

# Yin Ping Zhu

## Agricultural biotechnology in East Asia

### A comparative assessment of GM crop adoption in China and Japan

#### Topic and Research Question

A rising global population increases the food demand under challenging circumstances considering limited natural resources and strained agriculture. Food production requires not only higher efficiency for higher outputs but also sustainability in the process of cultivation. With climate change adding up to existing challenges solutions have been searched for and discovered in agricultural biotechnology (agri-biotech). Both China and Japan have invested into agri-biotech and GM (genetically modified) crops to fill the growing gaps in their food and feed supply.

The guiding research question of this thesis is as follows:

What are the similarities and differences between GM crop adoption in China and Japan?

The main objective of this thesis is to achieve a comparative analysis of China and Japan's approach to GM crop adoption. The findings are expected to offer insights into the agri-biotech and GM crops' roles in each East Asian country. Agri-biotech has become a tool that will keep refining and growing on global relevance with GM as the fastest adopted crop technology worldwide (James 2015, 4). GM biotechnology for crops has come a long way since its commercialization in 1996 and has established itself beyond merely our food supply system, but also in other fields, such as in the textile industry (Wong and Chan 2016, 124) or the medical sector (WHO 2014; Dutta 2016, 509).

#### State of the Art

The literature review revealed the multifaceted character of the topic of this thesis. Prevailing literature approaches to GM crop adoption involve food security, economic, environmental and health effects, controversial debates, and country-specific studies, which represent the fundamental of the analytical framework (AF) of this thesis.

Even though the literature on biotechnology and GMOs, in general, are vastly represented, an AF designed explicitly for the topic of this thesis did not exist at the time this research was conducted. Available works of research on GM biotechnology and its products are carried out either in a broad manner or focused on very narrow and specific topics.

Therefore, I have compiled an individual framework for this thesis based on studies from more experienced researchers in this field. In the course of literature

research, I have encountered several relevant studies and ultimately selected three of them to be used as core literature and main pillars for the customized AF.

#### Methodology and Approach

The AF is structured in two main sections. The first section focuses on the political and socio-economic factors that induced GM crop adoption, while the second section deals with the regulatory factors that are crucial during the adoption process. Each key factor is explained by several criteria, which again are defined by several indicators for further precision. The complete table of the AF, including the indicators, is available in the thesis.

The first section is primarily derived from Mabaya et al.'s research on the political and socio-economic key factors of GM crop adoption in African nations (2015), and complemented with Burachik's research on Argentina's GM crop adoption (2010), where the author dealt with the advantageous circumstances for the introduction of a new biotechnology into Argentina and critically assessed the impact of GM crop adoption on the country (ibid.).

Section I	Factors	Criteria
Key factors before the GM crop adoption	Ministerial control of biosafety	→ Jurisdiction → Primary department → Stage of biosafety policies
	Advocacy by key political figures	→ Political leadership → Key departments
	Peer country influence	→ Received influence → Emitted influence
	Technical capacity	→ Advancement of key industries → Human resources → Financial resources
	Food security crises	→ Natural threats → Perception → Benefits → Barriers
	Role of media	→ Media structure → Awareness and acceptance → Debates and activism

Source: Extract of AF based on Burachik 2010; Mabaya et al. 2010; Vigani and Olper 2015

The second section follows Vigani and Olper's index of regulatory components for GMOs (2015). The choice of regulatory factors that were treated in this thesis are based on this third core literature.

Section II	Factors	Criteria
Key factors during the GM crop adoption	Approval process and risk assessment	→ Type of approval process → Scope of approval execution → Asynchronous approval → Stage of risk assessment
	Labeling and traceability	→ Regime of labeling → Threshold level for labeling → Labeling target → Traceability of GM products
	International agreements	→ Codex Alimentarius → Cartagena Protocol

Source: Extract of AF based on Burachik 2010; Mabaya et al. 2010; Vigani and Olper 2015

#### Main Facts

In **China**, the ministry of agriculture (MOA) has the primary responsibility for biosafety related issues, which created a supportive environment, where leading politicians publicly advocate for GM biotech and GM crops. Its publicly owned media provides contents following the government's policies. China's agri-biotech sector has been focusing on developing specific food crops and field management. Its biosafety regulation tends to be criticized as fragmented and incoherent with tendencies of tightening its rules in favor of domestic biotech enterprises.

In **Japan**, biosafety falls under the jurisdiction of the ministry of environment (MOE). Japanese politicians were strong advocates in the past, however grew increasingly susceptible to civic concerns. Traditionally strong consumer movements and popular complicated GM crop commercialization. Japan invested increasingly more in developing gene-editing tools in agri-biotech and shifted its focus beyond the food sector. Its regulatory framework has been a shining example of clarity and transparency. The expansion of the decision-making process curbed its initial strive for GM crop adoption.

#### Results

Both nations show similarities and differences in their approaches to GM crop adoption, often reflected even within the same influential factor. The main responsibility of biosafety jurisdiction falls in China under the MOA and in Japan under the MOE. Even though both nations are led by different ministries in terms of agri-biotech, they share similar pragmatic and scientific-oriented goals.

In China and Japan's strives for sustainable development and higher food self-sufficiency both have

continuously increased investments to enhance technical capacity, especially the seed sector. However, they differ in their research focus, which aims in China at food crops and in Japan at novel gene-editing technologies.

Even though both nations started out with encouraging environment towards GM crop adoption, Japanese politicians grew increasingly cautious and were more susceptible to consumer concerns. Chinese farmers' willingness has its roots in its supportive government.

Regulatory differences can be detected in the approval process, which in China is criticized for being too fragmented and deliberately time-consuming, while in Japan's system is being praised as well structured with clear allocation of tasks. Even though both nations follow the EU's precautionary principle, China's approval process leans closer to EU's strict regulations while Japan's approach reflects the US's efficiency for import approval.

The analysis reveals that while all key factors are relevant for the successful GM crop adoption, factors requiring government involvement and support are particularly crucial for the initial launch. Advancements in policy frameworks and technical capacities do not always proportionally reflect the extent of adoption. The success and difficulties of GM crop commercialization in both China and Japan reflect the important roles of the other treated factors and their interconnectedness.

#### References

All references can be found in the full version of the MA thesis available at <http://othes.univie.ac.at>

#### About the Author

Yin Ping Zhu holds a BA in Sinology from the University of Vienna, Austria. Research interests include sustainable agriculture and bio-resources management which she longs to pursue. She gained work experience in Austria, Brazil and China.

Contact information:

[zhuyinping@hotmail.com](mailto:zhuyinping@hotmail.com)



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