

## Benefits of rural-urban interactions for sustainable food security in Iran

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Cities and rural areas, as two human settlements, have long interacted with each other, and these interactions have many benefits for producing better products and food security. However, despite the importance of benefits in rural-urban interaction, identifying, improving, and investing them in rural areas of Iran has always been neglected. Therefore, in addition to identifying the benefits of interactions, this study investigates the causal relationship between them and sustainable food security in villages in the southeast Tehran province in Iran. Four hundred questionnaires were completed among farmers by simple random sampling. The findings, conducted in a descriptive-analytical and questionnaire-based manner, show the positive effect of rural-urban interactions on sustainable food security. The product transport variable has the most significant impact, and agricultural services and production support have a negligible effect on sustainable food security. Villagers' access to roads (proximity to farms), suitable ways to deliver agricultural and non-agricultural products to the city, warehousing, refrigeration, and packaging services, widening roads between farms, and market access are the key factors influencing food security.

**Key Words:** *reciprocal interactions, urban and rural facilities, Iranian villages, food security indicators*

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## **Introduction**

Urban and rural areas have always interacted with each other. The simplest and most basic form of interaction was the transfer of products from the village to the city and factory goods from the city to the village. Over time, rural-urban interactions have become more complex, and the importance of the benefits of these interactions has been increasingly emphasised in the specialised literature. One of the critical factors that these rural-urban interactions can improve is the issue of sustainable food security, which is expected to become more critical in the future (Shafieisabet & Mirvahedi, 2021). Rural-urban interaction's type, intensity, weakness, and quality have changed and have benefited from better production and food security with the emergence of sustainable development (Setiadi et al., 2020). Several definitions of food security have evolved over the years (Yu & You, 2013). The intellectual origins of food security go back to the global food crisis in the early 1970s or earlier with the 1948 United Nations Declaration of Human Rights (Smith et al., 1993; Bennell, 2008).

In the early 1970s, the world faced a food crisis in which food production, especially in developing countries, was volatile and declining sharply. To prevent the dire consequences of this crisis, the World Food Conference was convened in 1974 at the initiative of the United Nations. The issue of food security was addressed seriously for the first time at the conference and was widely defined globally and nationally (Harrigan, 2014). Sustainable food security is defined as "when all people at all times have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life without compromising the productive capacity of natural resources, the integrity of biological systems, or environmental quality" (Balakrishnan, 2005, p. 1; FAO, 1996). In this study, the leading indicators of food security, Availability, Access, Utilization, and Stability in the context of the dimensions of sustainable development have been explained, such as environmental-ecological, socio-economic, political-cultural, and infrastructural dimensions (Santeramo, 2015). Many researchers enumerate the benefits of rural-urban interactions that transform rural communities and contribute to sustainable food security (Douglass, 1998; Akkoyunlu, 2015).

Training by a specialist urban workforce from developing countries in rural areas is a rural-urban interaction benefit for food security. By providing training, the urban expertise improves the capacity of villagers to diversify activities, increase productivity and income, access information about health care, and strengthen social cohesion and participation. These factors are essential for long-term food security. Studies show that the relationship between food insecurity, and training continues to develop and this issue can provide the basis for improving food security (Burchi & DeMuro, 2016). Targeted institutionalism is rural-urban interactions that benefit from sustainable food security in environmental-ecological, political-cultural, socio-economic, and infrastructural dimensions.

Also, active non-governmental groups and launching non-agricultural rural activities (handicrafts) by the city in the village are among the benefits of rural-urban interaction. Furthermore, creating a micro-credit fund and using local employment-generating capacity can pave the way for rural opportunities to produce more products. In addition, in interaction with the villages, urban specialists create organisations to facilitate the increase in the efficiency of agricultural products (Hussein & Suttie, 2016; Akinyemi et al., 2005; Sharma, 2018). Supply of agricultural tools and inputs from the city and products such as food and clothing needed in the city, providing technical services like agricultural engineering in the village, services to protect crops from pests, banking services, and veterinarian services in the village are also benefits that stem from rural-urban interaction (Adesope et al., 2016; Martin & Laborde, 2018; Proctor & Berdegué, 2020).

In addition, innovation and promotion of seeds and fertilizers, innovations in changing cropping patterns, irrigating farms and gardens, transforming traditional livestock into an industrial one, and branding and marketing as benefits of rural-urban interaction for sustainable food security have also been proven by several studies (Olumakaiye & Ajayi, 2006; Moa, 2013; Proctor & Berdegué, 2020; Hussein & Suttie, 2016).

Rural-urban interaction also leads to the increasing use of information and communication technology in rural areas, which provides a significant opportunity for sustainable food security. Information and communication technology can improve agricultural production of rural households, farm profitability, job opportunities, healthy practices, and risk management (Nakasone & Torero, 2016). In Australia, ICT has many potential benefits for increasing food production and the sustainability of agricultural systems. In Africa, mobile phones and other ICT platforms, such as mass media, influence the sale of agricultural products (Kiambi, 2018; Okoedo-Okojie & Omoregbee, 2012). In Nigeria, membership in social organisations and cell phone use has significantly impacted household food security (Olaniyi & Ismaila, 2016). In India, information and communication technology has affected in a positive way the food security system (Biswal & Jenamani, 2018). In the Asia Pacific, information and communication technology can help with agricultural policy, increase production, resource management, and marketing, mitigate the effect of disaster events, and play a key role in modern agriculture and maintaining agricultural sustainability and food security (ECOSOC, 2008). The role of information and communication technology in improving food security in the KwaZulu-Natal Province of South Africa has also been significant (Jere & Maharaj, 2017).

Urban investment in agriculture and livestock, participation of urban investors in agricultural and non-agricultural projects, investment in conversion and complementary industries in rural areas are influential factors in food security. Also, investment in expanding the transportation network to facilitate the sale of products is an influential factor in food security achieved through rural-urban interaction (Proctor & Berdegué, 2020; Hussein & Suttie, 2016).

Remittances are also another benefit of rural-urban interaction in the flow of capital. Remittances are a significant source of household income in Africa, especially Nigeria, the largest recipient of remittances (Babatunde, 2018). In this country, studies have shown that remittances are strongly related to aspects of welfare, such as food security (Adeyemo & Olajide, 2013). Studies show a significant relationship between remittances and food security in southern countries of the world (Ebadi et al., 2018). In Ethiopia, remittances are also an essential component of food security programs and policies (Abadi et al., 2018).

Planners and policymakers have neglected to identify, improve, and invest in these benefits despite the importance of rural-urban interactions. As a result, the importance of rural-urban interactions about sustainable food security in Iran has been ignored. Given the importance of villages for food security, a lack of attention to the benefits of rural-urban interactions can typically have adverse consequences. In this context, this study seeks to answer the following research questions: Are the benefits of rural-urban interactions related to sustainable food security? and Which benefits of rural-urban interactions have the most significant impact on sustainable food security?

## **Methodology**

The rural settlements selected in this study are villages around the metropolis and practice farmed agriculture. These villages have many opportunities due to their proximity to a large city with a population of several million. In Iran, many villages around the metropolis enjoy the benefits of their proximity to the metropolis. As one of the metropolis, Tehran, is at the highest level among Iranian cities in terms of economic development and urbanization and concentration of facilities and services. It has a relatively high population growth due to the rapid migration from all parts of the country to this metropolis.

The reasons for the research questions and selection of the villages in the study area are as follows:

- Rural settlements in the study area around the metropolis of Tehran have very fertile agricultural land. Moreover, the surrounding cities are located in the very fertile plain of Varamin.
- The close distance of the surrounding villages and their agricultural areas to Tehran's metropolis is significant. The proximity of the surrounding villages to the Tehran metropolis provides facilities for agricultural production and marketing of products.
- Villages around the metropolis of Tehran are in its direct area of influence and are inextricably linked with it. Due to its fertility, this plain has been inhabited by various ethnic groups since ancient times. With numerous agricultural, horticultural, and livestock products, it has always been considered the centre of agriculture and animal husbandry in Tehran and Iran. The presence of water is another potential for producing and diversifying agricultural and non-agricultural activities. Abundant water and

suitable land for agriculture and settlement villages in flatlands are crucial for the prosperity of agricultural production.

- The proximity of this vast agricultural area to the metropolises of Tehran, Karaj, Qom, and numerous adjacent large cities has created a unique economic feature in selling agricultural products to the surrounding consumer market. Moreover, this proximity has led to spatial flows and interactions between cities and villages in the region. These rural-urban flows and connections in the form of spatial flows can diversify activities and improve sustainable food security challenges in rural.
- Also, in recent years, national and international organizations have considered this area and have implemented sustainable food security schemes to improve sustainable food security there.

The present study was built on an applied descriptive quantitative survey. The topic of this study was the study of the effects of rural-urban interactions on sustainable food security and was carried out in 2020 in rural areas around the Tehran metropolis. The research population included the farmers around Tehran. Based on field observations, local institutions in villages were divided into two groups based on their population. The first group included villages with a population of less than 1,500, and the second one included villages with over 1,500. Two-stage cluster sampling was used in this study. Initially, the villages were randomly selected within clusters (based on city boundaries). The total number of villages in this stage was 37. Then, within the cluster of selected villages, random sample farmers were selected based on the size of the existing farmers (based on the general census data in 2016 by the Statistical Center of Iran), and a simple random sampling was performed. The sample size was determined based on Cochran's Method and sampling in qualitative variables, which were classified through the Likert Scale from 1 (very low) to 10 (very high), with a 95% confidence level, and a probability accuracy of 5%, and prediction of the variance of 0.25. Some 342 farmers were selected as the random sample of the study based on Morgan's table. For more accuracy and completing the questionnaire in villages where the sample size was less than 5, the sample size was increased to 400 to provide better coverage in the statistical population. The villages were divided into four blocks based on their territorial distribution. In each block, farmers were selected randomly to complete the questionnaire. If there were no persons in the selected farmers with the intended age or gender, another unit was randomly replaced.

A researcher-made questionnaire, designed based on a review of previous studies and taking into account the conditions and situation of Iranian society, was used to collect the data. Academic and rural municipality organisations experts reviewed the designed questionnaire to ensure that the questions extracted from previous studies are consistent with the content of the research variables. In addition, they examined the face validity of the questionnaire and the importance of effective and influential research components. In other words, the face validity and importance of items and effective and affected indices of the study were measured by 35 academic lecturers and researchers from the

University of Tehran, Kharazmi, Shahid Beheshti, and Tarbiat Modares universities, and 37 experts from the Ministry of Agriculture Jihad, Ministry of Agriculture. Also, some results from several field investigations conducted for more than 26 years in villages around Tehran Metropolis were used in this research. After receiving their comments, corrective actions were taken in the questionnaire, and several unqualified questions were removed. Therefore, the final indices of benefits of rural-urban interaction as independent variables and sustainable food security were collected. These indicators were measured on a Likert Scale ranging from 1 (very low) to 10 (very high). The data of the study were analyzed using SPSS, version 24. In addition, Cronbach's alpha method was used to evaluate the reliability of the indicators, the results of which are shown in Table 1. A total of 31 samples were collected as a pretest to determine the validity and reliability of the questionnaire.

Out of 400 questionnaires completed by agricultural and horticultural farmers, 61.3% of the respondents were male, and about 38.8% were female. According to the information obtained, 37.8% were single, and 62.3% were married. Also, 14.8% of the rural respondents were illiterate, 28% had primary education, 24.5% graduated from middle school, 10% had a high school education, 15.3% had a high school diploma, 3% had finished a master, and 5% had a bachelor's degree. Furthermore, according to the information obtained, 19.8% of respondents were under 35 years old, 71.8% were in the age group of 35-55 years, and 8.4% had over 55 years.

## Results

One of the most critical tests to check whether the data is normal or not is the Kolmogorov-Smirnov test, the background of all tests in this study. Because sig. is less than 5%,  $H_0$  is rejected, and the claim that the data distribution is normal is not accepted, so the data does not have a normal distribution.

**Table 1.** Cronbach's alpha coefficient

Main dimensions	Cronbach's alpha
The urban and rural specialist workforce	0.789
Targeting institutionalism	0.756
Agricultural services and production support	0.751
Transportation of products	0.756
Innovation in production and product supply workshops	0.733
Information and Communications Technology	0.775
Investing in formal and informal resources	0.701
Enterprises and microcredit	0.731
Environmental-Ecological	0.734
Political-Cultural	0.881
Socio-Economic	0.833
Infrastructure	0.925
	0.929

Source: Research Findings, 2020

### **The impact of rural-urban interactions on sustainable food security**

Determining the components' relationship is due to the indices' non-normality using non-parametric Kendall's tau\_b statistics. The statistical test results showed that rural-urban interactions directly and positively relate to sustainable food security.

In other words, benefits such as specialist urban and rural workforce, targeted institutionalism, agricultural services, production support, transportation of products, and investment from formal and informal sources positively affect sustainable food security. Firms and microcredit, innovation in the production and supply of products, workshops, and ICT also impact sustainable food security (Table 2).

### **Multivariate linear regression analysis to explain the effect of rural-urban interactions on sustainable food security**

We used multivariate linear regression stepwise to investigate rural-urban interactions' effect on sustainable food security. The stepwise regression model of independent variables to explain the sustainable food security shows that model (1) could predict 58.3% of the sustainable food security in the region after the variable of transportation of products. Models 2 to 8 show that after adding investment, information, and communication technology variables, innovation in production and supply of products and other benefits of rural-urban interaction have increased to about 79.2% (Table 3).

In the final model, the variable of product transportation (0.583) and agricultural services and production support (0.293) have the highest and, respectively, lowest impact on the dependent variable. All of the eight variables included in the regression equation, except for the urban and rural specialist workforce, remain in the equation. It should be noted that the effect of all variables on the dependent variable of food security is positive (Table 4).

**Table 2.** The relationship between benefits of rural-urban interactions and sustainable food security

Benefits of Rural-Urban Interactions		Kendall's tau_b test		Significance
		Correlation	Significance	level (sig)
		coefficient	level (sig)	
Urban and rural specialist workforce		0.239	0.000	Accept
Targeting institutionalism		0.459	0.000	Accept
Agricultural services and production support	Sustainable	0.371	0.000	Accept
Transportation of products	Food	0.517	0.000	Accept
Production innovation and product supply	Security	0.459	0.000	Accept
Workshops		0.124	0.000	Accept
ICT		0.372	0.000	Accept
Investing in formal and informal resources		0.545	0.000	Accept
Enterprises and microcredit		0.522	0.000	Accept

Source: Research Findings, 2020

**Table 3.** Regression model to explain the impact benefits on sustainable food security

Model	Variable	Coefficient of determination (R <sup>2</sup> )	Adjusted coefficient of determination	ANOVA (F)	Sig.
1.	Transportation of products	0.340	0.338	205.161	0.000
2.	Investing in formal and informal resources	0.481	0.487	183.940	0.000
3.	ICT	0.547	0.543	159.158	0.000
4.	Production innovation and product supply	0.589	0.585	141.557	0.000
5.	Enterprises and microcredit	0.603	0.598	119.864	0.000
6.	Workshops	0.617	0.611	105.501	0.000
7.	Targeting institutionalism	0.624	0.617	92.812	0.000
8.	Agricultural services and production support	0.628	0.620	82.484	0.000

Source: Research Findings, 2020

**Table 4.** Impact coefficients of the final model of independent variables on sustainable food security

	Variables	Non-standard coefficient		Standard coefficient	T	Sig.
		B	Std.	Beta		
	Transportation of products	1.446	0.084	0.583	17.191	0.000
	Investing in formal and informal resources	0.892	0.092	0.449	11.703	0.000
	ICT	0.730	0.089	0.349	9.109	0.000
	Innovation in production and product supply	0.448	0.095	0.348	9.370	0.000
	Enterprises and microcredit	0.736	0.121	0.342	9.663	0.000
	Workshops	0.675	0.120	0.310	7.546	0.000
	Targeting institutionalism	0.633	0.120	0.296	7.481	0.000
	Agricultural services and production support	0.594	0.121	0.293	5.364	0.000

Source: Research Findings, 2020

## Discussion

This study aimed to investigate the role of the benefits of rural-urban interactions in the direction of sustainable food security. This study examined internal validity with face validity, a particular type of content validity. We conducted the research questionnaire's validity with the opinion of experts at Shahid Beheshti University, the Ministry of Agriculture Jihad, and the Institute of Economic Research and Rural Development, to find out if the tools or methods used in the research are appropriate. As a result, the questionnaire items to analyse the findings reflect interaction and food security research.

The findings show a significant relationship between the benefits of rural-urban interactions such as transportation of products, investment from formal and informal sources, information and communication technology. Also, there is a significant relationship between the benefits of rural-urban interactions such as innovation in production and supply of products, enterprises, and microcredit. Also, there is a significant relationship between the benefits of rural-urban interactions with sustainable food security. So that with the targeted improvement and guidance of each of the benefits, food security is enhanced. There are



interactions between villages of the study area with cities such as Tehran and even other metropolises. Planning to improve rural-urban interactions will raise the level of food security standards in rural communities on the one hand and create more prosperous cities with the support of villages. On the other hand, government officials, planners, and policymakers should strengthen the rural-urban interaction with a comprehensive view of the policy-making and planning system. This article identified the benefits of rural-urban interactions and sustainable food security by carefully reviewing the literature, research background, and surveys with human experts and geographers in Iran.

The findings of linear regression in a stepwise manner have shown that the variable of product transportation has the most significant impact on sustainable food security. The benefits of providing agricultural services and production support have the most negligible impact. As Douglas (1998) and Akkoyunlu (2015) emphasise the importance of rural-urban interactions in rural development and sustainable food security, the findings of this study in Iran also showed that improving the benefits of rural-urban interaction is effective in food security. The findings of the present study are consistent with the findings of other researchers from Indonesia (Setiadi et al., 2020), sub-Saharan Africa (Hussein & Suttie, 2016), Nigeria (Akinyemi et al., 2005; Olaniyi & Ismaila, 2018; Adeyemo & Olajide, 2013), Africa (Adesope et al., 2016; Kiambi, 2018; Jere & Maharaj, 2017), Bangladesh (Moa, 2013), India (Biswal & Jenamani, 2018; Sharma, 2018) and Ethiopia (Abadi et al., 2018) in terms of benefits of rural-urban interactions leading to sustainable food security. In this regard, it is suggested to adopt appropriate policies and review the policy-making system to pay more attention to rural-urban interaction for sustainable food security.

Of course, we have faced limitations in conducting research. This research examines a new approach to the crucial indicators of benefits of rural-urban interactions and sustainable food security. Therefore, it needed detailed interviews and opinions from experts and specialists in these fields. Unfortunately, coordinating and arranging interviews for interviews with experts and heads of responsible organizations was difficult. The present study results can be generalised to villages around other metropolia. If it needs to be generalised to other rural areas, it must be done with sufficient caution and knowledge. We have conducted this research in 37 sample villages in the southeastern villages of Tehran province. It is better to repeat the research process with a larger sample size in future research. Due to the novelty of the research topic, we had few resources. To fill the research gap in this area, other researchers in other countries need to examine the role of rural-urban interactions in food security to compare the results better. This study's study area is located around Tehran's metropolis (the capital of Iran) and on the desert's edge. Therefore, we suggest that other researchers conduct the study process for other areas with other geographical features, such as border villages, to design a single pattern for villages with the same geographical features.

## Conclusion

Today, the benefits of rural-urban interactions are considered one of the main components required for sustainable rural food security. In this study, while identifying the most critical benefits of rural-urban interaction, we have addressed the impact of these benefits on sustainable food security in rural Iran. Findings confirm the positive effect of rural-urban interactions on the dimensions of sustainable food security. Therefore, recognizing the benefits of rural-urban interactions can help change the structure and function of the existing relationships between them.

If the benefits of rural-urban interactions are considered an infrastructure for sustainable food security, it can reduce the adverse effects of this category. For example, it can be said that the specialised workforce from city to village and their cooperation in changing the pattern of cultivation, integrated cultivation, launching conversion and complementary industries, modern and efficient irrigation systems is leading to produce natural and healthy food. Local production has also increased. In addition, with the targeted institutionalism and formation of multi-purpose agricultural and non-agricultural cooperatives in rural areas, plant species, native seeds, and products adapted to the region's climate expanded. Supply of agricultural tools and inputs from the city (seeds, fertilizers, pesticides, seedlings, machinery), services to protect crops from pests, diseases, and weeds (plant protection) from sources against pollution protected, and the study area has reached reliable levels of food hygiene.

The expansion of the transportation network to facilitate the sale of agricultural and non-agricultural products eliminated brokers from marketing products. Periodic and weekly markets in the villages for the sale of products to the city have stabilized the increase of local production and solved the problems related to the maintenance and storage of products. Creativity and innovation in packaging agricultural and non-agricultural products lead to better sales. Training farmers to produce healthy and quality crops by irrigating farms and orchards contributed to the quantity and quality of available food. As a result, farmers could produce desirable horticultural, agricultural, and livestock products, and there was stability in increasing local production.

Also, villagers have access to suitable ways to provide agricultural and non-agricultural products to the city; warehousing, refrigeration and packaging services, expansion of roads between farms, and market access are critical factors for sustainable food security.

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