs

of seed purchase, fertilization, pesticides and pest control, irrigation, labor, harvesting, and post-capanen land maintenance. Agrotechnology can play an important role in the seed component, where it can use seed technology for genetic and physical properties such as the development of superior varieties and a short harvest period. Fertilizer and labor consumption can be minimized because IoT can reduce labor components because monitoring and irrigation, as well as irrigating system settings, can be done remotely using smart phones.

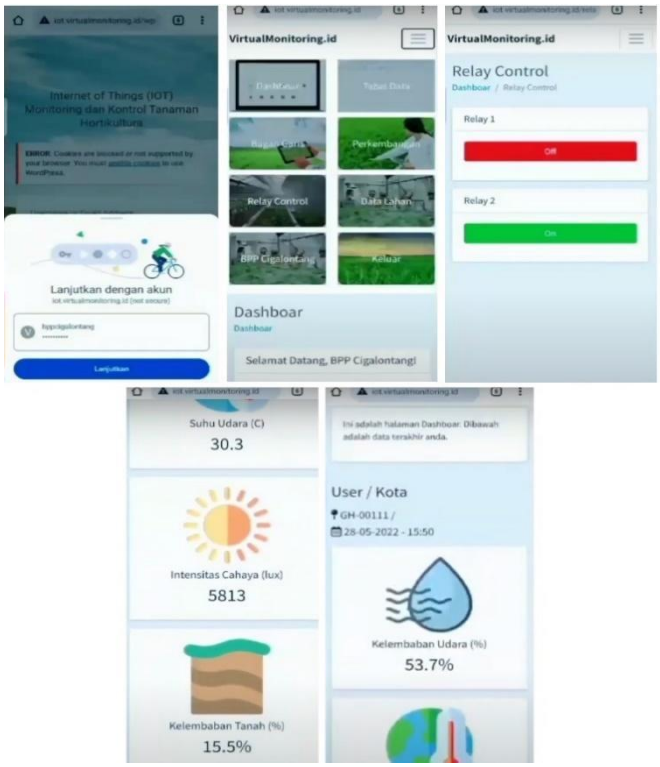

Fig. 2. IOT Monitoring System of BPP Cigalontang.

Increased Value of Food Products.
The increase in value added for farmers and entrepreneurs in agrotechnology can occur in several ways:

1. Processing and Marketing of Food Products: Farmers can generate added value by processing agricultural products into food products that are ready to be consumed or sold. For example, they can process fruits into juices, cereals into bread or cake products, or livestock products into processed meat products. By carrying out this processing, farmer entrepreneurs can offer products with higher added value and

reach wider markets. In addition, they can also pack products with attractive branding to increase consumer attractiveness.

2. Organic and Sustainable Products: In an era of increasing awareness of health and sustainability, farmer entrepreneurs can focus on organic or sustainable food production. By avoiding the use of pesticides or harmful chemicals, they can offer healthier and more environmentally friendly food products. Organic food products often have higher added value and can attract markets that prioritize quality and sustainability.
3. Product Diversification and Innovation: Agriculture entrepreneurs can diversify products or develop new innovations in food agrotechnology. They can create unique varieties of plants, combine different local ingredients in food products, or develop new processing techniques. Through diversification and innovation, they can create unique products, attract consumer interest, and deliver higher added value.
4. Improved Market Access: Agriculture entrepreneurs in food technology can improve their access to markets through collaboration with retailers, restaurants, or e-commerce platforms. By establishing partnerships or using digital platforms, they can expand their market reach and reach a wider audience of consumers. Increased market access will open up opportunities to increase sales, increase income, and add value to farm entrepreneurs.

The increase in value added has already been carried out by the local government in the Tasikmalaya district, among them by targeting consumers from a certain segmentation so that it can increase the value of farmers sales. Some agricultural products in the Tasikmalaya district are processed so that they become more valuable and among them are:

Organic Rice.

Entrepreneurs in the organic rice sector have the potential to increase farmers' income significantly. There are several factors that make organic rice more expensive compared to conventional rice. Product added value makes the demand for organic rice higher in the market for a particular market segmentation. Organic rice is considered more valuable because it is produced without the use of synthetic pesticides and chemical fertilizers. Consumers who care about health and the environment tend to choose organic products. The high demand for organic rice allows farmers to sell at higher prices, thereby increasing their income.

Figure 3 shows one of the organic rice products in the Cisayong district of Tasikmalaya. Organic rice Sukapura is managed by Gapoktan Sympatik, which manages marketing cooperation with one of the social companies that operate in the field of agriculture. Bloom Agro is based in Jakarta. With the support of the local government, PT. Bloom Agro, a member of Gapoktan Sympatik, has successfully obtained international certification from the Swiss-based Institute for Organic Marketecology (IMO). Exports from the district of Tasikmalaya have already been made to several countries, namely the United States, Malaysia, Germany, Singapore, the United Arab Emirates, Italy, and the Netherlands. In addition, the export market for this product also cooperates with Rans Market and SOGO for the local market. Overall, the sales of organic rice products

in Tasikmalaya district are more than 80% international export targets and 20% national.

Fig. 3. Organic Rice.

The quality and image of Sukapura organic rice products are better than conventional rice. More natural production processes and the use of organic fertilizers can produce rice with a better taste and aroma. This superior product image can attract more healthy-minded and quality-conscious consumers who are willing to pay a higher price. Ecological value can also be enhanced as organic rice production contributes to environmental conservation and sustainability. Organic farming practices, such as the use of organic fertilizers, sustainable land management, and conservation of natural resources, help reduce the negative impact on the environment. Consumers who care about the environment tend to give more value to products produced in a sustainable way.

Although organic rice farming can increase farmers' income, it should also be noted that production costs may be slightly higher. Farmers must allocate additional resources and labor to meet the requirements of organic production, such as organic certification, organic fertilization, and more integrated pest management. However, with significant sales price increases, the profits earned by farmers could compensate for the additional production costs. With increasing consumer awareness of the importance of organic food and environmental sustainability, organic rice farming can be an attractive opportunity for entrepreneurs to increase their income, expand markets, and contribute to the sustainability of the agrotechnology-based agricultural sector.

The application of entrepreneurship in the context of Sukapura organic rice can provide a variety of opportunities and benefits in terms of production and marketing, and entrepreneurs their own production business. By implementing appropriate organic farming methods, organic strawberries and produce high-quality organic rice can be grown. Product marketing can be done to consumers who care about healthy and sustainable foods and then sell them through organic stores, local markets, or even online platforms to reach wider markets.

Processing and product innovation on organic rice can be developed for processed products that use organic rice as a raw material. Entrepreneurs can collaborate with organic rice producers and create their own brand. Organic rice can be produced in

special packaging, made into instant organic rice, or used to create healthy food products based on organic rice, such as snacks or biscuits. By making innovations in processing and products, higher added value and reach wider market segments can be created. Partnerships can also be made with farmers who partner with local farmers in the Sukapura organic rice production area. Technical support, training, and raw materials are needed to improve the quality of their production. Through this partnership, it can ensure the supply of high-quality raw materials for the enterprise while helping farmers increase their income. This will create synergies between entrepreneurship and agricultural sustainability.

Consulting and education services in the field of organic rice can be provided to farmers or the general public interested in organic farming. Entrepreneurs can provide training on organic farming methods, the management of organic rice production, or the processing of processed products. By providing consulting and educational services, it can add value to the farming community and, at the same time, generate additional income. Overall, entrepreneurship in the context of Sukapura organic rice can create sustainable business opportunities, increase added value for products, increase farmers' income, and contribute to local economic growth. By combining sustainable organic farming practices with creative entrepreneurial strategies.

Arabica Coffee.

Fig. 4. Arabica Coffee.

Coffee plants are one of the crops that can be further processed to increase their added value. The process of processing coffee starts with the newly harvested wet coffee products and reaches the final product of coffee powder. Efforts to increase processed coffee production can be made through increased coffee processing productivity supported by increased production factors. Production factors in coffee processing are the main raw materials or inputs, the capital used in the processing of coffee, and the use of processing machine tool technology [9].

Coffee commodities in Puspamukti region, Cigalontang district, and Tasikmalaya district of West Java continued to show increased demand. The shipment did not only

come from the domestic market but also reached the international coffee market. There are 11 villages in Cigalontang that produce quality coffee, one of which is Java Sukapura Arabica coffee, which is in demand in Europe. The plantation area reaches 6,200 hectares. Of the total, approximately 5,871 hectares are public gardens, with details about 3,273 hectares of people's plantations as well as 1,807 hectares of large country plantations. The total area of coffee planting land in the Tasikmalaya region has reached 2905 hectares, with approximately 1.533 hectares of which are planted land in the category of not produced, and 1.275 hectares that have already begun to be produced.

The cultivation pattern used by Arabica coffee farmers in Cigalontang is very good. The texture of the soil in the Cigalontang area is good; its hares are still not so disturbed by vegetable crops that it affects the quality of coffee grown, so it is more quality and superior. Compared to other world coffees such as Brazil, Indonesian Arabica coffee is considered to have a more diverse and unique taste, so it has its own market share. Figure 4 shows an example of another Arabica coffee product in Cigalontang.

Brown Sugar.

Fig. 5. Brown Sugar.

Sugar is more practical than red sugar. In addition, brown sugar is more easily soluble in water because the water content in sugar is small and it has a sweet taste and a distinctive smell. Sugar is also more durable and has many other benefits. Sugar is one of the natural sweeteners that are popular on the international market, and it is already included as a natural sweetener in the world of food and beverages without sugar. The sugar of ants has the form of particles (granulations) made from direct nira water or red sugar raw material that is mostly obtained from the palm family, such as aren, cocoa, siwan, nipah, sago, and dates. One of the conditions for nira that is used to become palm sugar is that nira from the palm tree that will be processed into palm sugar and shaped into gula semut should at least have a pH between 6 and 7 so that the process of crystallization and the formation of sugar particles is easier.

The village of Cikuya is one of the villages in the Culamega district of Tasikmalaya, where its inhabitants have made an innovation to increase their income by making gula semut as shown in Figure 5. The production of brown sugar was first to be found in Tasikmalaya. Sugar is a derivative of gula cetak. This gula semut is pure without any

mixture of ingredients, so it also smells very typical. The soft grains, brown color, and distinctive aroma have a good impact on the food and beverages it mixes.

Moringa Leaf Tea.

Fig. 6. Moringa Leaf Tea.

Moringa oleifera is a tropical plant that is easily grown in tropical areas such as Indonesia. Moringa plant is a perennial plant with a height of 7–11 meters and grows well from the low plains of 0 to an altitude of 700 meters above sea level. It can grow in tropical and subtropical areas on all soil types and is resistant to the dry season, with a tolerance to drought of up to 6 months.

The use of moringa plants in Indonesia today is still limited; in addition to their traditional use, moringa leaves have developed into modern food products such as tea leaves. Moringa is one of the agricultural commodities that are neglected in the village of Ciheras, Cipatujah, Tasikmalaya district, so it is necessary to have a handling system for the processing of moringa leaves that can add value to either the price or the quality of the raw commodity.

The demand for tea leaves mostly comes from outside the city, and the surrounding community has already consumed tea for medicine or just to replace coffee. Figure 6 shows an example of a moringa leaf tea product.

4 CONCLUSIONS

This study highlights the importance of agrotechnopreneurship in the food business. By adopting technologies and innovations in agriculture, food business operators can increase the efficiency, sustainability, and added value of their products. However, challenges such as high costs and limited access to technology need to be addressed through collaboration between various stakeholders. Thus, agrotechnopreneurship can play a crucial role in advancing the food industry toward a more sustainable and innovative future. This research provides a comprehensive understanding of agrotechnopreneurship and its importance in the development of the agricultural sector and food business.

Implications of this research include the need for government support, collaboration among stakeholders, and policy development that facilitates innovation, technology access, and capacity strengthening for agrotechnopreneurs. Thus, this research contributes to our understanding of how to make farming more value-added to reaching the dining table.

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