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Investigation of the Productivity of Networking Activities and Improvement Projects on the Sales and Employment of Iranian Agricultural Clusters

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Abstract

One of the effective strategies for economic development of clusters is the conduct of networking activities by cluster members. Indeed, the majority of cluster members are micro and small enterprises, so, should attempt to overcome their inherent constraints and influence the market through networking activities. In addition, these enterprises lack an intra-firm research and development unit due to their limited financial and knowledge resources. Therefore, the execution of improvement projects by the BDSs situated in clusters plays an undeniable role in the development of clusters. Given the important role of networking activities and improvement projects in the economic development of industrial clusters, this study aims to investigate the efficiency of Iranian agricultural clusters in using these two important input factors, namely networking activities and improvement projects. In this regard, the final outputs, including the total sales and employment rates will be examined so that some strategies and guidelines can be offered to policy makers for the development of these clusters. DEA has been used to evaluate the effectiveness of networking activities and improvement projects in the performance of the six Iranian agricultural clusters under study. Based on the results obtained from the analyses, some solutions were suggested to promote the effectiveness of networking activities and improvement projects.

Keywords: Agricultural Clusters, Networking Activities, Improvement Projects, Iran.
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1. Introduction

1.1 Problem Statement

At present, development strategy of industrial cluster is one of the

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economic development strategies in developing countries regarding support for micro, small, and medium enterprises (Sonobe & Ōtsuka, 2006). Micro, small, and medium enterprises constitute the majority of cluster members. These enterprises suffer from several constraints in terms of marketing, finance, and knowledge aspects (Biswas, Roy, & Seshagiri, 2007). Therefore, the emphasis in development policies should be placed on the increase of competitive capabilities of cluster members via the conduct of networking activities by the networks shaped within the cluster as well as the fulfilment of improvement projects by business development services providers (BDSP) (Fischer & Reuber, 2003; Guerrieri & Pietrobelli, 2004).

Micro and small enterprises have many advantages, such as innovation, employment, and flexibility over large enterprises (O'Dwyer, Gilmore, & Carson, 2009). On the other hand, the small size and limited resources of these enterprises lead to the incidence of some constraints, including financial, marketing, production, research and development, and so on (Man, Lau, & Chan, 2002). Networking and joint activities by cluster members are among the solutions, which make it possible to overcome the constraints of micro and small enterprises (Pitelis & Pseiridis, 2006). The other remedy to overcome the constraints of these enterprises is to use development and consulting services of BDSPs. The members of cluster can purchase the items pertaining to their technical needs, including research and development, training, marketing, and engineering ones from the BDSPs existing in the cluster (Sievers & Vandenberg, 2007). Therefore, the present study mainly attempts to examine the productivity of networking activities and improvement projects in the sales and employment of Iranian agricultural clusters.

1.2 Industrial Clusters

A set of the enterprises that have been deployed in a geographical area and offer similar products and services is referred to as industrial clusters (Romanelli & Khessina, 2005). These enterprises complement each other’s activities through marketing and non-marketing transactions of product, information, and staff (Rabellotti, 1995). Thus, they encounter common challenges and opportunities (Felzensztein, Gimmon, & Aqueveque, 2012). The members of cluster have many

advantages since they are placed in the same geographical location and do activity in the same business (Breschi & Malerba, 2005). The geographical proximity of cluster members causes they have access to technical inputs, including parts, machinery and business development services (such as financial, insurance, marketing, legal, education, and counseling services) more easily and less costly (Bathelt, Malmberg & Maskell, 2004). Geographic proximity also leads to the overflow of knowledge and facilitation of "innovation" in the clusters (Audretsch & Feldman, 2004). Knowledge overflows and tacit knowledge sharing among cluster members, local networks of innovators, and research institutions certainly play an important role in the promotion of innovation within clusters (Asheim & Isaksen, 2002).

In case of appropriate organization, the cluster members will benefit from many other advantages such as the opportunity to conduct networking activities and accessibility to the results of improvement projects in addition to the co-location advantages (such as the existence of a proper group of skilled workers, facilitation of the flow of information, and knowledge overflow) (Vom Hofe & Chen, 2006). These benefits and advantages lead to the cost reduction and promotion of the competitiveness of the cluster members (Albaladejo, 2001).

Industrial clusters are good grounds for collaboration and networking activities among the cluster members. The existing commonalities in the cluster lead to inter-firm interactions and trust-building, which provide the basis for collective efficiency through networking and joint activities (Walker, Kogut, & Shan, 1997). In other words, there are backgrounds for the conduct of networking activities between the members of cluster. To name some of these activities, one may refer to joint procurement, use of joint distribution networks, technological communications, joint research, joint training, collective standardization programs, joint market studies, purchase of joint technology as well as the use of shared labor market (Karlsson, 2010).

In fact, the particular organizational structure of a cluster is its strength through which interfirm networks are formed based on the principles of collaboration and competition. Then, through specialization, each unit takes the responsibility of some part of the

production or distribution process along with its pertaining role in innovation and, thereby, exerts influences on other parts (Lin, Tung, & Huang, 2006). The success of the enterprises existing in clusters depends upon the performance of the enterprise and other members of cluster. Overall, the fundamental characteristic of industrial clusters is the interdependence of the enterprises and their contribution in the benefits and advantages. Moreover, the success of enterprises results from joint activities for the resolution of collective problems while there is competition (Lechner & Dowling, 2003).

1.3 Networking Activities as the Cluster Development Strategy

Despite the key role of micro and small enterprises in economic development and job creation, one of the biggest problems of these businesses is their legendary failure rate (O'Dwyer et al., 2009). The constraints of micro and small enterprises, including shortage of financial resources, lack of time, lack of market information, and marketing expertise are the main reasons for the failure of these enterprises (Nwankwo & Gbadamosi, 2010). In most cases, micro and small enterprises cannot grab market opportunities individually, because this needs large-scale production, standard quality products at reasonable prices, continuous supply, and after-sales service (Belleflamme, Picard, & Thisse, 2000).

In addition, micro and small enterprises face numerous serious problems in terms of the achievement of the economies of the scale in buying inputs such as equipment and raw materials, financial credit, consultancy services, etc. The small size of these enterprises is a major obstacle in internalizing functions such as training, marketing, R&D, technical support, and innovation (Ceglie & Dini, 1999). In recent years, networking activities and collaboration based on competition have become increasingly popular for greater compatibility of micro and small enterprises with environmental requirements as well as the improvement of their competitiveness (Zain & Ng, 2006). Micro and small enterprises can access the resources and skills that are owned by other firms through partnerships with the enterprises with complementary competencies or assets. Therefore, networking activities provide micro and small enterprises with some opportunities for mutual synergy and learning

(Drees & Heugens, 2013).

Networking and joint activities are among the solutions that can remove the constraints of micro and small enterprises and facilitate the access to market information for these enterprises (McGrath, 2008). Networking greatly helps firm managers understand complex markets (lkkonen, Tikkanen, & Alajoutsijärvi, 2000). Access to information, resources, markets and technologies is the main motivation for networking activities and collaboration in clusters (Gulati, Nohria, & Zaheer, 2006). In fact, networking activities have non-financial benefits such as facilitating access to shared information and learn from the experience of others in addition to financial benefits (Dennis, 2000). Buttery & Buttery (1994) define a network as "two or more enterprises that become involved with relations for some mutual benefits that keep together all participants as separate companies". The networks in which three or more enterprises join together for common production, shared marketing, joint purchase or participation in development of new products are defined as hard networks. However, soft networks include information sharing or acquisition of new skills (Jones & Tilley, 2007). According to Reamer (1997), the existence of domain interference is required for the success of networks. Product or service similarities, customers' similarities, operation method similarities and co-location reflect the opportunities that usually occur within domain interference. In the context of industrial clusters, there is the chance for the occurrence of domain interference (Karlsson, Johansson, & Stough, 2005). Therefore, there is a higher possibility of the success of networking activities in the field of industrial clusters.

One of the most important causes of undeveloped clusters is low levels of social capital and, consequently, lack of networking activities among cluster members (Rutten & Boekema, 2007). The members of undeveloped cluster have become entangled in a vicious circle of fragile competition due to low levels of social capital. To improve business and enhance competitive advantage, cluster stakeholders (entrepreneurs, policy makers, business services providers, political representatives, etc.) must learn to take responsibility of the conduct of networking activities and increase social capital in the cluster (Ketels, 2003). Networking activities encourage cluster members to

learn from each other, exchange ideas, improve the quality of their products, identify the markets with higher profitability, and penetrate into such markets. In fact, forming network at the strategic level and the maintaining relative independence at the operational level is the best approach for cluster members (Lin & Zhang, 2005).

1.4 Improvement Projects Done by BDSPs

One of the reasons for low productivity of micro and small enterprises is poor management practices, because in the majority of micro and small enterprises, company owners takes responsibility of management affairs, which don't have sufficient managerial skills (Fletcher, 2000). Since small enterprises are generally established by individual entrepreneurs who often lack technical and specific managerial skills, these enterprises need specialized services, such as technical-engineering, management, finance, marketing, training services, etc., in order to develop their business needs (Mazanai & Fatoki, 2011).

The other key difference between small and large enterprises is that one person or a very small team is responsible for all functions in many small enterprises (Abor & Quartey, 2010). This simple structure has made coordination in these enterprises very easy due to continuous face-to-face interactions and abundant communication opportunities between management and team members (Renuka & Venkateshwara, 2006). However, as far as micro and small enterprises lack skilled managers and technical experts, many functions are managed poorly and, thereby; these enterprises need to receive business development services from outside the enterprise (Buratti & Penco, 2001).

Business development services are mostly applied to micro, small, and medium businesses so that their competitive ability can increase in comparison with large-scale industries (Mawardi, Choi, & Perera, 2011). Business development services include all the services from the establishment of the enterprise to sustain and expand the enterprise. Of course, these services along with the providing process of these services are variable in line with business conditions (Fischer, Gebauer, & Fleisch, 2012).

Firms which provide business development service are named

Business development service providers (BDSPs). BDSPs are mostly experts with academic degree, which have sufficient experience in different business areas (Najib & Kiminami, 2011). BDSPs, according to their expertise, provide commercial services to SME, services such as training, consulting, marketing, information, transformation and development of technology, and promotion of commercial communications, etc. This means that, BDSPs provide both (Pietrobelli & Rabellotti, 2007):

1. Strategic services (medium and long-term issues that will improve business performance) and
2. Operational services (daily issues of businesses)

In fact, business development services are the non-financial services that are proposed to entrepreneurs at different development stages of their business. These services are primarily aimed at transferring skills or providing business advice (Goldmark, 1996). Business development services are of high importance to micro and small businesses because these services help entrepreneurs accomplish their business much more effectively. In other words, if these businesses are properly implemented, access of micro and small enterprises to financial resources will be facilitated (Brijlal, 2008).

In general, provision of business development services (BDS) to micro, small, and medium enterprises is aimed at improving performance, having access to market, and enhancing the competitiveness of these enterprises. These services influence the structural characteristics of SMEs and make them more competitive than ever. Therefore, the role and importance of BDSs in the qualitative and quantitative development of micro, small and medium-sized enterprises are inevitably well known across the world. Moreover, BDSs recently have attracted more attention of policy makers in order to develop SMEs (Gibson, 2000). The most important reasons that convince micro and small enterprises to purchase BDSs from the outside are as follows (Pietrobelli & Rabellotti, 2007):

- *Cost Factors*: This reason is at play when the recruitment of experts for the conduct of affairs cost the enterprise more than the situation in which services are bought from the outside. This factor is of more urgency and importance, especially to the micro and small enterprises that occasionally need these services and

lack the financial resources necessary to hire experts.

- *Technological Factors*: When the enterprise cannot take steps with these developments because of the extremely rapid changes in technology and the lack of updated knowledge, technical-engineering services should be necessarily purchased from the outside. This factor is more obvious in micro and small enterprises where there is no research and development unit.

1.5 Conceptual Model

As mentioned above, most of cluster firms are micro and small, so they suffer from several inherent constraints (Abor & Quartey, 2010). Several studies suggest that networking activity and business development service could employ to overcome constraints of cluster firms (Nishimura & Okamuro, 2011; XIE & LIU, 2007; Keeble & Nachum, 2002). So, networking activities and improvements projects by BDSP are the main inputs in most of cluster development program (Zimmer et al., 2014). In result of these actions, productivity and product quality of cluster firms will improve, overall cost of operation cluster firms will reduce, and cluster firms can enter new markets; Which ultimately increases sales and employment cluster (Yeung, 2008; Beckeman & Skjöldebrand, 2007).

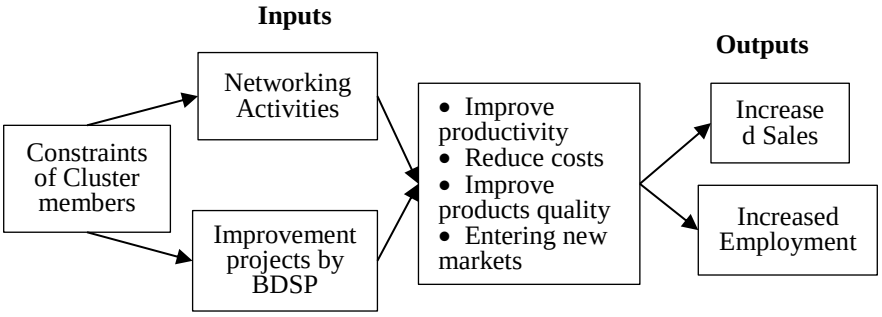

Figure 1: Conceptual Model of Research

2. Methodology

2.1 Problem Definition

In each cluster of agricultural products in this research, the following

factors have been investigated.

a) Input factors: Input factors refer to the enabling factors that underlie the improvement of operational capabilities of the cluster to provide high-quality products. The input factors considered in this research include:

- The number of networking activities conducted in the cluster (by business networks)
- The number of improvement projects (provided by BDSPs)

b) Output factors: Output factors refer to the performance and operational outputs expected from the effective activities of each agricultural cluster. The output factors considered in this study include:

- Total sales of the cluster
- The employment rate

The data needed for this study have been collected from the datasets of business clusters in Iran Small Industries and Industrial Parks Organization (ISIPO). Profiles of the agricultural clusters under study are presented in the following table (Table 1).

Table 1: Profiles of the Agricultural Clusters under Study

Cluster Index (DMU)	City	Product
C1	Oromiyeh	Fruit
C2	Mashhad	Saffron
C3	Ahwaz	Date
C4	Bam	Date
C5	Rudbar	Olive
C6	Rasht	Rice

2.2 DEA Model

In this research, each cluster has been considered as a decision-making unit (DMU). Data Envelopment Analysis (DEA) technique has been used to analyze clusters efficiency in converting inputs, (i.e., networking activities and improvement projects) into outputs (i.e., Total sales and employment rate). Without determining any specific assumptions regarding the production function, DEA technique solves the mathematical models for decision-making units and estimates the production function or cost function in the form of a fragment envelope using the data pertaining to the actual outputs and inputs of these units (Wöber, 2007). So, in this research, the relative efficiency

of clusters in comparison with other clusters has been calculated by using DEA technique. In fact, in DEA technique, inefficient cluster has not been assessed as inefficient since it is compared with a standard predetermined level or with a certain function from; whereas, the assessment criteria are determined by other clusters that act in the same conditions and this is a symbol of the realistic assuagement of data envelopment analysis compared with other methods (Ji, & Lee, 2010). The following equation is sued to measure the efficiency of a cluster (DMU).

$$Efficiency_j = \frac{\mu_1 y_{1j} + \mu_2 y_{2j} + \cdots + \mu_s y_{sj}}{\vartheta_1 x_{1j} + \vartheta_2 x_{2j} + \cdots + \vartheta_m x_{mj}} \quad (2\text{-}1)$$

where

μ_{ir} : The weight given to the rth output

y_{irj} : The value of output in the jth cluster

ϑ_i : The weight given to the ith input

x_{ij} : The value of ith input in the jth cluster

In calculating the efficiency, different weights are assigned to the inputs and outputs since inputs and outputs do not hold the same value. On this way, the degree of importance and priority of the inputs and outputs are determined. Accordingly, efficiency is defined as the ratio of the sum of weighted outputs to the sum of weighted inputs. However, if it is possible to obtain this ratio for each cluster in comparison with other clusters, one can compare these clusters in terms of efficiency and differentiate efficient cluster from inefficient ones. Then, the efficiency increase of those inefficient clusters can be put on the agenda. Charnes and colleagues (1978) first introduced the above method, namely data envelopment analysis. The model proposed by them is also known as CCR model. The relative model of CCR is defined as follows.

$$Max\ h_0 = \frac{\sum_r \mu_r y_{r0}}{\sum_i \vartheta_i x_{i0}} \quad (2\text{-}2)$$

In equation (2-2), μ_r and ϑ_i are decision variables and their coefficients are x_{io} and y_{ro}, respectively. Finally, the fractional programming model for performance assessment of clusters is written as follows.

$$
\begin{aligned}
&Max\ h_0 = \frac{\sum_{r=1}^{s} \mu_r y_{r0}}{\sum_{i=1}^{m} \vartheta_i x_{i0}} \\
&S.t.\ \ \frac{\sum_{r=1}^{s} \mu_r y_{rj}}{\sum_{i=1}^{m} \vartheta_i x_{ij}} \leq 1 \quad j = 1,2,\dots,n \\
&\qquad \mu_r, \vartheta_i \geq 0 \quad \forall r, i
\end{aligned}
\tag{2-3}
$$

The fractional programming model (non-linear) number (2-3) is converted to the following linear programming model by adding constraint $\sum_{i=1}^{m} \vartheta_i x_{i0} = 1$

$$
\begin{aligned}
&Max \sum_{r=1}^{s} \mu_r y_{r0} \\
&S.t. \sum_{r=1}^{s} \mu_r y_{rj} - \sum_{i=1}^{m} \vartheta_i x_{ij} \leq 0 \quad j = 1,2,\dots,n \\
&\qquad \sum_{i=1}^{m} \vartheta_i x_{i0} = 1 \\
&\qquad \mu_r, \vartheta_i \geq 0 \quad \forall r, i
\end{aligned}
\tag{2-4}
$$

In this research, as mentioned before, each cluster has been considered as a DMU. Clusters use networking activities and improvement projects, as the inputs, to increase total sales and employment rate, as the Outputs. Since, in DEA model, one of the constraint functions is the sum of weighted inputs equals to 1, so, the goal function is maximization of outputs. Therefore, equations of DEA model are as follow:

$$Max\ (\mu_1 Total\ Sales_j + \mu_2 Employment\ rate_j)$$

DMU= Cluster and i= 1, 2, ..,6

Constraints are:

$$\left(\mu_1 Total\ Sales_j + \mu_2 Employment\ rate_j\right) - \left(\vartheta_1 Networking\ Activities_j + \vartheta_2 Improvement\ Projects_j\right) \leq 0$$

$$\left(\vartheta_1 Networking\ Activities_j + \vartheta_2 Improvement\ Projects_j\right) = 1$$

$$\mu_r, \vartheta_i \geq 0 \quad \forall r, i$$

DEA output is efficiency indicators (IE) for each cluster. Efficiency indicators show relative efficiency of clusters. Each cluster that has higher IE, is more efficient than other clusters; it means that, this cluster uses inputs in more efficient way to produce outputs compared with other

clusters. It is worth noting that, the amount of IE is between 0 and 1.

3. Results and Discussion

3.1 Analysis of Agricultural Clusters in Terms of Output Parameters

At first, agricultural clusters are analyzed at the same time in terms of the two output factors "total sales" and "employment rate". It is noteworthy that input factors include “the number of networking activities conducted in the cluster” and “the number of improvement projects”. As a result of using DEA model, the efficiency indicators (IE) of each of the clusters have been calculated and compared together in terms of the efficiency of the usage of inputs to provide the aforementioned outputs, as shown in the table below (Table 2).

Table 2: Efficiency Indicators of Clusters in Terms of Input and Output Parameters

Cluster Index (DMU)	City	Product	EI
C1	Oromiyeh	Fruit	1
C2	Mashhad	Saffron	1
C3	Ahwaz	Date	1
C4	Bam	Date	0.53
C5	Rudbar	Olive	0.02
C6	Rasht	Rice	1

The above table shows that the networking activities undertaken by the formed networks inside the cluster and the improvement projects performed by BDSPs in four clusters of C_1, C_2, C_3, and C_6 have had the greatest impact on sales and employment rate of these cluster units. This is so because the efficiency indicators of these four clusters equal to the maximum score, i.e. one. Regarding how the inputs (i.e. networking activities and improvement projects) affect the outputs of these superior clusters, it is possible to refer to the actions undertaken in Mashhad Saffron cluster (C_2). In this cluster, several networks have been established in the field of marketing, particularly export consortiums. Accordingly, numerous successful networking activities have been done by members of these networks such as identifying markets, marketing, and exporting of saffron to all over the world. For example, one of the export consortiums of saffron cluster has chosen Southeast and East Asian countries as its target market. In addition to studying the consumer market of saffron in these countries, this consortium has signed joint sales contracts with the businesspersons of

these countries by setting up shared booths at food exhibitions. Moreover, in this cluster, several BDSPs are active in technical engineering and marketing fields and have succeeded in accomplishing improvement projects. To name one of these improvement projects, one can refer to the construction of industrial machine of saffron drying. The usage of such machines rather than traditional methods of saffron drying enhance the color and flavor of saffron.

The lowest efficiency scores among the six agricultural clusters under study belonged to Rudbar olive cluster (equal to .02). This indicates that networking activities and improvement projects (as the inputs) have not exerted an acceptable impact on the sales and employment rates (as the outputs) in this cluster. Hence, the enhancement of the effectiveness of networking activities and improvement projects should be considered in development policies of this cluster. The notable point here is the difference between the performance of Ahwaz date cluster and that of Bam date cluster in such a way that efficiency indicators of Ahwaz date cluster and Bam date cluster equal 1 and .53, respectively. In other words, networking activities and improvement projects in Ahwaz date cluster are much more effective than those of Bam date cluster. Another point prominently observed in the above table reflects the availability of a significant difference between the efficiency indicators of the four efficient clusters (efficiency indicators equal to 1) and the second ranked cluster (Bam date cluster (C_4) with an efficiency indicator equal to .53).

3.2 Analysis of Agricultural Clusters in Terms of Total Sales (an Output Factor)

In this section, the input and output factors are as follows:

- Output factors: total sales
- Input factors: “the number of networking activities conducted in the cluster” and “the number of improvement projects”

As a result of using DEA model, the efficiency indicators have been calculated in terms of the efficiency of the usage of inputs, as presented in the table below (table 3).

Table 3: Efficiency Indicators of Clusters in Terms of Total Sales

Cluster Index (DMU)	City	Product	EI
C1	Oromiyeh	Fruit	1
C2	Mashhad	Saffron	1
C3	Ahwaz	Date	0.25
C4	Bam	Date	0.51
C5	Rudbar	Olive	0.02
C6	Rasht	Rice	1

The calculations presented in the above table show that the three clusters C_1, C_2, and C_6 have taken up the maximum efficiency indicator of one. This means that the networking activities conducted by the active networks in these clusters and improvement projects conducted by BDSPs in Urmia fruit cluster (C_1), Mashhad Saffron cluster (C_2), and Rasht rice cluster (C_6) have been successful in the increase of sales. In this analysis wherein total sales of the cluster have been considered as the output factor, Rasht Olive cluster (C_5) has taken up the lowest EI (0.02). In the previous analysis wherein the two factors, namely the total sales and employment rates of the units in the cluster have been considered as output, Rasht Olive cluster has obtained the lowest efficiency score. The important point seen in the above table is that, when only cluster's total sales has been considered as the output factor, Bam date cluster (C_4) has gained a higher efficiency score than Ahwaz date cluster (C_5). This is so while Ahwaz date cluster has received a higher efficiency score in the previous analysis where sales and employment had been considered as output factors.

Table 4: Efficiency Indicators of Clusters in Terms of Employment Rate

Cluster Index (DMU)	City	Product	EI
C1	Oromiyeh	Fruit	0.65
C2	Mashhad	Saffron	0.01
C3	Ahwaz	Date	1
C4	Bam	Date	0.08
C5	Rudbar	Olive	0.02
C6	Rasht	Rice	0.1

3.3 Analysis of Agricultural Clusters in Terms of Employment Rate (An Output Factor)

In this section, the input and output factors are as follows:

- Output factors: "the employment rate"
- Input factors: "the number of networking activities conducted in the cluster" and "the number of improvement projects"

As a result of using DEA model, EIs have been compared with each other and calculated in terms of the usage of the above inputs.

The above table shows that Ahwaz date cluster (C_3) has obtained the maximum EI in terms of the optimal use of input factors for providing the output factor of employment. The effectiveness of networking activities and improvement projects (input factors) in the employment (output factor) of agricultural clusters is divided into three separated general categories as follows:

1. Ahwaz date cluster (C_3) with the EI equal to 1
2. Urmia fruit cluster (C_1) with the EI equal to .65
3. Rasht rice cluster (C_6), Bam date cluster (C_4), Rasht olive cluster (C_5), and Mashhad saffron cluster (C_2) with the EIs equal to .1, .08, .02, and .01, respectively.

The notable point here is the very high difference of the efficiency score in Ahwaz date cluster (C_3) between the condition in which employment has been considered as the output factor and the condition in which total sales has been considered as the output factor. In the former situation, the EI of Ahwaz date cluster is equal to one while it is equal to .25 in the latter state. These statistics show that networking activities and improvement projects have acted much more efficiently in Ahwaz date cluster than other clusters. The reason for the high efficiency of Ahwaz date cluster in job creation is that many farmers traditionally process, pack, and supply their products to the market. However, industrial and workshop units in other clusters mainly fulfill the processing of agricultural products. Due to the high unemployment rate in the geographical area of Ahwaz date cluster, high rates of employment and job creation in this cluster is desired output. However, despite traditional processing of agricultural products has led to an increase in employment, but it has had a negative effect on the productivity of the whole cluster.

3.4 Analysis of Agricultural Clusters in Terms of "The Number of Networking Activities Conducted in the Cluster" (an Input Factor)

In this section, the performance of agricultural factors is analyzed in terms of input and output factors as follows:

- Input factors: "the number of networking activities conducted in the cluster"

- Output factors: “total sales” and “employment rate”

The EIs pertaining to agricultural clusters are presented in the following table.

Table 5: Efficiency Indicators of Clusters in Terms of the Number of Networking Activities Conducted in the Cluster

Cluster Index (DMU)	City	Product	EI
C1	Oromiyeh	Fruit	1
C2	Mashhad	Saffron	0.47
C3	Ahwaz	Date	1
C4	Bam	Date	0.04
C5	Rudbar	Olive	0.02
C6	Rasht	Rice	1

The table above shows three Urmia fruit cluster (C_1), Ahwaz date cluster (C_3), and Rasht rice cluster (C_6) have obtained the maximum EI equal to one. In other words, the networking activities conducted by the active networks in these three clusters have had the highest efficiency in terms of effectiveness in sales and employment. For example, the members of Rasht rice cluster have undertaken many successful networking activities in order to solve the main problems of cluster. To name some of these activities, one can refer to the following: setting up a common reference laboratory for controlling quality and hygienic processing of rice, participating in national and international exhibitions in order to develop the market and reduce the negative competition (Price war), creating a common brand, and modernization of processing lines to reduce waste in rice processing stage (reduction of broken rice). Mashhad Saffron cluster (C_2) with an efficiency score of .47 is placed in the second ranked while Bam date cluster and Rasht olive cluster with efficiency scores of .04 and .02 are placed in the next ranks.

3.5 Analysis of Agricultural Clusters in Terms of "the Number of Improvement Projects" (An Input Factor)

In this part of the study, the performance of agricultural clusters is analyzed in terms of the following input and output factors:

- Input factors: "the number of improvement projects”
- Output factors: "total sales" and "employment rate"

Efficiency indicator of agricultural clusters is shown in the table below (Table6).

Table 6: Efficiency Indicators of Clusters in Terms of Improvement Projects

Cluster Index (DMU)	City	Product	EI
C1	Oromiyeh	Fruit	1
C2	Mashhad	Saffron	1
C3	Ahwaz	Date	1
C4	Bam	Date	0.53
C5	Rudbar	Olive	0.01
C6	Rasht	Rice	0.32

According to the calculations presented in the above table, three clusters of Urmia fruit (C_1), Mashhad saffron (C_2), and Ahwaz date (C_3) have optimally benefited from improvement projects towards an increase in sales and employment rate. In other words, these three clusters have achieved maximum efficiency score of one. Rudbar olive cluster (C_5) has the lowest IE from the business perspective, which shows that improvement projects are not optimally used in this cluster for enhancing the output performance of the cluster. The reason for it may be attributable to the traditional operation of processing units in this cluster in that a large volume of the produced olive in the cluster are processed and supplied to the market in completely traditional units.

In contrast, Urmia fruit cluster has shown quite remarkable performance in the optimal use of improvement projects. Project of designing and developing new technology is one of the most important improvement projects that has been conducted by the active BDSPs deployed in clusters. Indeed, the majority of the enterprises operating in agricultural clusters lack the research and development unit due to financial and knowledge constraints; therefore, they cannot design, develop, and apply new technologies. For example, one of the most important problems of Urmia fruit cluster was some issues in fruit processing technology. In fact, flavor of fruit products (mostly juice) was deteriorated since the pasteurization system was old and there was no appropriate packaging. Therefore, the shelf life of juice would decline or preservatives would be used which reduced marketability. Several improvement projects have been operationalized by BDSPs to tackle these problems. The most important projects of this type are the usage of nanotechnology in packaging to extend the shelf life of juice as well as the design and manufacturing of plate pasteurization devices in order to preserve flavor and juice nutrients.

4. Suggestions for Improvement

The ability of cluster members is upgraded through networking activities; therefore, cluster member could solve the common problems by networking and provide the conditions for the sustainable development of the cluster without the need for external support and with dependence on their collective strength. Several studies have also emphasized the importance of networking activities in the development of clusters (He & Rayman-Bacchus, 2010; Kajikawa, Takeda, Sakata, & Matsushima, 2010). Most of agricultural cluster members are micro and small and cannot afford buying modern technologies of agricultural product processing due to lack of financial resources. So, due to old technology, quality of their final products and also value added of the processing stage decreases. One of the strategies to overcome this problem is to set up common facilities for the processing of agricultural products.

For example, several traditional units of processing and packaging of date clusters have established joint mechanized washing and packing centers of date by forming some networks and through the receipt of financial support from government agencies. With the establishment of these mechanized packaging centers, the traditional date processing units could obtain required health licenses to enter larger domestic and international markets. Another problem faced by micro and small members of agricultural clusters is the negative competition and price war as a result of limited markets. The solution to this issue is the cooperation of cluster members and establishment of market development networks. In this way, the market is developed and, thereby, negative market competition declines among cluster members and the conditions for collaboration are provided. For example, market of members of Rudbar olive cluster was limited to local markets. The small size of the market had caused cluster members continuously reduce price and supply their products at a lower price than competitors' one. This negative competition over prices caused the overall profitability of all cluster members to be undermined and cluster business to be at risk. Under the supervision and leadership of Iran Small Industries and Industrial Parks Organization (ISIPO), market development networks were formed in Rudbar olive cluster and cluster members supplied their products in national markets through participation in commercial exhibitions.

The other reasons for poor performance and low value added of agricultural cluster members are the lack of knowledge about markets, customer preferences, as well as their unknown brands. Given the weakness of the cluster members in the field of marketing, the use of marketing and market study services by the BDSs specialized in marketing is the solution to this problem. In this way, the benefits and costs of these services are shared between units. For instance, some saffron processing units signed a contract with a marketing BDSp and passed the marketing and market study affairs to this BDS.

Also, Units of agricultural clusters can follow the strategy of common brand to overcome the weaknesses of their branding. In this way, they can enhance their position in target markets by joint investment on this common brand. In this regard, several date-processing units could gain a good market share in national markets with the establishment of a common brand, named "Surna". However, for success of common brand it is required that necessary standards are established and product quality inspection over the units under the common brand is done routinely.

The findings of the current study are useful to managers of the cluster members and policy makers. Networking activities will provide the possibility for enterprises to take advantage of new market opportunities, obtain market information, learn from the experience of others, and benefit from the synergistic effects of the common resources. Managers of micro and small enterprises can use networking to improve their competitiveness (Felzensztein & Gimmon, 2007). In fact, managers and directors of enterprises can expand their networking capabilities and use this skill as a means of business development. The results of this study also highlight the importance of hard networks, especially trade unions in meeting the needs of micro and small businesses.

Formal and informal social networks are also considered as a means to achieve higher levels of networking activities and collaboration between cluster members. Hence, governmental organizations should support the formation and development of associations and trade unions as well as social networking. The availability of multiple communication channels between cluster members facilitates the conduct of new networking activities. Therefore, commercial events like trade exhibitions,

conferences, seminars, forums, and trade unions provide more opportunities for interaction between clusters activists and facilitate the conditions for doing networking activities.

5. Conclusion

The main problems of industrial clusters members are Poor skills of the labor, weakness in processing technology, market study, branding, and limited local markets. Due to financial, marketing, and human resources constraints, the resolution of these problems entails the networking activities of cluster members and implementation of improvement projects by the BDSPs. In fact, the networking activities and improvement projects provide necessary conditions for development of agricultural clusters. Given the importance of these two input factors, the main purpose of this study was to analyze the effectiveness of networking activities and improvement projects in the realization of performance measures of sales and employment rates (as factors output) in Iranian agricultural clusters.

In this research, DEA technique has been used in three different states in order to provide a comprehensive analysis. In each of the three states, performance of the clusters has been compared together and efficient and non-efficient clusters have been determined. In the first state of the analysis, all the inputs (the number of networking activities and improvement projects) and all the outputs (total sales and employment rates) have entered DEA model to evaluate the efficiency of clusters. In the second state of DEA, cluster efficiencies regarding the realization of performance outputs have been analyzed. In the third state, cluster efficiencies were analyzed using DEA model in terms of optimal use of the inputs. Based on the obtained results, some suggestions are proposed regarding the usage of input factors in order to make useful policies towards the performance improvement of the available clusters.

Given that Urmia fruit cluster, Ahwaz date cluster, and Rasht rice cluster have achieved the maximum effectiveness in terms of networking activities, it is suggested that forums be assigned credit or meetings and conferences be held so that these clusters can be highly developed. In Mashhad saffron cluster, networking activities are of moderate effectiveness; therefore, the obstacles to networking activities

should be identified and tackled along with the promotion of networking activities within the cluster. Since effectiveness of networking activities in Bam date cluster and Rudbar olive cluster is very low, efficiency enhancement of these projects should be put on the agenda by policy makers in the first step. Since improvement projects have obtained the maximum effectiveness in Urmia fruit cluster, Mashhad saffron cluster, and Ahwaz date cluster, the main strategy for the development of these clusters is to increase the number of improvement projects in order to resolve common problems of the clusters' members. However, considering the moderate effectiveness of improvement projects in Bam date cluster and Rasht rice cluster, it is necessary for the development of these clusters to increase both the productivity and the number of improvement projects. Since improvement projects are not implemented effectively in Rudbar olive cluster, it is suggested that the main problems of the cluster and selection of appropriate BDSs be concentrated on in the first stage in order to improve the effectiveness of these projects.

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