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*Artículos Científicos*

## **Factores socioeconómicos como impulsores de vulnerabilidad alimentaria**

*Socioeconomic Factors as Drivers of Food Vulnerability*

*Fatores socioeconômicos como motores da vulnerabilidade alimentar*

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## Resumen

En este trabajo se evalúa la vulnerabilidad alimentaria en los municipios de Nayarit a partir de la construcción de un índice que considera tres variables: desarrollo socioeconómico, inseguridad alimentaria y vulnerabilidad alimentaria. Dentro de los resultados se encuentra que el municipio de Del Nayar se ubica en un nivel muy alto de vulnerabilidad; mientras que Huajicori, Acaponeta, Rosamorada y Ruiz en un nivel alto de vulnerabilidad. Por otra parte, los factores identificados como impulsores de vulnerabilidad son la deficiente dotación de carreteras pavimentadas, la baja actividad económica y el bajo nivel de escolaridad del jefe o jefa de familia.

**Palabras clave:** desarrollo socioeconómico, índice, inseguridad alimentaria, Nayarit, nivel de escolaridad.

## Abstract

This work assesses the food vulnerability in the municipalities of Nayarit using an index of food vulnerability that incorporates three factors: socio-economic development, food insecurity and food vulnerability. Results show that the municipality of Del Nayar was found at very high vulnerability level; Huajicori, Acaponeta, Rosamorada and Ruiz at high vulnerability level. On the other hand, the factors identified as drivers of vulnerability are deficient road structure, low economic activity and low schooling of the household head.

**Keywords:** socio-economic development, index, food insecurity, Nayarit, schooling.

## Resumo

Este trabalho avalia a vulnerabilidade alimentar nos municípios de Nayarit com base na construção de um índice que considera três variáveis: desenvolvimento socioeconômico, insegurança alimentar e vulnerabilidade alimentar. Entre os resultados, o município de Del Nayar está localizado em um nível muito alto de vulnerabilidade; enquanto Huajicori, Acaponeta, Rosamorada e Ruiz em um alto nível de vulnerabilidade. Por outro lado, os fatores identificados como vetores de vulnerabilidade são a baixa oferta de estradas pavimentadas, a baixa atividade econômica e o baixo nível de escolaridade do chefe de família.



**Palabras-chave:** desenvolvimento socioeconômico, índice, insegurança alimentar, Nayarit, nível de escolaridade.

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## Introduction

An index is an aggregation of a set of individual indicators that gives evidence of a multifaceted problem using mathematical methods. Its main objective is to quantify and simplify the information of the set of indicators so that it is understandable for all types of audiences (Bas Cerdá, 2014). Over time, the number of indices applied to different areas of interest has increased, since they measure multidimensional concepts, are of political importance and relevant in decision making (Granger, 2001); They also allow setting political priorities (Saltelli, 2007).

Index construction is gradual. First there is the set of simple indicators that accumulate existing information; then, on a second level, there are the thematic indicators: they are simple indicators grouped according to specific topic or area. And in a third level are the indices that are generated by combining the thematic indicators, which are presented as a single composite measure (Freudenberg, 2003). When building indexes it is necessary to standardize the variables to put them on a common basis and avoid problems with the mixing of units of measure. Regarding standardization, the standard deviation approach has desirable characteristics when it comes to aggregation and is the most used (Freudenberg, 2003), since all variables become a common scale and assume a normal distribution, with an average of zero, which means that it avoids introducing alterations derived from the differences in the means.

Vulnerability rates in the food issue have contributed to the design of State policies to eradicate chronic child malnutrition; they allow to identify and prioritize the attention to the most vulnerable population (Ministry of Development and Social Inclusion [Midis] and the Food and Agriculture Organization of the United Nations [FAO], 2012).

The definition of food security, accepted by the Committee on World Food Security (CSA), is as follows: "Material and economic access to sufficient food for all household members, without undue risk of losing such access." This definition, according to Thomson

(1999), introduces the concept of vulnerability. For the CFS, an organization belonging to FAO, the vulnerability of food security refers to the full range of factors that cause people to be exposed to food insecurity. Thus, the analysis of food vulnerability has developed as a way of identifying who is unable to obtain food and the factors that restrict its access (Stephen and Downing, 2001).

In the vulnerability assessment in the food issue, global indices have been used that are constructed with different variables; Secondary sources of information have been used, such as population and housing censuses, chronic malnutrition rates and extreme poverty, all grouped by food security components (Midis and FAO, 2012). For global indices, data on poverty, human development and food insecurity have also been used (National Institute of Statistics and Census [INEC], 2004). In another case, agricultural production data, population, road network, income, poverty, emigration, diseases, access to water and illiteracy were used, all of them referring to the food security component (Dumazert, 2008).

To date, many of the studies on vulnerability have focused on poverty (Chaudhuri and Datt, 2001; Holzmann and Jørgensen, 2000; Ozughalu and Ogwumike, 2013; Figueroa, 2005), which indicates that the low-income population is the more vulnerable. However, the models used in these analyzes do not incorporate adaptive capacity and, therefore, do not consider that the population develops mechanisms to face unfavorable events. On the other hand, focusing solely on poverty, the various strategies that the population has for accessing food are excluded. It also does not identify the food preferences of the population.

In a crisis situation, vulnerability is related to assets that can mobilize homes or communities (Salomone, 2016). It is a dynamic concept that changes according to various factors (Bengoa, 1996). In fact, it has been considered that the level of vulnerability depends on the possession of assets, also called capitals (Kaztman and Filgueira, 1999). Capitals are those resources that a community has (Gutiérrez and Siles, 2008). However, Filgueira and Peri (2004) and Kaztman (2000) consider that in addition to the assets available in households, consideration should be given to how these relate to the structure of opportunities integrated by the State and society.

In his empirical work, Moser (1998) finds that the more active a person or community has, the less vulnerable. In this sense, the concept of assets in this work is associated with adaptive capacity.



A complete way to address vulnerability is the one proposed by Hughes et al. (2012). This includes the exposure and sensitivity of a system to single or multiple stressors and the ability of the system to adjust or capitalize successfully for the effects of these stressors.

Within the framework of the above considerations, when integrating food vulnerability comprehensively, it is important to incorporate relevant components that contribute to vulnerability, including exposure, sensitivity and adaptive capacity; as well as factors of socioeconomic development and food security estimated from experience in households. Also, when integrating all these dimensions - vulnerability, socioeconomic development and food security - it is important to link them with the elements of food security (availability, access, stability and use).

The main objective of this work was to identify drivers of food vulnerability in the municipalities of the state of Nayarit, based on an index of socioeconomic drivers of vulnerability to food insecurity that considers socioeconomic variables, food security and food vulnerability.

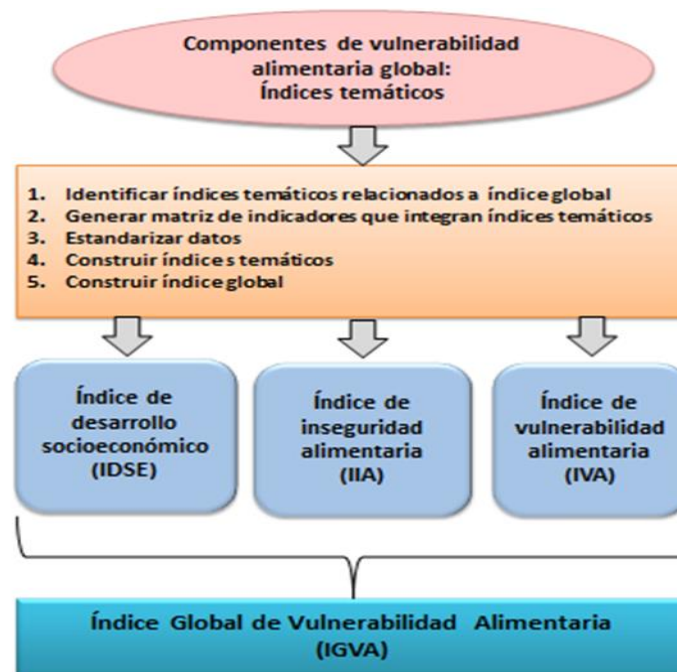
In Nayarit three municipalities are identified in unfavorable socioeconomic conditions: Del Nayar, La Yesca and Huajicori; There, most of the indigenous population of the state is concentrated. These three municipalities, which are located in the mountain area and are distributed in 42% of the state area, are made up of 1037 dispersed and hard-to-reach locations, distant from the centers of economic activity and commercialization. The National Council for the Evaluation of Social Development Policy [Coneval] (2017) reports this area with the highest ranks (75% -100%) of the population in poverty. Del Nayar, the municipality with the greatest poverty, ranked 41 for 2015, with 23,916 people in extreme poverty.

## **Material and method**

First, a causal model of food vulnerability was developed. It was determined that the components that reflect the reality of vulnerability are represented by thematic indices: socioeconomic development, food insecurity and food vulnerability. Finally, by integrating these thematic indices, the “Index of socioeconomic drivers of vulnerability to food insecurity” (ISEV) was constructed, as shown in the methodological scheme in Figure 1.



**Figura 1.** Proceso metodológico del ISEV



Fuente: Elaboración propia

Thus, the assessment of food vulnerability in the municipalities of Nayarit was made from the ISEV, which was obtained by averaging the rates of socioeconomic development, food insecurity and food vulnerability. The value of the socioeconomic development index was multiplied by -1 before averaging it, since it has an inverse meaning to food vulnerability. The functional relationship was:

$$ISEV = f (IDSE^{-}, IIA^{+}, IVA^{+})$$

As:

*ISEV* = “Index of socioeconomic drivers of vulnerability to food insecurity”;

*IDSE* = socioeconomic development index;

*IIA* = food insecurity index;

*IVA* = food vulnerability index.

A Bartlett test was performed to determine if there is a relationship between the variables that make up each of the thematic indices, as well as the Kaiser-Meyer-Olkin (KMO) test to know its degree of relationship. And acceptable values greater than 0.50 were obtained with  $p < 0.0001$ .

Finally, the municipalities were classified into five levels according to the value of each index: very low (less than -0.75), low (from  $\geq -0.75$  to -0.25), medium (from  $> -0.25$  to 0.25), high (from  $> 0.25$  to 0.75) and very high (greater than 0.75).

The materials and method for each of the thematic indexes that make up the ISEV are described below.

### Socioeconomic Development Index (SDI)

This index was formed with the following indicators: index of marginalization, degree of urbanization, gross rate of economic activity, coefficient of economic dependence and density of paved roads. To construct these indicators, nine variables were used that were taken from the National Institute of Statistics and Geography (Inegi) and the National Population Council (Conapo); all of them from 2010. The functional relationship was as follows:

$$IDSE = f(M^-, GU^+, TBAE^+, CDE^-, DC^+)$$

As:

*IDSE* = socioeconomic development index;

*M* = marginalization index;

*GU* = degree of urbanization;

*TBAE* = gross economic activity rate;

*CDE* = economic dependence coefficient;

*DC* = paved road density.

Next, the index of each municipality was calculated by averaging the five indicators. The value of the marginalization index and the economic dependence coefficient were multiplied by -1 before averaging them, because they have an inverse meaning to development. Finally, according to the value of the index, municipalities were classified into five levels of socioeconomic development: very low (less than -0.50), low (from -0.50 to 0.00), medium (from 0.01 to 0.50), high (from 0.51 to 1.00) and very high (greater than 1.00).

### **Food Insecurity Index (FII)**

The IIA was constructed from the results of household surveys that were applied to housewives; The instrument applied was the Latin American and Caribbean Food Security Scale (ELCSA). From the results of the survey, an index of food insecurity in each municipality was first estimated, representing the proportion of households with food insecurity. Then, these indices were transformed into normalized values of a distribution characterized by the mean and standard deviation arguments. The formula used to standardize was:  $Z = \frac{X-\mu}{\sigma}$ ; as  $X$  is the value to be normalized,  $\mu$  the arithmetic mean and  $\sigma$  the standard deviation. Finally, the municipalities were classified into five levels, according to the value of each index: very low (less than -0.75), low (from  $\geq -0.75$  to -0.25), medium (from  $> -0.25$  to 0.25), high (from  $> 0.25$  to 0.75) and very high (greater than 0.75).

### **Food Vulnerability Index (FVI)**

The VAT was formed with the indexes given below: exposure, sensitivity and adaptive capacity. The adaptive capacity index was constructed based on indicators of human, financial, physical, social and natural capital.

The exhibition is the population most exposed to food insecurity. For the exposure index, four indicators were constructed based on variables taken from the Inegi and Conapo, all of them, once again, from the year 2010. The sensitivity index, which characterizes the condition that makes people susceptible to insecurity. Food was constructed with five indicators that were formed based on information from the Nayarit Health Secretariat (SSN) of 2011 and Coneval in 2010. For the adaptive capacity index, which represents the potential, skills and In order to address food insecurity, information from the Ministry of Social Development (Sedesol) of 2013 and the Inegi of 2010, 2012 and 2013 were used.

Before integrating the exposure, sensitivity and adaptive capacity indices, all the indicators used were transformed into standardized values of a distribution characterized by the mean and standard deviation arguments. The formula used was:  $Z = \frac{X-\mu}{\sigma}$ ; as  $X$  is the value that you want to normalize,  $\mu$  the arithmetic mean and  $\sigma$  standard deviation.



Finally, to obtain the VAT, the exposure index and the sensitivity index were added, to this sum the adaptive capacity index was subtracted. The functional relation of VAT was as follows:

$$IVA = \textit{exposición} + \textit{sensibilidad} - \textit{capacidad adaptativa}$$

## Results and Discussion

In the six municipalities identified with high or very high vulnerability, there are 157,832 people representing 15% of the state population; 246 859 people live in the five municipalities with medium vulnerability (23% of the population); Finally, 680 288 inhabitants (62%) distributed in nine municipalities have low or very low food vulnerability. On the other hand, the general factors identified as drivers of vulnerability were: poor provision of paved roads, low economic activity and low education level of the head of the family.

The results of the estimates expressed in indexes are presented in Table 1, where it is highlighted that the highest value of the ISEV (2.10) is considerably higher than the one that follows (0.73). Otherwise, the values of this index are distributed on a regular basis.

**Tabla 1.** ISEV por variables y municipios

	IDSE	VA	IA	IGVA
Del Nayar	-2.75	1.01	2.54	2.10
Jala	-0.01	0.49	1.70	0.73
Acaponeta	0.00	0.95	0.54	0.50
Rosamorada	-0.45	0.41	0.55	0.47
Ruíz	0.17	0.92	0.43	0.39
Huajicori	-1.01	0.34	-0.34	0.33
Tecuala	0.12	0.52	0.27	0.22
Tuxpan	0.62	-0.46	1.12	0.01
Compostela	0.36	0.05	-0.22	-0.18
Santiago Ixcuintla	0.23	-0.03	-0.40	-0.22
La Yesca	-1.30	-0.54	-1.48	-0.24
Santa María del Oro	0.07	-0.35	-0.43	-0.28
Ahuacatlán	0.17	-0.66	-0.04	-0.29
San Blas	0.76	-0.27	0.16	-0.29
Ixtlán del Río	0.48	0.59	-1.51	-0.47
Bahía de Banderas	0.97	0.01	-0.47	-0.48
San Pedro Lagunillas	0.14	-1.15	-0.16	-0.48
Tepic	1.08	-0.27	-0.20	-0.52
Amatlán de Cañas	0.08	-1.25	-1.33	-0.89
Xalisco	0.44	-0.25	-0.71	-0.47

Fuente: Elaboración propia

The ranking of vulnerability levels shows the situation of each of the municipalities. Figure 2 shows that Del Nayar is the only municipality with very high global food vulnerability. The five municipalities with high vulnerability are Huajicori, Acaponeta, Rosamorada, Ruíz and Jala; while Tecuala, Tuxpán, Santiago Ixcuintla, Compostela and La Yesca classify with medium vulnerability; Next are San Blas, Tepic, Xalisco, Santa María del Oro, San Pedro Lagunillas, Ixtlán del Río, Ahuacatlán and Bahía de Banderas with low food vulnerability, and finally, there is Amatlán de Cañas with very low global food vulnerability. Likewise, the results show that the condition of vulnerability at the municipal level has several causes.

**Figura 2.** ISEV de Nayarit, 2015



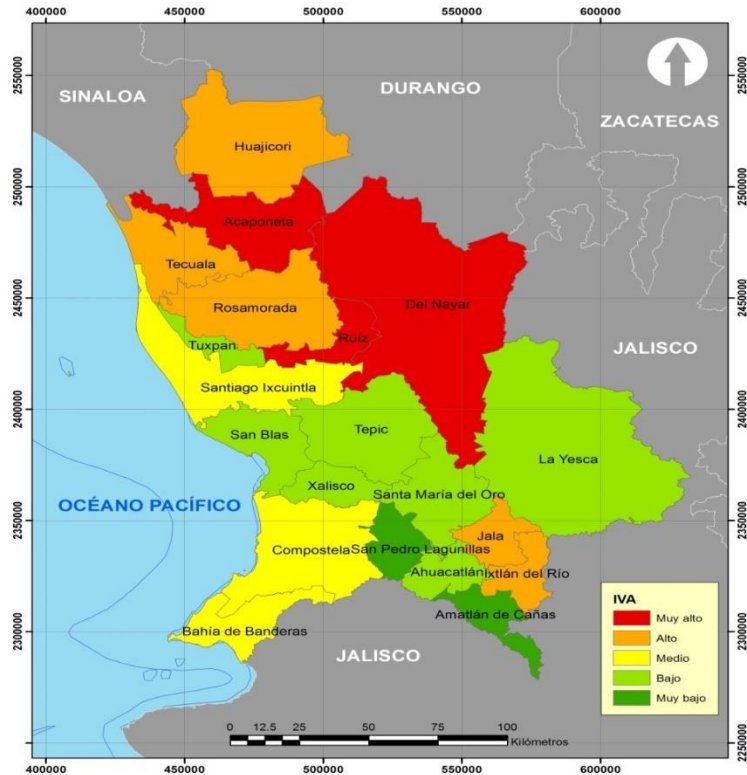
Fuente: Elaboración propia

### **Vulnerability condition by municipality**

Del Nayar is the only municipality identified with a very high ISEV. It has the least advantageous conditions, very high levels of insecurity and food vulnerability and a very low IDSE. It is characterized by being of rural condition in all of its locations, with very high marginalization rates (3.6); It has a very low gross economic activity rate, only 16% of the population is economically active occupied, every 502 inactive people (without formal employment) are sustained for every 100 assets (with formal employment). In addition, Del Nayar registered the highest percentage of households with food insecurity in the state (45%).

A very high level of food vulnerability is also identified (see figure 3), 51% of the population is under 18 years old, the average schooling is the lowest in the state (4.5 years).

**Figura 3.** Índice temático de vulnerabilidad alimentaria de Nayarit, 2015



Fuente: Elaboración propia

Jala identified with a high ISEV. This municipality has low socioeconomic development rates, very high food insecurity and high food vulnerability. The development situation is due to its low economic activity, since only 34% of the population is economically active and also has high economic dependence (19 people depend on 10). On the other hand, Jala, with 38.5% of the population with moderate or severe food insecurity, is placed in the second place of the entity with food insecurity (see figure 4). What places this municipality with a high VAT is that it has high sensitivity.

**Figura 4.** Índice temático de inseguridad alimentaria de Nayarit, 2015



Fuente: Elaboración propia

Acaponeta has a high ISEV, a low IDSE, a high IIA and a very high VAT. The development situation is due to its low economic activity: only 35% of the population is economically active, and also has high economic dependence (19 people depend on 10). In Acaponeta, 29.4% of the population reports moderate or severe food insecurity. On the other hand, VAT is very high because it showed the highest infant malnutrition mortality rate in the state (8.81 case per 100,000), this places it with a very high sensitivity index and not enough adaptive capacity is observed as to reduce vulnerability. Likewise, this municipality did not show poverty characteristics and, therefore, not enough support was provided by food aid programs.

Rosamorada has a high ISEV, reports a low IDSE, high levels of food insecurity and vulnerability. Economic dependence, an indicator of the IDSE, is 21 people for every 10. Associated with it, it has low economic activity (32% of the population is economically active). In Rosamorada, 29.4% of the population reports moderate or severe insecurity. In addition,

although it has medium exposure and sensitivity, it shows low adaptive capacity; recorded the lowest financial capital of the entity.

Ruiz shows a high ISEV, presents a medium IDSE, a high IIA and a very high VAT. The percentage of population with moderate or severe food insecurity was 28.5. In this municipality, what stands out the most is that it registered 3.99 cases of deaths due to malnutrition in children under 5 years of age per 100,000 in 2011. This municipality also did not show characteristics of poverty and therefore not enough support was provided by programs of food aid

Huajicori was identified with a high ISEV, with a very low IDSE, a low IIA and a high VAT. The issue of socio-economic development (figure 5) is what mainly places this municipality with a high ISEV. These types of municipalities are characterized by having a degree of zero urbanization, with rural characteristics in its entirety, which are associated with a very high marginalization rate (1.4), with high economic dependence (21 people depend on 10) and limited economic activity rate (only 32% of the population is economically active), as well as having a lower percentage (66%) of health coverage in the state. Regarding Huajicori, lastly, the lowest proportion of the employed population with income of more than two minimum wages (15%) is identified.

Figura 5. Índice temático de desarrollo socioeconómico de Nayarit, 2015



Fuente: Elaboración propia

The municipality of Tecuala has a medium ISEV, the result of a medium IDSE and high levels of food insecurity and vulnerability. It is a stagnant municipality, with a high percentage of population with food insecurity (27.3%), has high exposure and low adaptive capacity, with high agricultural area per capita (1.25 hectares per person).

In Tuxpán an average ISEV with a high IDSE, very high IIA and low VAT is observed. Tuxpan ranked third in the state as a percentage of population with food insecurity (34%) and population 65 and over: here 10% of the population was 65 and older. Highlights that only Tuxpán was identified with a very high adaptive capacity index, since it had the largest endowment of financial capital; Among the indicators of financial capital, it stands out that it

had the highest rate of economic support for adults; Likewise, physical capital shows the largest proportion of grocery and food stores per household of the entity.

Compostela shows an average ISEV, as well as an average IDSE, IIA and VAT. This municipality is the only one that maintains all the indexes at medium level, it does not present outstanding characteristics. Another municipality that presents a regular distribution of the thematic indexes that make up the ISEV is Santiago Ixcuintla with an average ISEV, medium IDSE, low IIA and average VAT.

Due to its characteristics, La Yesca acquires an average ISEV. Although it has a disadvantage with a very low IDSE, a very low IIA and a low VAT are identified. In La Yesca, a low level of food insecurity was detected, 13.4% of the population; The state average is 25.5%. In addition, this municipality is characterized by having a degree of zero urbanization (zero). It stands out because it has the lowest population density of the entity (8 inhabitants per square kilometer). Another outstanding feature is that it shows the lowest life expectancy in the state (60 years).

Santa María del Oro, with a low ISEV, has a medium IDSE and low levels of food insecurity and vulnerability. In this municipality there are no relevant characteristics.

For its part, Ahuacatlán shows low ISEV with medium IDSE, medium IIA and low VAT. This municipality has the highest coverage of piped water at home in the entity and does not register cases of malnutrition (year 2011).

San Blas is included in the municipalities with low ISEV, has a high IDSE, medium IIA and low VAT. In the entity, San Blas shows the highest gross economic activity rate in the state (44% of the population is economically active) and the highest density of paved roads. The proportion of population with moderate and severe food insecurity is 26%.

Ixtlán del Río shows a low ISEV. And the components of this index are distributed as follows: medium IDSE, IIA very low and high VAT. It reports the lowest moderate and severe food insecurity in the state (13%). In addition, this municipality has the highest exposure rate of the entity: it ranked second in homes with female heads (28%) and has the highest life expectancy in the state (80 years).

In Xalisco the ISEV is low. It has a medium IDSE and low levels of insecurity and food vulnerability. Xalisco reports low level of moderate or severe food insecurity 19.5 (state average



25.5%). The indicators that integrate the thematic indexes do not show any outstanding feature in this municipality.

Bahía de Banderas presents a low ISEV, with a high IDSE, low IIA and average VAT. In this municipality, the highest concentration of economic activities in the secondary and tertiary sectors of the state was identified, as well as the highest proportion (72%) of the employed population with incomes of more than two minimum wages. Bahía de Banderas has 21.4% moderate or severe food insecurity.

The municipality of San Pedro Lagunillas shows a low ISEV, the result of average socioeconomic development and food insecurity rates, as well as a very low VAT. In San Pedro Lagunillas there were no cases of malnutrition (year 2011), it has the lowest percentage of population under 18 years (32%) and the highest population of 65 and over (12%) in the state, has the highest coverage of health (87% of the population), endowment of agricultural area per capita in the entity and production of corn and beans.

Tepic, the capital, shows a low ISEV. The thematic indicators that make up this index have this distribution: very high IDSE, medium IIA and low VAT. This municipality records the best socioeconomic development situation of the entity. What stands out most is that it shows the lowest marginalization rate and the highest population density in the state; It also presented the highest average schooling (10 years) in the state. In the area of adaptive capacity, the vulnerability component registered the largest human capital of the entity.

Amatlán de Cañas is the only municipality with a very low ISEV. It has a medium IDSE and very low rates of food insecurity and vulnerability. In this municipality, what stands out the most is that it shows the lowest exposure index in the state, has a small population under 18 (33%) and a population of 65 years and over.

This paper identifies that the poor provision of paved roads, the low economic activity and the low level of education of the head of the family are driving factors of vulnerability to food insecurity.

It is relevant to note that it is noted that where there is a deficient provision of paved roads, greater vulnerability to food insecurity is identified; This reinforces the conceptualization of food security that considers, in addition to availability, physical access to food.

Identifying low economic activity as a driver of vulnerability is recurring. FAO, the Pan American Health Organization [PAHO], the World Food Program [WFP] and the United

Nations Children's Fund [UNICEF] (2018) consider that food security is related to lack of income more than with the lack of food, since, although there is availability of food, access could be restricted due to insufficient household income.

Food security vulnerability refers to the full range of factors that cause people to be exposed to food insecurity. The low level of education of the head of the family as a driver of vulnerability in the food issue confirms that it is, of origin, a problem to consider for future actions. Since the low level of schooling of the head of the family is correlated with a higher prevalence of food insecurity (Valencia and Ortiz, 2014; FAO, International Fund for Agricultural Development [IFAD] and WFP, 2015; Mundo, Méndez and Shamah, 2014 ; De Muro, 2007). Similarly, it has been reported (Cruz and Maldonado, 2017) that the level of schooling is the main determinant of food insecurity. Likewise, Díaz, Sánchez and Díaz (2016) identify that schooling is the one that contributes most to the explanation of severe food insecurity in the states of Mexico. This is a capacity that allows people to increase the opportunity to join the labor system with sufficient income to ensure sufficient and quality food in their homes. In addition, the level of schooling, translated into education, ensures that the head of the family makes better decisions in the consumption of nutritional quality foods.

Finally, the ISEV represents a current and comprehensive evaluation; it allows to identify who are most vulnerable; shows that the municipalities with high and very high global food vulnerability are mainly located in the Sierra and North regions of the entity, while the municipalities identified with very low or low global food vulnerability are distributed mostly in the Central and South regions. On the other hand, the distribution of average global vulnerability is irregular, it varies according to the socioeconomic and educational level. These results coincide with Seguinot (2016) in its vulnerability analysis applied to climate change; In addition, the educational level has also been associated with food insecurity (De Haro *et al.* 2014; De Haro y Marceleño, 2018; Valencia y Ortiz, 2014; Mundo *et al.*, 2014).

## Conclusions

The ISEV can be used as an instrument to formulate basic directions of policies and actions on the food issue, as it provides information on where the most vulnerable are located, which are those that require immediate attention. In addition, it offers information on the conditions that place this population in a situation of vulnerability and that represent a challenge to overcome for local governments. Vulnerability depends on each context and requires appropriate policies for different territories.

Making an observation on the issue of food vulnerability at the municipal level has been a great achievement because there are limitations in the availability of information, especially if the opinion of people is included, as was done in this work. But it must be recognized that the analysis can hide a very specific vulnerability at the local level. It is possible that, in a more detailed observation, information can be obtained that allows focusing and prioritizing institutional efforts at the local or lower level to reduce food vulnerability in Nayarit.

## References

- Bas, M. C. (2014). *Estrategia metodológica para la construcción de indicadores compuestos en la gestión universitaria*. (tesis doctoral). Universitat Politècnica de Valencia, Valencia, España.
- Bengoa, J. (1996). Pobreza y vulnerabilidad. *Temas Sociales*, 10(4), 23-38.
- Consejo Nacional de Evaluación de la Política de Desarrollo Social [Coneval]. (2017). *Pobreza en los municipios de México, 2015*. México: Consejo Nacional de Evaluación de la Política de Desarrollo Social. Recuperado de [www.coneval.org.mx/Medicion/Documents/Pobreza\\_municipal/Presentacion\\_resultados\\_pobreza\\_municipal\\_2015.pdf](http://www.coneval.org.mx/Medicion/Documents/Pobreza_municipal/Presentacion_resultados_pobreza_municipal_2015.pdf).
- Cruz, J. y Maldonado. L. (2017). Incidencia del ingreso familiar y la educación en el acceso a la canasta básica familiar en Ecuador. *Revista Económica*, 3(1), 19-31.
- Chaudhuri, S. and Datt, G. (2001). Assessing household vulnerability to poverty: a methodology and estimates for the Philippines. Paper presented at the 3<sup>rd</sup> Asian Development Forum. Bangkok, June 2001.
- De Haro, R. y Marceleño, S. (2018). Seguridad alimentaria en localidades rurales y urbanas en Nayarit, México. *Visum Mundi*, 2(1), 121-126.
- De Haro, R., Marceleño, S., Garibay, G., Curiel, A. y Bojórquez, I. (2014). El alimento como eje interdisciplinario y sistémico en la educación para el desarrollo sustentable. *Revista educarnos*, 4(14-15), 11-26.
- De Muro, P and Burchi, F. (2007). Education for rural people: a neglected key to food security. *Departmental Working Papers of Economics - University Roma Tre*, 0078.
- Díaz, M. Á., Sánchez, M. y Díaz, A. (2016). Inseguridad alimentaria en los estados de México: un estudio de sus principales determinantes. *Economía, sociedad y territorio*, 16(51), 459-483.
- Dumazert, P. (2008). *Análisis y cartografía de la vulnerabilidad a la inseguridad alimentaria y nutricional en Nicaragua. Actualización del VAM en base a datos del periodo 2005 – 2008. Informe final*.
- Figueroa, D. (2005). Grupos vulnerables y su caracterización como criterio de discriminación de la seguridad alimentaria y nutricional en Brasil. *Revista Brasileira de Saúde Materno Infantil*, 5(3), 367-375.



- Filgueira, C. y Peri, A. (2004). *América Latina: los rostros de la pobreza y sus causas determinantes*. Santiago, Chile: Comisión Económica para América Latina y el Caribe.
- Freudenberg, M. (2003). Composite indicators of country performance: A critical assessment. *OECD Science, Technology and Industry Working Papers*, (2003/16).
- Granger, W. J. (2001). Macroeconometrics – Past and future. *Journal of Econometrics*, 100(1), 17-19.
- Gutiérrez, I. y Siles, J. (2008). *Diagnóstico de medios de vida y capitales de la comunidad de humedales de Medio Queso*. Los Chiles, Costa Rica: Oficina Regional para Mesoamérica y la Iniciativa CARIBE.
- Holzmann, R. y Jørgensen, S. (2000). Social Risk Management: A New Conceptual Framework for Social Protection, and Beyond. *Social Protection Discussion Paper*, (0006).
- Hughes, S., Yau, A., Max, L., Petrovic, N., Davenport, F., Marshall, M. y Cinner, J. E. (2012). A framework to assess national level vulnerability from the perspective of food security: The case of coral reef fisheries. *Environmental Science and Policy*, 23, 95-108.
- Instituto nacional de estadística y censos (2004). Análisis de la Pobreza y la Seguridad Alimentaria Nutricional en Nicaragua., Gobierno de la República de Nicaragua. INEC.
- Kaztman, R. (2000). Documentos de Trabajo del IPES N° 2. Aportes conceptuales. Notas sobre la medición de la vulnerabilidad social. Universidad Católica del Uruguay.
- Kaztman, R. y Filgueira, C. (1999). Marco conceptual sobre activos, vulnerabilidad y estructura de oportunidades. Apoyo a la implementación del Programa de Acción de la Cumbre Mundial sobre Desarrollo Social. Montevideo. CEPAL, 7-23.
- Ministerio de Desarrollo e Inclusión Social y Organización de las Naciones Unidas para la Alimentación y la Agricultura [FAO]. (2012). Mapa de Vulnerabilidad a la Inseguridad Alimentaria 2012. Ministerio de Desarrollo e Inclusión Social, Perú. Lima, Perú.
- Moser, C. (1998). The asset vulnerability framework: Reassessing urban poverty reduction strategies. *World Development*, 26(1), 1-19.
- Mundo, V., Méndez, I. y Shamah, T. (2014). Caracterización de los hogares mexicanos en inseguridad alimentaria. *Salud Pública de México*, 56(supl. 1), 12-20.
- Organización para la Cooperación y el Desarrollo Económicos [OECD]. (2008). *Handbook on Constructing Composite Indicators: Methodology and User Guide*. OECD Publishing.

- Organización de las Naciones Unidas para la Alimentación y la Agricultura [FAO], Fondo Internacional de Desarrollo Agrícola [FIDA] y Programa Mundial de Alimentos [PMA]. (2015). *El estado de la inseguridad alimentaria en el mundo. Cumplimiento de los objetivos internacionales para 2015 en relación con el hambre: balance de los desiguales progresos*. Roma, Italia: Organización de las Naciones Unidas para la Alimentación y la Agricultura, Fondo Internacional de Desarrollo Agrícola y Programa Mundial de Alimentos.
- Organización de las Naciones Unidas para la Alimentación y la Agricultura [FAO], Organización Panamericana de la Salud [OPS], Programa Mundial de Alimentos [PMA] y Fondo de las Naciones Unidas para la Infancia [Unicef]. (2018). *Panorama de la seguridad alimentaria y nutricional en América Latina y el Caribe 2018*. Santiago, Chile: Organización de las Naciones Unidas para la Alimentación y la Agricultura, Organización Panamericana de la Salud, Programa Mundial de Alimentos y Fondo de las Naciones Unidas para la Infancia.
- Ozughalu, M. and Ogwumike, O. (2013). Vulnerability to Food Poverty in Nigeria. *African Development Review*, 25(3), 243-255.
- Salomone, A. (2016). *Vulnerabilidad a la inseguridad alimentaria en la ciudad de Neuquén: análisis de las políticas públicas alimentarias y las estrategias de los hogares entre 1990 y 2010*. (tesis doctoral). Universidad Nacional de Córdoba, Córdoba, España.
- Saltelli, A. (2007). Composite Indicators between analysis and advocacy. *Social Indicators Research*, 81(1), 65-77.
- Seguinot, B. J. (2016). Cambio climático y vulnerabilidad de las comunidades al ascenso del nivel del mar (ANM) en la ciudad de San Juan, Puerto Rico (2005-2015). *Boletín de la Real Sociedad Geográfica*, tomo CLI, 239-257
- Stephen, L. and Downig T. E. (2001). Getting the Scale Right: A Comparison of Analytic Methods for Vulnerability Assessment and Household-Level Targeting. *Disasters*, 25(2), 113-135.
- Thomson, A. (1999). *Implicaciones de las políticas económicas en la seguridad alimentaria: Manual de capacitación*. Roma, Italia: Organización de las Naciones Unidas para la Alimentación y la Agricultura.

Valencia R. G. y Ortiz, L. (2014). Disponibilidad de alimentos en los hogares mexicanos de acuerdo con el grado de inseguridad alimentaria. *Salud Pública de México*, 56(2), 154-164.

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Metodología	Principal: Susana Marceléño Flores
Software	No aplica
Validación	Participación igual de: Susana Marceléño Flores, Rebeca de Haro Mota y Oyolsi Nájera González
Análisis Formal	Principal: Rebeca de Haro Mota
Investigación	Participación igual de: Susana Marceléño Flores, Rebeca de Haro Mota y Oyolsi Nájera González
Recursos	Principal: Susana Marceléño Flores
Curación de datos	Principal: Rebeca de Haro Mota
Escritura - Preparación del borrador original	Participación igual de: Susana Marceléño Flores, Rebeca de Haro Mota y Oyolsi Nájera González
Escritura - Revisión y edición	Participación igual de: Susana Marceléño Flores, Rebeca de Haro Mota y Oyolsi Nájera González



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