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Food Security Model and the Role of Community Empowerment: The Case of a Marginalized Village in Mexico, Tatoxcac, Puebla

Marco Antonio Lara De la Calleja, María Catalina Ovando Chico, Eduardo Lopez Ruiz

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***Abstract*—**Community empowerment has been proved to be a key element in the solution of the food security problem. As a result of a conceptual analysis, it was found that agricultural production, economic development and governance, are the traditional basis of food security models. Although the literature points to social inclusion as an important factor for food security, no model has considered it as the basis of it. The aim of this research is to identify different dimensions that make an integral model for food security, with emphasis on community empowerment. A diagnosis was made in the study community (Tatoxcac, Zacapoaxtla, Puebla), to know the aspects that impact the level of food insecurity. With a statistical sample integrated by 200 families, the Latin American and Caribbean Food Security Scale (ELCSA) was applied, finding that: in households composed by adults and children, have moderated food insecurity, (ELCSA scale has three levels, low, moderated and high); that result is produced mainly by the economic income capacity and the diversity of the diet on its food. With that being said, a model was developed to promote food security through five dimensions: 1. Regional context of the community; 2. Structure and system of local food; 3. Health and nutrition; 4. Information and technology access; and 5. Self-awareness and empowerment. The specific actions on each axis of the model, allowed a systemic approach needed to attend food security in the community, through the empowerment of society. It is concluded that the self-awareness of local communities is an area of extreme importance, which must be taken into account for participatory schemes to improve food security. In the long term, the model requires the integrated participation of different actors, such as government, companies and universities, to solve something such vital as food security.

***Keywords*—**Community empowerment, food security, model, systemic approach.

I. Introduction

FOOD security is one of the main lines in the world agenda since the financial crisis in 2008. The Food and Agriculture Organization (FAO) calculated the number of people with food insecurity in the world after the crisis, with less than 800 million in 1955-77 increased to more than 1,000 million in 2009 [1]. These numbers are changing the priorities of both, national governments and international organizations to make investments on agriculture, food and nutrition security, after decades of negligence [2].

The definition of food security is a term in continuous change. It has established recently that it must have a multidisciplinary analysis gathering economy, agriculture, sociology, and nutrition, promoting actions to address hunger issues in regions [3]. The FAO´s classic definition used for this work declares "Food Security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life [4]. Therefore the lack of capacity to supply food among the countries may lead to instability, threatening national security [5].

The Food system in Mexico has suffered unfortunate transformations, for example those occurred in the 80´s where the state support for the agricultural structure was disarmed trying to promote a global economy model. From then on the government has given privileges to importation policies, delegating to the market dynamics basic elements for productivity such as: supplies, machinery, financing and technical training [6].

In 2012, data from the national health and nutrition survey (ENSANUT) revealed that the majority of Mexican families are in the mild food insecurity classification (41.6%); these families are constantly concerned about food access and may even be sacrificing the quality of the family´s diet [7]. According to data reported in 2010 by the National Council for the Evaluation of Social Development Policies (Coneval), there is a slight trend to moderate and severe food insecurity [8]. The food problem in Mexico is serious considering the high rate of obesity and malnutrition; it is evident that the policies to address food poverty have had results with low impact [6]. Mexico also faces a high rate of marginalization in its population, affecting food security by having obstacles to access adequate food. According to the marginalization index of the National Population Council (CONAPO), which measures four dimensions: education, housing, income per job, and population distribution, found that 35.63% of the inhabitants in Mexico (40,028,527 people), are in high or very high marginalization [9]. The regions in Mexico with more population in high and very high marginalization are: Guerrero, Chiapas, Oaxaca, Veracruz and in the fifth position Puebla [9]. The present work is Puebla specifically in a community called Tatoxcac, located in the municipality of Zacapoaxtla, with a 4,297 population, classified with high marginalization. Another relevant aspect of the community is that more than 50% of the population is sponsored by

Marco Antonio Lara De la Calleja, PhD Student, and María Catalina Ovando Chico, Research professor in the Ph.D., are with the Strategic Planning and Technology Direction, Autonomous Popular University of the State of Puebla, UPAEP. Puebla, Mexico (e-mail: marcoantonio.lara@upaep.edu.mx, mariacatalina.ovando@upaep.mx).

Eduardo Lopez Ruiz, Environmental and urban designer in the Municipality of Puebla, Environmental Bureau (e-mail: servicioyfuncion@gmail.com).

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"PROSPERA" a government program, created in 1997 under the name PROGRESA, the main objective is to grant money as a strategy to reverse poverty, the program has been implemented since the 90´s and it would be expected to have had an effect on reducing food poverty since then, but it is important to note that trends in food poverty nationally have not been uniform through the past 20 years, increasing between 1992 and 1996, declining steadily between 1996 and 2006 to reach 13.8%, and increasing again to 18.8% between 2006 and 2010 [10].

To face the challenge to improve the food security conditions in the community, it is necessary to place at the center of the analysis the people themselves and the way they create networks as part of their culture, to obtain regionalized and contextualized strategies responding to their own necessities, this way we can achieve better implementation and execution of governmental programs for social support. Empowerment of people as the basic element promotes community involvement, mental health, community intervention, social participation, strong social networks and justice. For this it is required to see the subject as an active participant and as creator of elements that improve his quality of life and well being [11]. Thus, many community organizations need to "promote empowerment through a formation and accompaniment process of leaders and organizations to execute democratic leadership" [12]. Empowerment is considered "as one of the fundamental ways to achieve the development and transformation of communities" [13].

In this work, community empowerment is the basis for generating community actions, the basis that allows the creation of integrated participation schemes through different actors, working together to address the food security problem in the country.

The objective of this study is to identify the food security rate in the community of Tatoxcac and the factors that impact on its improvement. This will allow the creation of a model with special attention on community empowerment, food security improvement. This will represent a strong analysis to develop accurate strategies, and orientate the capacity of public policies.

II. Literature Review

A. Ontological Approaches

The concept of Food Security has more than 200 definitions and it has generated numerous debates since its adoption by the FAO. The ambiguities and controversies have their origin in the in the complex and heterogeneous global agriculture and food situation [14].

The FAO´s definition considers four dimensions about food security, including availability, access, utilization, and stability:

1. Availability. Stands for physical disposition of the food and is determined by the level of food production, reserve and trade.
2. Access. It refers to physical and economic proximity of the food.
3. Utilization. It refers to the biological way the body makes the best out of the nutrients, and the preparation of the food, dietary diversity and distribution among the family members.
4. Stability. It connects the permanency of the three previous dimensions along the process, which implies continuous availability, access and utilization [1].

Consequently, when these dimensions are successfully reached the result is food security. However, over time there´s been requests to modify this definition in order to create a greater inclusion to achieve food security.

Experts have considered the need of a new definition for food security, changing from a macro paradigm, which concerns to national governments and international community, to consider a new micro social dimension with space to individual decision capacity inside this basic social unit. In addition, it converges the complex relation and interdependence among the members of domestic social unit and the community it is part of, also the nation and the international context [15].

According to Putnam Godek under this more local perspective, taking into account participation of farmers communities, civil society organizations, academic and research institutions, the concept of food sovereignty was created, used mainly for the organization "Vía Campesina", stating that in order to reach food security, it is required certain actions and mechanisms in a particular context, centered in justice and human rights, to really protect the food system and secure the well-being of people [16].

B. Related Works

According to Loring and Gerlach, in their bibliometric analysis for food security analyzing 62 papers published between 1997 and 2013 found in the Web of science and Google Scholar [17]. Considering the frequency and the number of publications, four problematic areas were found.

1. Connections with the global system. The food production activities are highly dependent on non-inclusive technologies, related to gasoline and petroleum and prices in the supply chain for production. Fazzino and Loring [18]; Skinner, [19]; explore the problem of production costs increase and the purchase of food, in some cases people must choose whether to buy food or pay for heating, framing the job access issue and subsistence activities.
2. Contamination and pathogens impact in the food quality. Many researchers had studied the risks for health, framing fish and mammals in the studies of Loring [20]; and caribous in the work of de Schuster [21].
3. Climate change and its impact in the environment. There are several papers related to climate change and supply activities, for example the studies Loring and Gerlach [17]; Wesche and Chan [22] about fishing.
4. Governance and administration. The obstacles for sustainable production have been widely discussed; the

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economic and government policies keep no relation to the food security problems, along with the lack of participative governance for the decision making in the work of McNeeley [23]; and Gadamus [24].

This is how Loring and Gerlach [17] show the trends in the food security research; however, they also conclude with the necessity to increase studies to know the direct relation between culture and health considering the importance of local culture; as a result, in recent year's research about food security have been reduced exclusively to caloric intake.

To talk about food security from a local view it is important to mention the community empowerment, which is the social action process where people, community and organizations take control in the improvement of its environment and life quality [11]. Due to the complexity of the topic and the temporary reach of the previous investigations it is hard to find study cases where community empowerment is the main element. There lies the interest of the present work to show the process created in order to promote empowerment in the community studied.

A reference in terms of cultural context is the study developed by Beuchelt and Badstue [25]; see Fig. 1, where they point at the importance to incorporate a gender perspective and human development as an opportunity to improve agriculture and at the same time the nutrition system in communities. Proposing various categories to identify opportunity areas, and consequently, develop interventions with a multidisciplinary participation [25].

TABLE I
QUESTIONS FROM ELCSA

1. Have you ever been worried about running out of food in your home?
2. Have you ever been without food in your home?
3. Have you ever stopped eating healthy at home?
4. Have you or anyone in your household ever had a little variety of foods?
5. Have you or any adult in your household ever stopped having breakfast, lunch, or dinner?
6. Have you or an adult in your household ever eaten less than you should eat?
7. Have you or any adult in your household ever felt hungry but did not eat?
8. Have you or any adult in your household ever eaten once a day or stopped eating for a whole day?
9. Has anyone under the age of 18 years in your household ever had a healthy diet?
10. Has anyone under the age of 18 years in your household ever had little variety of foods?
11. Has anyone under the age of 18 years in your household ever stopped having breakfast, lunch, or dinner?
12. Has anyone under the age of 18 years in your household ever eaten less than they should?
13. Have you ever had to reduce the amount served at meals to someone under the age of 18 years in your household?
14. Has anyone under the age 18 years at home ever felt hungry but did not eat?
15. Has anyone under the age of 18 years at home ever eaten once a day or stopped eating for a whole day?

The categories in the model are the result of a human rights perspective, particularly for agriculture and nutrition related to women. In spite of focusing on the human rights and gender perspective, community empowerment is not included in the model as a change factor.



Fig. 1 Gender perspective and food security model [25]

III. METHODOLOGY

In order to establish the food security diagnosis in the community of Tatoxcac in Zacapoaxtla Puebla, the Food Security Scale for Latin America and the Caribbean (ELCSA) was applied; this instrument belongs to direct measuring based in household experience scale group. According to the user´s guide, the scale was built from previous experiences taken from the Household Food Security Supplement Module, (HFSSM), the Food Insecurity Brazilian Scale (EBIA), and the Household Food Insecurity Access Scale, HFIAS. Due to its inclusive and international development it has proven its high effectiveness and reliability in different successful applications for the local and international scale, in government reports, academic studies and public opinion surveys [26].

The scale is formed by 15 questions to measure the food insecurity rate, as seen in Table I, exploring household changes in alimentation, lack of money or resources during a certain time interval (three months previous to the survey). The questions allowed a distinction between adults and members of the family of less than 18 years old. Every question can be answered with "yes" or "no". If all the answers are "no" the family have food security, the affirmative answers are measured to identify the food insecurity level, as follows mild, moderate and severe, as seen in Fig. 2.

In Tatoxcac there are 1,173 families sponsored by the governmental program "PROSPERA", a representative sample was created as a result of (1) in Arkin and Colton [27]; a sampling error of 0.07 was considered and the final sample for the study was 200 families.

$$n = \frac{N}{(N-1)K^2+1} \quad (1)$$

N: Total Population, K: Sampling Error.

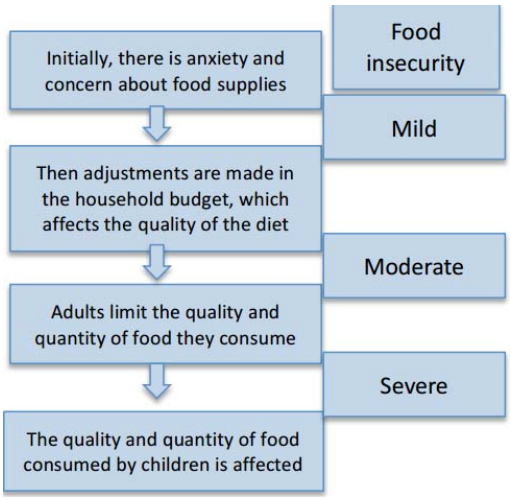


Fig. 2 Degree and evolution of perceptions in the ELCSA

On April of 2016, the ELCSA scale was applied, with the following scale:

TABLE II
SCALE FOR FOOD INSECURITY CLASSIFICATION

	Classification of food insecurity			
Type of home	Security	Mild insecurity	Moderate insecurity	Severe insecurity
Households integrated only by adults	0	1 to 3	4 to 6	7 to 8
Households integrated by adults and under 18 years old	0	1 to 5	6 to 10	11 to 15

IV. RESULTS

After application of the instrument in Tatoxcac, it was found the following: From 200 households interviewed, 183 formed by adults and family members less than 18 years old have a 5.1 affirmative answers average, in other words mild food insecurity. In 17 households integrated only by adults, the affirmative answer average is 2.8; this result is in the border of moderate food insecurity. In addition, it was possible to determinate two main elements affecting the food security perception, on one side, 83% of the families mentioned being concerned about access to food related to economic income, while on the other side 46% considers their diet variety limited.

It is important to mention that the governmental program called "PROSPERA" sponsors every family interviewed. It is necessary to establish models with a local approach considering and promoting the community capacities to improve food security.

With that in mind the following community empowerment model was designed: Integrating different dimensions: Community empowerment: Integrated as a basic and transversal element in the model, to promote the collaboration and social innovation in the community. It is through motivational activities considering the cultural barriers and community context to generate change and awareness. This dimension also incorporates entrepreneur and financial skills development.

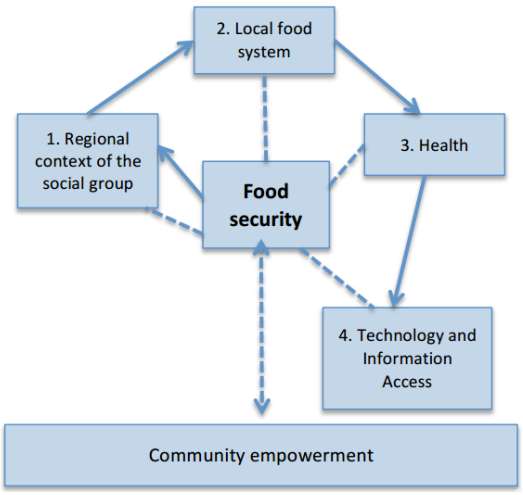


Fig. 3 Food security model in highly marginalized communities

1. Regional context of the social group: In order to create an efficient food security policy it is necessary to know the financial situation and income per family, also the physical and environmental characteristics in the region, and the social networks in the community to collaborate with formal and non-formal leaders.
2. Local Food System: To promote the local production it is necessary to know all the elements involved in the current way to produce food, with the aim to generate added value in the products and increase the variety of production.
3. Health: It is necessary to encourage quality nutrition through a healthy and diverse diet without this representing a big spend for families. And in the same way, the incorporation of more government policies and programs dedicated to increase health conditions.
4. Technology and Information Access: Here it is necessary to integrate in a systemic way the resources available in higher education institutions, as well as public and private organizations in the region, so the community can have access to them and create or improve skills.



Fig. 4 Group of volunteer participants to develop the food security model

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The model is currently being applied with families from Tatoxcac trying to create an open space for other researchers to continue. To evaluate the effectiveness of the model, a group has been defined within the region, but in a different community with almost the same geographic, social and economic characteristics; however, there will be no intervention in this place, to measure and compare the obtained results.

V. Conclusions and Future Works

In Mexico food security is an urgent topic that must be managed in the short term and prioritized in the public policies agenda, as it has been said more than 35% of the population in the country lives in marginalization conditions, which represents a high rate of people with problems to access an adequate diet.

Thanks to the diagnosis made using the ELCSA scale, it was possible to determinate that Tatoxcac has moderate food insecurity, and its population it is evidently concerned about economic income.

The evidence found shows that the implementation of "PROSPERA" has not been enough to fight food insecurity, as a consequence, one can say that other communities in high marginalization or very high marginalization might have the same result. On the other hand, it is proven that income capacity is not the only element to consider when talking about food security in the communities, it is also found the lack of diet variety is making evident the influence of factors such as culture, education and information access to achieve a healthy diet.

To improve the impact of public policies with a social focus like "PROSPERA" it is necessary to consider the context and culture of every region and understand how the people live and build their reality. Community empowerment will allow to develop strong and useful skills in the population, from the self-production of food, to the conformation of support networks with different institutions and players. The designed model pays special attention to the capacity of people to produce solutions. Developing as an initial phase, a diagnosis of the regional context, and then analyze the local food system, it also considers the health impact in people´s health, and last, but not least, the information and technology access, all those elements to diminish the rate of food vulnerability.

The food security model is currently in operation, and therefore through data and experiences, it is expected to improve to ensure its efficiency. It is important to say that during the development process of the model, interdisciplinary participation was necessary and we have as allies in the project agronomists, forestall engineers, administrators, health promoters, and so on, working in a systemic way with the main objective being social improvement. The actions to promote food security in high marginalization communities will continue.

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