

Livelihood diversification for achieving sustainable food security in peri-urban areas of Iran

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Abstract: According to their location and characteristics, peri-urban areas are increasingly exposed to extensive changes because of the expansion of cities in various dimensions. In these areas, due to the reduction of rural agricultural lands, land-use change, fragmentation of agricultural lands, and increasing urban population, one of the issues that need more attention in these areas is food security as the agenda 2030 Sustainable Development Goals. Accordingly, this article has identified the factors affecting livelihood diversification regarding sustainable food security in peri-urban areas of Iran. After accurately identifying these factors, it also examines the effectiveness of livelihood diversification to sustainable food security in environmental-ecological, socio-economic, political-cultural, and infrastructural dimensions and leading indices such as availability, access, utilization, and stability. This research has been done by the descriptive-analytical method in the peri-urban of Tehran. Inferential statistics, correlation relationships, stepwise linear regression, and a multiple-choice logit model were used to analyze the data. Findings showed that the influential factors in livelihood diversity in peri-urban areas of Tehran are training and awareness, knowledge and skills, institutionalism, access to resources, partnership for investment, and marketing of products. Diversification within agricultural sector activities such as agriculture, horticulture, livestock, and aquaculture significantly impact sustainable food security. Diversification within non-agricultural activities such as support services of agricultural production has the most negligible impact on the dimensions of sustainable food security. Among the variables included in the regression equation, the rest remain in the equation except for the diversification variables in non-agricultural activities such as conversion, complementary industries, handicrafts, and workshops in the village.

Citation: Lastname, F.; Lastname, F.; Lastname, F. Title. *Biol. Life Sci. Forum* **2022**, *2*, x. <https://doi.org/10.3390/xxxxx>

Academic Editor: Firstname Lastname

Published: date

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Keywords: Diversification of economic activities; Food security; Rural areas; Empowerment.

1. Introduction

Livelihood diversification is one of the effective strategies for farmers in most developing countries. Non-agricultural activities cause job creation outside the farm, reduce rural-urban migration, improve income, and provide good inter-sectoral linkages (Udoh & Nwibo, 2017). Diversification of agricultural and non-agricultural activities is one of the fundamental factors of growth and development in agriculture, industry, and service sectors to achieve sustainable food security in various countries. Therefore, non-agricultural and off-farm activities are considered sources of income along with other activities for a large number of families. In this context, Ellis (2004) raised this point: when agricultural production faced stagnation in Africa, farms grew that had incomes other than agricultural activities. Families engaged in various activities had more food security (Frimpong & Asuming-Brempong, 2013). These families are less vulnerable

to unemployment, climate change, pest attacks, disease, and other unforeseen events. Non-agricultural income in rural areas enables households to purchase food in times of agricultural stagnation and low harvests and to use it as a reserve source in times of scarcity (Gordon & Craig, 2001). According to Asogwa and Okwoche (2012), income from agricultural and non-agricultural activities positively affects food security because off-farm economic activities are one of the coping strategies that provide more income for rural households and increase household income at a time when the production of agricultural products is declining. Reardon et al. (1998) claim that non-agricultural income by diversifying activities is essential for food security in the long term because it increases smallholder farmers' access to agricultural tools and inputs. As a result, the productivity of farmers is improved. In India, many efforts have been made to minimize risks in production and overcome food insecurity by diversifying cropping patterns. In addition to facilitating the attainment of food security in India, it has established justice among farmers by increasing GDP and reducing poverty (Sheereen & Banu, 2018). Implementing a diversification strategy for agricultural activities and products in Myanmar has affected the country's food security. In such a way, the farmers could cultivate a large variety of species in their fields, which resulted in the production of quality and diverse products in line with sustainable food security plans (Cho et al., 2016). In this context, research in Nigeria has shown a significant relationship between food security and diversification strategies for agricultural and non-agricultural activities (Gani et al., 2019). Therefore, farmers were encouraged to participate in various activities in both agricultural and non-agricultural sectors to increase their income and reduce the cycle of poverty among them. Trained and capable farmers have dealt with chronic poverty and food insecurity in rural areas by participating in the diversification of agricultural and non-agricultural activities in addition to increasing household income and improving their livelihoods. In this way, the increase in the villagers' income has freed the families from lacking food. Therefore, it has reduced their vulnerability to hunger, disease, and mortality and has effectively improved the dimensions of sustainable food security (Echibiri et al., 2017). Livelihood diversification to agricultural activities and non-agricultural employment in Ethiopia has increased farmers' income to meet their basic needs such as food supply, education, clothes, and health services (Robaa & Tolossa, 2016; Adem et al., 2018). In sub-Saharan African countries, diversification into agricultural and non-agricultural activities is a fundamental factor in improving the condition of farms and promoting resilience in the face of climate change (Njeru, 2013). In Kenya, studies show that diversifying agricultural and non-agricultural activities and improving farmers' access to food have played an important role in household food security (Kandagor & Nyandoro, 2018). In Zimbabwe, the diversification of agricultural activities has increased products and flexibility in production systems (Makate et al., 2016). Therefore, this research seeks to answer these basic questions: what are the influential factors in livelihood diversification in the peri-urban areas of Tehran? What is the effect of each livelihood diversification index on sustainable food security?

2. Materials and Methods

The present study was an applied descriptive-quantitative survey. The data of the study were analyzed using SPSS, Version 26. The field survey method was used to collect field data about indicators. Based on the central limit theorem and the number of larger and equal numbers of 30, the number of random samples for this statistical population was 37 villages. Therefore, 37 random sample villages were selected by a multi-stage cluster sampling method, which, according to the statistics of 2016 and 2018, included 3127 farming households. In the final step, according to the number of farmers in 37 villages (3127 households), the number of samples required for questioning through Cochran's formula with a specific statistical population was 342 random. The sample size was determined based on Cochran's Method and sampling in qualitative variables, which were classified through a 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. For more accuracy and completing the questionnaire in villages with less than 10, the sample size was increased to 400 to provide better coverage in the statistical population. A questionnaire was used to collect field data.

3. Results

Table 1. The mean and standard deviation of the studied indicators

Indicators	Rural stakeholders		
	Mean	Variance	Standard deviation
Diversification in the production of products within the agricultural sector's activities (agriculture, horticulture, livestock, aquaculture, etc.)	2.29	1.242	1.114
Formability and expansion of non-agricultural activities (conversion and complementary industries)	2.31	1.315	1.147
Formability and expansion of handicrafts and workshops	2.37	1.376	1.173
Formability and expansion of non-agricultural activities (agricultural production support services)	2.45	1.501	1.225
Environmental-ecological dimension of food security	2.50	0.717	0.847
Socio-economic dimension of food security	2.26	0.986	0.993
Political-cultural dimension of food security	2.35	0.880	0.938
infrastructural dimension of food security	2.44	1.270	1.127

Source: Research Findings, 2022

Table 2. Relationship between indicators

Effective indicators	Impressible indicators	Kendall's tau-b test	
		The correlation coefficient	Sig.
Training and awareness	Livelihood diversification	0.234	0.000
Knowledge and skills		0.233	0.000
Institutionalism		0.151	0.000
Accessing resources		0.248	0.000
Participation		0.169	0.000
Marketing		0.136	0.001

Source: Research Findings, 2022

Table 3. Relationship between indicators based on Kendall's tau-b test

Effective indicators	Impressible indicators	Kendall's tau-b test	
		The correlation coefficient	Sig.
Diversification in the production of products within the agricultural sector's activities (agriculture, horticulture, livestock, aquaculture, etc.)	Sustainable Food security	0.251	0.000
Formability and expansion of non-agricultural activities (conversion and complementary industries)		0.209	0.000
Formability and expansion of handicrafts and workshops		0.178	0.000

Formability and expansion of non-agricultural activities (agricultural production support services)	0.185	0.000
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Source: Research Findings, 2022

Table 4. Regression model to explain the impact of diversification on sustainable food security

Model	Variables	Multiple correlation coefficient (R)	The coefficient of determination (R ²)	The adjusted coefficient of determination	ANOVA (F)	Sig.
1	Diversification in the production of products within the agricultural sector's activities (agriculture, horticulture, livestock, aquaculture, etc.)	0.294	0.086	0.084	37.676	0.000
2	Formability and expansion of non-agricultural activities (agricultural production support services)	0.310	0.096	0.091	21.081	0.000

Source: Research Findings, 2022

Table 5. Impact coefficients of the final model of independent variables on the diversification of activities

The final model	Variables	Non-standard coefficient		Standard coefficient	T	Sig.
		B	std	Beta		
		Diversification in the production of products within the agricultural sector's activities (agriculture, horticulture, livestock, aquaculture, etc.)	0.234	0.038		
Formability and expansion of non-agricultural activities (agricultural production support services)	0.074	0.036	0.102	2.045	0.041	

Source: Research Findings, 2022

3. Conclusion

Improving the indicators of livelihood diversification can provide a suitable basis for sustainable food security through the empowerment of local stakeholders and the implication of appropriate policies in the field of training and awareness, knowledge and skills, institutionalism, access to resources, participation in investment, marketing of products. Diversification indicators within the activities of the agricultural sector such as agriculture, horticulture, livestock, and aquaculture and non-agricultural activities such as support services of agricultural production have the most significant impact on sustainable food security. Diversification of agricultural and non-agricultural activities positively affects sustainable food security. This issue means that the more human capacities are used to diversify and improve indicators, the more diverse agricultural and non-agricultural products will be. As a result, a basis for sustainable food security will be provided. It was revealed in the present research; if infrastructure diversification is considered for sustainable food security, it can reduce the negative impacts of this category.

The diversification variable within the activities of the agricultural sector, such as agriculture, horticulture, livestock, and aquaculture, showed the most significant impact on sustainable food security in the region. In addition, in this connection, it is suggested to adopt appropriate policies and review the policy system to pay more attention to the potential of rural-urban linkages to empower local stakeholders and diversify activities in sustainable food security.

Funding: Please add: "This research received no external funding."

Conflicts of Interest: "The authors declare no conflict of interest."

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