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Relationship Analysis of Food Security with Patents and Gross Domestic Products

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Abstract

Purpose: Food security is a critical global challenge that is influenced by research and innovation in the field. Therefore, the objective of this study is to analyze the scientific output of developing countries in food security and examine its relationship with patents and Gross Domestic Product (GDP).

Methodology: This applied research utilized the Scientometric approach. A total of 8,416 papers published between 1992-2023 in the field of food security by developing countries were included in the study using citation databases from Clarivate Analytics. Additionally, patent registrations from the WIPO database and GDP data from the World Bank were analyzed. Information was collected through note-taking, and the data was analyzed using Pearson's correlation coefficient.

Findings: The findings reveal an upward trend in the publication and citation of scientific outputs related to food security in developing countries. China has higher numbers of papers, patents, GDP, and food production index compared to Iran, Japan, and South Korea. There is also a positive correlation observed between population and the number of papers, gross production and the number of papers, food production and the number of published papers, as well as the number of patents and papers citing scientific outputs of countries.

Conclusion: These results highlight the significant relationship between increasing scientific output, GDP, the number of patents, and food security. Greater emphasis on food security contributes to enhanced scientific output, GDP, and innovation. Similarly, increasing scientific output, GDP, and innovation positively impact food security in countries.

Value: This study emphasizes the importance of scientific outputs in driving technological advancements, innovations, and ultimately, ensuring food security in developing countries.

Keywords: Agricultural Biotechnology, Food Security, Biotechnology Development Policies, Gross Domestic Product, Patents**.**

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Extended Abstract

Introduction: Today, the popularity and value of organic food are increasing steadily. The growing demand is mainly driven by consumer concerns about the negative consequences of conventional agriculture on human health and the environment. Particularly in developed countries, consumers perceive organic food as being safer and healthier than non-organic options

Purpose: Food security is one of the most critical challenges in today's world, which is affected by the amount of research and innovation in this field. Therefore, the purpose of this research is to analyze the status of scientific outputs of developing countries in food security and to examine its relationship with the number of patents and their Gross domestic product (GDP).

Methodology: This applied research adopts a scientometric approach. A total of 8,416 papers published between 1992-2023 were included from Clarivate Analytics' citation databases. The study also examines patent registrations in the WIPO database and the GDP of the countries involved. Information was collected through note-taking, and data analysis utilized Pearson's correlation coefficient.

Findings: The findings reveal an increasing trend in publication and citation of scientific outputs related to food security in developing countries. China demonstrates higher numbers of papers, patents, GDP, and food production index compared to Iran, Japan, and South Korea.

Table 1. Correlation between papers counts and the gross production of countries

Country	GDP	Number of papers	Correlation
China	17.73 trillion	6522	0.573
Japan	4.94 trillion	872	0.645
Iran	231.55 billion	572	-0.677
South Korea	1.8 trillion	450	0.793
Total	24.7	8416	0.990

A positive and strong correlation exists between papers counts and countries' GDP, suggesting a mutually influential relationship.

Table 2. Correlation of papers counts with food production of countries

Country	Number of papers	Food production	Correlation
China	6522	103.0	-0.379
Japan	872	99.2	0.892
Iran	572	99.4	0.998
South Korea	450	98.4	0.97
Total	8416	400	0.983

Increasing scientific output shows a positive and strong correlation with the food production index, indicating its impact on food security.

Table 3. Correlation of papers counts with countries' patents

Country	Number of patents	Number of papers	Correlation
China	12224084	6522	0.689
Japan	9671777	872	0.876
Iran	204092	572	0.217
South Korea	3492042	450	0/698
Total	25591995	8416	0/888

There is a positive and strong correlation between the number of patents and paper publications, implying a two-way relationship.

Table 4. Correlation of papers counts with country citations

Country	Number of citations	Number of papers	Correlation
China	103408	6522	0/789
Japan	21615	872	0/819
Iran	6572	572	0/273
South Korea	10674	450	0/987
Total	142269	8416	0/653

Table 4 shows a positive correlation with the number of papers, signifying the significance of food security in developing countries.

Conclusion: The results suggest a significant correlation and mutual influence between the publication of scientific outputs, GDP, the number of patents in countries, and food security. In particular, food security plays a crucial role in promoting scientific output, GDP growth, and fostering innovation. Likewise, an increase in scientific output, GDP, and innovation positively impact food security within countries. The analysis reveals that Iran, China, Japan, and South Korea have achieved commendable levels of food security based on their scientific outputs and patents. This success can be attributed to efforts such as enhancing self-sufficiency in essential product production, bolstering economic growth and job creation in the agricultural sector, supporting agricultural producers and production, promoting productivity and water efficiency, strategic planning, maintaining production capacity, ensuring self-sufficiency in basic products, protecting essential resources, and improving resource productivity. However, recent years have also highlighted certain challenges faced by Iran in achieving food safety. These challenges include neglecting the utilization of scientific outputs and patents, inadequate scientific planning and policy development, failure to prioritize research needs, limited freedom of expression in scientific societies, insufficient application of expertise, neglecting applied research in this field, brain drain, support for elites by foreign countries, lacking research infrastructure, limited cooperation between professionals and responsible organizations, rising food prices, improper food consumption habits, insufficient investment, flawed policy-making, political decisions impacting scientific works and patent registration, and limitations due to international sanctions. Considering the positive association between scientific outputs, patents, GDP, and the development of science, technology, and innovation, as well as their critical role in ensuring food security, it becomes evident that supporting applied research, fostering innovation, preventing the emigration of intellectual elites, leveraging scientific research findings to address food security concerns, implementing precise and principled policies, investing in food security initiatives, promoting scientific cooperation among nations, and considering factors like available resources, pricing policies, resource protection and optimal use, sustainability, household financial capacity, consumer cultures, and demographic indicators are crucial elements in ensuring the food security of nations.

Value: This study emphasizes the importance of scientific outputs in driving technological advancements, innovations, and ultimately, ensuring food security in developing countries.

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