

Research Article



Prioritizing the Criteria of Establishment and Development of Agricultural Industries in the Rural Areas (Case Study: Tehran Province)

Ahmad Kiani^{1*}, Shapour Zarifian¹, Hosein Kouhestani¹ and Hosein Karimzadeh²

¹Department of Rural Development and Extension, The University of Tabriz, Iran; ²Faculty of Geography, The University of Tabriz, Iran.

Abstract | Rural industrialization is one of development strategies to increase rural incomes, create new job opportunities in rural areas etc., and site selection of rural industries has led to the development goals. Agricultural industries are one type of rural industries and it's so important in Iran because of major potential of agriculture in Iran and also other developing countries. According to the statistics in Tehran province by the end of 2013 about 135 units of Agricultural industries were active but there is still the gap between urban regions and rural regions and many immigrants from rural regions to urban regions have been recorded. So, this research tries to prioritize the criteria of establishment and development of agricultural industries in the rural areas in Tehran Province. The result shows the items which refer to market and financial issue have greater weight, So, it is necessary to develop transportation to streamline access to market and also the industries need investors to be flourishing; Accordingly, both governmental and non-governmental organizations could take part to improve industrial sector. Moreover, the output of research shows some geographical factors like climate and geology have the least importance as to development and establishment of industries in the rural areas, and they are not paramount obstacle to be dealt with in order to contribute rural industrialization.

Received | October 12, 2019; **Accepted** | April 18, 2020; **Published** | May 25, 2020

***Correspondence** | Ahmad Kiani, Department of Rural Development and Extension, The University of Tabriz, Iran; **Email:** AhmadKiani@rocketmail.com

Citation | Kiani, A., S. Zarifian, H. Kouhestani and H. Karimzadeh. 2020. Prioritizing the criteria of establishment and development of agricultural industries in the rural areas (Case study: Tehran province). *Sarhad Journal of Agriculture*, 36(2): 668-674.

DOI | <http://dx.doi.org/10.17582/journal.sja/2020/36.2.668.674>

Keywords | Analytical hierarchy process (AHP), Agricultural industries, Tehran province, Rural industries, Site assessment

Introduction

Since 1950s and with the advent of scientific approach to “development”, a paradigm has been set forth for it in any period. Primary paradigms after Second World War (WW2) focused on growth, rebuilding, and applying rural workforce for developing urban industries. These procedures resulted in rapid development of urban industries at the expense of rural environment. This consequence led to a revision on the concept of development by researchers and resulted in a development paradigm shift toward

growth accompanied by justice in 1970s. In this period, the conditions of development of societies were based on their attention rate to issues such as employment, income distribution, and essential needs (food, residence, etc.). Considering these factors have caused the strength of rural environment in terms of welfare and income promotion, and gap reduction between city and village, resulting in reduction of migration rate (Shakouri, 2010).

The previous studies show the effect of industrialization on economic growth. For example, a research on

Chinese industries showed how the knowledge and technology industries could improve the economy (Yuhe et al., 2020). Also, it has alignment with sustainable development (Grischa et al., 2020) as it uses local sources. It is irrefutable that the agricultural industries could contribute farming activities as they produce processed goods which may have better value in the market. In other word, processed product could have higher demands in comparison with raw material. In addition, there are disparate methods in order to process the food and agricultural products (Talha et al., 2020), and each method produces specific quality which could affect the marketing. So, it is not as risky as farming is while in the farming many items could be out of control especially when the size of lands is not suitable to consider a modern version of farming.

Obviously, the gap between urban and rural areas in terms of development has led to some adverse consequences in Iran. One of these consequences is the migration of villagers to urban areas which can produce various troubles for urban and rural areas. Immigration from village to the city results in workforce decrease in rural areas, reduction in agricultural products, food dependence, etc.

The researchers have propounded the empowerment of villagers as a way for exiting from rural lack of development. Industrialization of villagers and development of strategic processing industries aims to strengthen ethnic people and facilitation of rural development. Some researchers believe that development of small and average industries bring about the economic development (Helaali, 2008).

Some researchers consider the small institutions as the reason for economic vitality of production system (Feizpour and Reza, 2008). Some believe that small industries lead to stable employment in rural areas (Rostami and Belgheis, 2008). Another researchers view the rural industries as a proper solution for optimal use of facilities and a preventive way of resource wasting (Al-Emran et al., 2011). Quoting from chamber of processing and complementary industries, state that the production rate has been doubled and wastes have been decreased to 50%, despite the agricultural industries (Nouri and Shohreh, 2007). mentions a number of roles played by rural industries in rural development, such as its power in attraction and localization, training managers and entrepreneurs, consolidation of industrial associations, contribution

to facilitation of social and economic development, increase of new job opportunities, improvement of income level and just distribution, producing a part of consumer goods, optimal usage of local resources, and reducing the commodity distribution cost (Darban, 2004).

Development of rural industries is considered by many countries in the world. After the Islamic revolution of Iran, the responsibility of development and support of this type of industries within the framework of domestic industrial policies has been conferred to Ministry of Agriculture Jihad according to article 8 of law of constitution of this ministry; accordingly, the performance of chamber of complementary and processing industries of agricultural department under water, land and industry assistance of Ministry in 2011 showed that 2711 permission of building processing and complementary industries have been issued which had been predicted to create 27128 billion Rials of investment and it created 37208 job vacancies in the country. Moreover, until the end of 2011, 495 production units have been operated with 3747 billion Rials of investment and employing 37208 people; in the same year, 6578 permission of operation have been issued with 24461 billion Rials and 69389 people employed (Jihad, 2019).

According to the 2011 national population and housing census, the population of Tehran province is 12183391 with the average growth rate of 1.44% during 2006-2011. The urbanity rate has been increased from 91.8% in 2006 to 92.8% in 2011. The population growth in urban areas of the province during 2006-2011 has been 1.65%, and the population growth of rural areas in the same time period has had a negative growth rate, 1.1% (Center, 2019).

The numbers above demonstrate the increase of population in Tehran province, especially in urban areas, while the population of rural areas shows a decline. The low employment rate in agriculture section, predominantly in rural areas, and high rate of employment in service section (mostly in urban areas) demonstrates the weakness of rural environment compared to urban locations. Despite the establishment of a considerable number of industries in Tehran province, the rural population is still decreasing and urban population is increasing. This event can bring potential problems for urban areas.

In order to prevent the consequences of villagers' immigration to the cities, the development of agricultural processing industries seems to be an appropriate strategy, since the major potential of rural areas is agricultural activities and developing and creating processing industries not only provides job opportunities and increase income and welfare level of villagers, but also improves the agricultural development. Policymakers and planners have not neglected this significant issue and have had this development under serious consideration, so that in Tehran province, 592 permissions for processing industries have been issued with 6632097 billion Rials of investment, employing 12511 people till the end of 2011. Also, until the end of 2010, 132 agricultural industry units in the province were operating with 1542545 billion Rials of investment and 2781 people employed (Jihad, 2019) Table 1 shows the comparison of number of active processing industries in each of the following categories (farming, garden, animal husbandry and fishery) in the country and in Tehran province:

Table 1: Number of processing industries unit in different agricultural sections in Tehran province and in the country (Jihad, 2019).

Fishery	Livestock and birds	Farming	Gardening	Group
				Region
2	53	47	30	Tehran province
136	1110	2474	1097	Total (country)

As Table 1 depicts, the highest activity rate in the country belongs to the farming group, and to the livestock and birds group in Tehran province. The highest investment among these four groups is for livestock and birds group and the highest employment rate created belongs to the same group. Tables 2 and 3 show the rate of investments and employments in each of four production units in Tehran province and the whole country till the end of 2010 (Jihad, 2019).

Table 2: Investment rate in farming, gardening, livestock and birds, and fishery section in Tehran province and the country till the end of 2010 (Unit: Million Rials) (Jihad, 2019).

Fishery	Livestock and birds	Farming	Gardening	Group
				Region
14476	604749	443156	480164	Tehran province
711742	8868484	6587659	5125013	Total (country)

Despite the magnitude of the industries, rural areas have still numerous problems, such that in 5-year period of 2006-2011, more than 650 immigration cases from villages to the cities have been recorded (Center, 2019). If the development of processing industries takes place considering scientific principles, locating components and available potentials of the area, it will reduce the wastes and transportation costs, as well as preventing waste of energy and resource which eventually lead to employment, income increase and welfare promotion in rural areas. It seems that the necessary potentials for developing agricultural processing industries have not been identified, so the benefits of industry cannot be used to the benefit of rural areas to regulate a proper plan regarding the potential of each region for rural industries. This issue has intensified the immigration rate and weakened the rural environment and its agricultural section. For this purpose, the present research aims at identifying agricultural processing industries and tries to prioritize them for establishment in Tehran province according to experts' opinion and applying their scientific principles. So, this research strives to respond to this question: which criteria and sub-criteria have higher prioritization in locating agricultural industries considering the potentials of Tehran province?

Table 3: Rate of employment in each of four production groups (farming, livestock and birds, gardening and fishery in Tehran province and in the country) (Jihad, 2019).

Fishery	Livestock and birds	Farming	Gardening	Group
				Region
38	1031	994	808	Tehran province
3643	21247	19017	17283	Total (country)

Table 4: Frequency distribution of respondents in agricultural engineering sub-disciplines.

Agricultural machinery	Mechanization	Farming	Soil science	Gardening	Food industry	Education major
1	1	1	1	1	5	Number

In other word, there are many industries in the region but the statistics show the problems in the rural areas and agricultural sector. These problems include migration to the urban areas, unemployment and some other problems. The underlying reason behind this fact is inaccurate establishment and development of industries. So, this research covers the gap and studies the necessary items in this regard in order to

contribute the site selection of agricultural industries. The importance of accurate site selection has made many researchers to study this issue. For instance, Geng used a making decision making framework to achieve a win-win situation in the project of fishing photovoltaic hybrid (Shuai et al., 2020); Also, a research on site selection of car sharing station benefited MCDM model to contribute site selection (Mingwei and Xuc, 2020). Generally, using MCDM and particularly AHP have been a pragmatic way especially when there is an uncertain situation (Guo-Niu et al., 2020), and hence it is used in site selection to obtain weighted items.

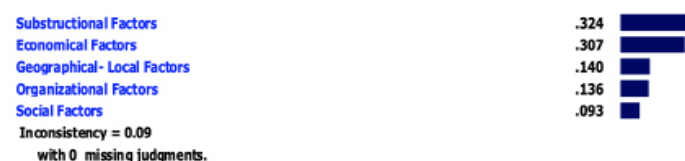


Figure 1: Priority of main criteria for locating agricultural processing industries in Tehran province
Source: secoundery data processing.

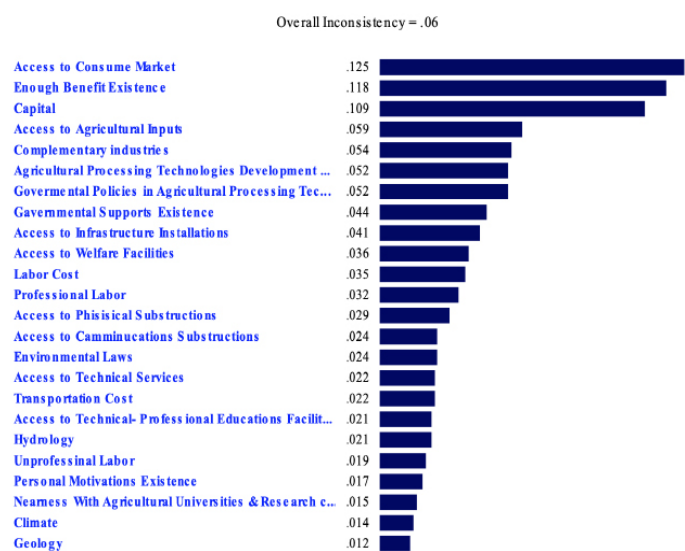


Figure 2: Priority of sub-criteria for locating agricultural processing industries in Tehran province.

Materials and Methods

In this research, analytical hierarchy process (AHP) method was applied for weighting the criteria and sub-criteria of locating agricultural processing industries of Tehran province. This method has been widely using to weigh items practically (Widiatmaka et al., 2015). This method contains main steps including, Making the decision hierarchy tree, Pair comparisons. The measures and factors are being compared in pairs in this step.

Subsequently, the relative weight of factors in each level is calculated from the model hierarchy levels. For this purpose, some methods have been proposed such as: Linear sum, Columnar sum, Mathematical mean, Geometrical sum (same reference), Consistency rate calculation.

Prof. Saaty proved that for consistent reciprocal matrix, the largest Eigen value is equal to the number of comparisons, or $\lambda_{nx} = n$. Then he gave a measure of consistency, called Consistency Index as deviation or degree of consistency using the following formula:

$$CI = \frac{\lambda_{nx} - n}{n - 1} \text{ (SIENA, 2019)}$$

Consistency rate is a mechanism which shows the reliability of obtained prioritizations. For instance, if CR is less than 0.1, the consistency of comparisons is accepted, otherwise the comparison should be performed again (Ma'soum and Aghdas, 2004) and it's calculated through $CR = CI / RI$ (SIENA, 2019)

In this research, all the steps above are taken using Expert Choice software. This software program is designed to analyze the multi-criteria decision making problems by applying AHP technique and is very capable. It provides the possibility of designing hierarchical decision-making graph, formation of pair matrices, fixing the priorities, and calculating the final weight, and it also has the capability of ranking decision-making options (Ma'soum and Aghdas, 2004)

Results and Discussion

It's an inevitable fact that practicing on-farm technologies and other innovations needs peers, scientists, experts and so on (Engler, 2019). The research sample included the experts of Ministry of Agriculture Jihad, experts of Ministry of Industry and Business, and faculty members. The average age of all experts and specialist was 43 years old, indicating sufficient experience for opining and filling the research questionnaire about recognition of area potentials. The minimum and maximum age (50 and 36 years old) was for experts of Ministry of Agriculture Jihad and organization of Industries and Business of Tehran province, and the average age of faculty members was 43 years old.

Record of service average in the field of industry or agricultural processing industries among experts and specialist was 19 years old. The longest record of service was for the experts of Ministry of Agriculture Jihad with 24 years old, and the shortest was for experts in Organization of Industries and Business with 12 years. Also, faculty members who participated in research had an average of 20 years of service in the field of industry.

Among 14 experts and specialists, 8 had bachelor's degree, 3 had Master's degree and 3 had Ph.D.

Also, among 6 experts of Ministry of Agriculture Jihad, 2 had Master's degree and 4 had bachelor's degree. Out of 5 experts of Organization of Industries and Business of Tehran province, 4 had bachelor degree and 1 had Master's degree.

Among 14 respondent experts and specialists, 10 of them had graduated in agricultural engineering sub-disciplines and the rest had graduated in non-agricultural sub-disciplines.

In other agricultural engineering sub-disciplines, 50% of experts and specialists had educated in food industry sub-discipline and the rest had educated in other agricultural sub-disciplines.

In selecting the criteria of analysis and evaluation, the attempt is made to determine the criteria regarding the studied problem and objective. In other words, a set of evaluation criteria is fixed regarding a certain issue, and the number of evaluation criteria is subject to the specification of the problem on which the decision is going to be made. Moreover, a complex of evaluation criteria for a decision-making problem may have been obtained by reviewing the respective literature, analytical and survey studies on individuals' opinions (Malczewski, 2006) Accordingly, 5 main criteria including infrastructural, economic, social, political and geographical factors was determined for locating agricultural processing industries in the present research.

Each of these criteria contains some sub-criteria which were prioritized using questionnaires based on opinions of experts and specialists.

Among the major factors of locating agricultural processing industries in Tehran province, the

economic factors are the most important factors and geographical factors are the least important ones.

Conclusions and Recommendations

According to the bar chart the most crucial item for site selection of agricultural industries in Tehran province is Marketing and having access to market, that's why marketing has effect of sustainability (Pomeroy, 2017). So, being very close to the largest Iranian city-Tehran- could bring new opportunities to improve marketing since main cities are the main logistic market (Raimbault, 2019). And then, capital and benefit are significant to locate industry in the rural areas, and it needs governmental and non-governmental aids to support rural areas which might be in vulnerable or living in poverty.

This research suggests that government can encourage establishing and developing agricultural industries in this province to avoid rural people migrating to urban areas. Also, this research shows that this province is full of risk for investors and craftsmen due to being on the faults and flood places. So, noticing technical advises in the buildings process is vital. Also, it's indispensable to facilitate transportation.

While agricultural sector is the main economic activity of society (Rika, 2015), it's really significant to empower the society in the rural areas and play contributory role to affect both economic issues like productivity and social issues like immigration. This research showed climate and geology are negligible, and have the least weight amongst all criteria, so industrial development can be considered in any place to support agricultural activities. Afterwards, this study suggests following items:

1. While the access to the market has the highest priority, it is inevitable that the industries should be located near the market and on the other hand, roads, railways and so on must be developed in order to streamline transportation.
2. According to experts' ideas, Capital and benefit are paramount items in order to establish and develop industries; so, it is important that both governmental and non-governmental organizations take part and support local people and industries financially. In addition, government could contribute these industries by policies and strategies which have a high weight in the findings.

3. Using technology can optimize the productivity, and it is one of items that can make the industries reasonable economically. So, it is important to provide industries with technologies as a part of supports.
4. Looking on "Complementary Industries" reinforces the notion of industrial strategy which means the regions need several industries which could complete the procedure rather than a huge industry. So, this study focuses on small and medium size industries as a key to regional development.
5. The importance of "facilities" could lead the industries to become industrial states which can affect regional development in the rural areas.
6. While the Labour salary is one the important items according to the findings, the government and NGOs could support local labour financially as they might be vulnerable at beginning of activities.

Acknowledgment

Authors thanks library of the university of Tabriz and Sharif university of technology, academic members at the University of Tehran (Faculty of industrial engineering), Department of Geography at Shahid Beheshti university, Faculty of agriculture at Tarbiat Modares University, Faculty of Agriculture at the University of Tabriz, Ministry of Agriculture (Province of Tehran organization), Ministry of mine, industry and trading (Province of Tehran organization), Tehran provincial government to provide information and nurture this research.

Novelty Statement

Industrial strategies are one the practical ways to support agricultural sector especially when farming activities are not lucrative enough to meet development goals in the rural areas. This research shows the priorities which could be considered to establish and develop industries in order to form correlation and alignment between agricultural and industrial sector to maximize productivity in the agricultural sector, and as a result affect people's livelihood in the rural areas.

Author's Contribution

Ahmad Kiani: Managed literature and questionnaire,

analyzed data and wrote the manuscript.

Shapour Zarifian: Reviewing and nurturing agricultural aspects.

Hosein Kouhestani: Reviewing and nurturing context related to agricultural industries.

Hosein Karimzadeh: Reviewing and nurturing methodology.

References

- Al-Emran, R.M., Habibeh, Babapour, Elnaz. 2011. Industrial branches of new strategies for solving the problems of small industries. *Econ. J. Mon. Econ. Issues Policies*. 5(6): 41-62.
- Center, I.S., 2019. The selected results of national population and housing census in 2011. From Iran statistics center.
- Darban A.A., 2004. Concepts and principles of organizing industries in rural areas. Tehran: Organizations of municipalities and village administrations of the country.
- Engler, G.C.B.L.K.A., 2019. Combinations of bonding, bridging, and linking social capital for farm innovation: How farmers configure different support networks. *J. Rural Stud.*, 69: 53-69. <https://doi.org/10.1016/j.jrurstud.2019.04.004>
- Feizpour, M. and A.K. Reza. 2008. Small and average institutions and effective factors in their economic life in Iran's production industries. Paper presented at the First national conference for developing economic activities, Payam-e-Nour University, Tehran.
- Grischa, B., A.U.S. Niehoffa, M. Reißiga and M. Habichb. 2020. Industry 4.0: How it is defined from a sociotechnical perspective and how much sustainability it includes. A literature review. *J. Cleaner Prod.* 259 (120856). <https://doi.org/10.1016/j.jclepro.2020.120856>
- Guo-Niu, Z., J.H. Hong and L. Ren. 2020. A fuzzy rough number-based AHP-TOPSIS for design concept evaluation under uncertain environments. *Appl. Soft Comput.*, 91(106228). <https://doi.org/10.1016/j.asoc.2020.106228>.
- Helaali, A.S.K.S., 2008. The role of small and average industries in economic development. Paper presented at the First national conference for developing economic activities, Payam-e-Nour University, Tehran.
- Jihad, S.O.M.O.A., 2019. Statistics of agriculture from ministry of agriculture Jihad. The

- economic planning and assistance, The chamber of statistics and information technology.
- Ma'soum, Z. and H.T.Z. Aghdas. 2004. Ranking industrial production of the country using AHP method. *Commerce Res. J.*, 30: 69-83.
- Malczewski, Y., 2006. Geographical information system and analysis of multi-criteria decision making. Tehran: Samt publication.
- Mingwei, L. and C.H.Z. Xuc. 2020. MULTIMOORA based MCDM model for site selection of car sharing station under picture fuzzy environment. *Sustainable Cities Soc.*, 53 (101873). <https://doi.org/10.1016/j.scs.2019.101873>
- Nouri, H.N.T. and Shohreh. 2007. Prioritizing the development of processing and complementary industries of agriculture section using Delphi method in Falavarjan city of Isfahan province. *Geogr. Res. Projects.* (61): 161-177.
- Pomeroy, A., 2017. Marketing for sustainability: Extending the conceptualisation of the marketing mix to drive value for individuals and society at large. *Australas. Mark. J. (AMJ)*, 25(2): 157-165. <https://doi.org/10.1016/j.ausmj.2017.04.011>
- Raimbault, N., 2019. From regional planning to port regionalization and urban logistics. The inland port and the governance of logistics development in the Paris region. *J. Transp. Geogr.* 78: 205-213. <https://doi.org/10.1016/j.jtrangeo.2019.06.005>
- Rika, H.B.S.A.E.N., 2015. Geographic information system-based spatial analysis of agricultural land suitability in Yogyakarta. *Indones. J. Geogr.*, 47(2): 171-179. <https://doi.org/10.22146/ijg.9260>
- Rostami, Y.M. and Belgheis. 2008. Stable employment in villages with focus on development of small industries. Paper presented at the First national conference for developing economic activities, Tehran.
- Shakouri, A., 2010. Policies of agricultural development in Iran. Tehran Samt Publication.
- Shuai, G., L.L.L. Zhanga, X. Liua and Z. Huangc. 2020. Site selection framework of fishing photovoltaic hybrid project under interval-valued intuitionistic fuzzy environment. *J. Cleaner Prod.*, 252(119774). <https://doi.org/10.1016/j.jclepro.2019.119774>
- Siena. 2019. Analytic hierarchy process (What is AHP). Department of mathematics.
- Talha, A., T.B.L. Sudipta, R. Rana, M. Aadilc, A. Yanxun, X. Luo and Zishengade. 2020. Utilization of wastewater from edible oil industry, turning waste into valuable products: A review. *Trends Food Sci. Technol.*, 99: 21-33. <https://doi.org/10.1016/j.tifs.2020.02.017>
- Widiatmaka, W.A., Y. Setiawan, M.Y.J. Purwanto, Taryono and H. Effendi. 2015. Land Use Planning for Brackish Water Shrimp Ponds in The North Coast of Tuban, Indonesia. *Indones. J. Geogr.*, 47(2): 194 - 211. <https://doi.org/10.22146/ijg.9268>
- Yuhe, W., G.Y.Y. Zhang, P. Muc and H. Wangd. 2020. Is the Chinese construction industry moving towards a knowledge- and technology-intensive industry? *J. Cleaner Prod.*, 259(120964). <https://doi.org/10.1016/j.jclepro.2020.120964>