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**ANALYSIS OF GREAT ACTORS OF THE CENTRAL AREA OF CHIAPAS, MÉXICO  
AND ITS CONTRIBUTION IN FOOD SOVEREIGNTY**

**Cadena-Iñiguez, P<sup>1</sup>.; Camas-Gómez, R<sup>1</sup>.; Coutiño-Estrada, BJ<sup>1</sup>.; and Turrent-Fernández, A<sup>1</sup>.**

<sup>1</sup>Researchers of the National Institute of Forestry, Agriculture and Livestock Research, Mexico. Experimental Field Center of Chiapas. CP 29140, km 3 highway Ocozocoautla-Cintalapa. Ocozocoautla de Espinosa, Chiapas, México

**ABSTRACT**

From one of the components of the model for the production of corn "Granos del sur" applicable under irrigation conditions in south-eastern Mexico, a forum of inter-institutional linkage was held in which 12 governmental and private institutions participated, represented by the headlines or staff with voice and vote to make decisions. The objective was to analyze the potential collaboration with human, material and economic resources among the institutions to promote the model for the production of corn under irrigation and its contribution to food security in Mexico. To this end, the methodology of social network analysis suggested by Rovere (1999) was followed. It was found that the existing links of knowledge, work, cooperation and association to support the producers of maize under irrigation are severely limited as more resources are committed from one institution to another due to the internal regulations of each institution, whatever their origin, governmental or private.

**Keywords:** food security, network analysis, major actors

**1. INTRODUCTION**

The national corn production in Mexico has been in deficit. This increased from 1.86 million tons per year in the years 1990-1994 to 4.37 million tons per year in the period 1995-1999 and 5.49 million tons in the years 2000-2002 (SIACON, 2003, cited by Turrent *et al.*, 2004). On the other hand, there is the great paradox that Mexico has 31 million hectares of farmland, of which 6.3 million are managed under irrigation and almost 25 million are rainfed. The annual freshwater resource is 1530 km<sup>3</sup> of which 147 km<sup>3</sup> are retained in the dams, 410 km<sup>3</sup> drain to the sea. 67% of the runoff occurs in the southeast, with minimal use in irrigation, with an amount almost twice higher than what is currently retained for irrigation in the irrigation districts of the country. During the autumn-winter cycles 1996-1997, 1997-1998 and 1998-1999, the "Granos del Sur" project was operated and resumed in 2015-2016. The strategy of the project consisted of making maize sowings in the autumn-winter cycle, in representative localities of the south-southeast region that had irrigation infrastructure and as a main feature is that they irrigate by gravity and lack of leveling of the land and tracing of irrigation. The main objectives were: Promote the production of corn under irrigation with high yield production technology, recommended by INIFAP. Efficient use of underutilized land that presents fertility and water conditions for a production exceeding 10 t ha<sup>-1</sup> of corn under irrigation with INIFAP technology. Train producers and technicians in the technology of production of corn under irrigation in the

autumn-winter cycle. Transfer to producers high yield corn production technology under irrigation.

## **2. MATERIALS AND METHODS**

The work area was in the state of Chiapas, in the southeast of Mexico. The first thing that was carried out in the operation of the project were the soil samples, in such a way that the optimal dose of fertilization could be recommended, mainly of macronutrients, later a characterization of producers was made, to know their social and productive characteristics, in which land, 25 parcels were established in three municipalities, where commercial hybrids of INIFAP, fertilization doses, especially NPK, sowing topology and irrigation types were tested.

In addition to the establishment of parcels on the land of cooperative producers, courses were given to producers using the field school methodology, widely developed by: (Gallagher 2003; Morales and Galomo, 2006; Morales, 2007; Morales, 2008; Cadena, *et al.*, 2013; Cadena, 2016; and Morales *et al.*, 2016). Demonstrations of method and results were carried out both to personnel of the extension service and to executives of the agricultural sector, in addition to the demonstrations to producers, in this case the producers of the 25 plots and managers of the state corn product system were invited, for the exchange of experiences through a meeting of producers and later a forum of inter-institutional linkage of municipal, state and federal sector agencies linked with the support to the production of the field. All the actions are included in the model for the production of grain "grains of the south" widely developed in: (Cadena, *et al.*, 2009, Cadena, *et al.*, 2015, and Cadena,*et al.*, (2018).

## **3. RESULTS**

From the encounter of knowledge of the producers, using the methodological tool of the logical framework with a facilitator for this purpose, it was found that: the shortage of rains in the spring-summer cycle of 2016, caused the water table to decrease, therefore, the producers had to invest in deepening their wells, in addition to the previous indicated that the high temperatures caused the plant to suffer greater stress and that due to the drought presented a greater number of irrigations were applied (high temperature lower photosynthesis). This affects the cost of production, increased incidence and severity of pests and diseases. Therefore, the producers determined that it is very necessary to support an efficient irrigation path, without ruling out that the physical and chemical analysis of the soil is an important factor for the achievement of high yields with irrigation, the climatic conditions of that time limit the efficient production of corn with irrigation under the artisanal management conditions of this system. So it is important that the project or the "Southern Grains" model with the participation of other institutions of the sector, that allow to solve, problems of infrastructure and equipment for efficient irrigation, and control of pests and diseases, without ruling out technical assistance and the opportunity of the necessary inputs for production.

As part of the model, the Institutional Forum was organized, attended by 40 attendees (10% researchers and 90% technicians), in addition to the actors of the Maize product system and a

private seed company, all linked to the various State institutions, the purpose was to present the results of the "Southern Grains Corn Project 2015-2016", and with this, to reinforce the linkage of the institutional actors with the National Forestry, Agriculture and Livestock Research Institute (INIFAP) and thereby be able to specify the potential supports that in the scope of their competences each institution and / or actor of the productive chain could provide the producers.

In the autumn winter 2015-2016 agricultural cycle, 25 hectares of maize were established, where hybrids H-561 white and H-380 yellow were validated, plus the control materials of the cooperating producers, these hectares were distributed in the municipalities of Villaflores, Villacorzo and La Concordia, Chiapas, for this purpose different water sources were used for irrigation, among others: dams, wells, ferris, canals and El Portillo dam. The potential results expected were compromised by the decrease in the supply of irrigation water, since the water resources were dried, where seven hectares were not harvested, since they only had water available until the corn production stage. Even with the problems detected, the average yield of grain in the 18 hectares harvested for hybrids H-561 and H-380 were 6,537 and 8,882 kg ha<sup>-1</sup>, respectively. The benefit / cost ratio was 2.1 with the H-380, which indicates that the production of corn grain under the established conditions is profitable.

Through the methodological tool of network analysis, indicated by Rovere (1999), the institutions that participate in support to the agricultural sector were interrelated and the study of great actors among the participants was carried out, in this point it is very important to highlight that, of Attendees at the forum, 12 institutions were headed by its owner or second in command. The methodology emphasizing five stages of relationship according to Rovere (1999), which indicate the following: a social network, is a set of actors (producers, companies, public and private institutions, and other actors), with an activity, and with a common objective, with different functions that combine to provide information, in order to promote individual and collective development.

There are levels in the construction of social networks, and in this process, knowledge helps us to organize ourselves, to monitor the depth of a network. These levels could be named as: recognition, knowledge, collaboration, cooperation and association, where each serves as support for the next.

**Table 1. Levels of construction of a social network of great actors**

Level	Actions	Value
1. Recognize	Destined to recognize that the other exists	Acceptance
2. Knowing	what the other is or is	interested in
3. Collaborate	Provide sporadic help	Reciprocity
4. Cooperate	Share activities and / or resources	Solidarity

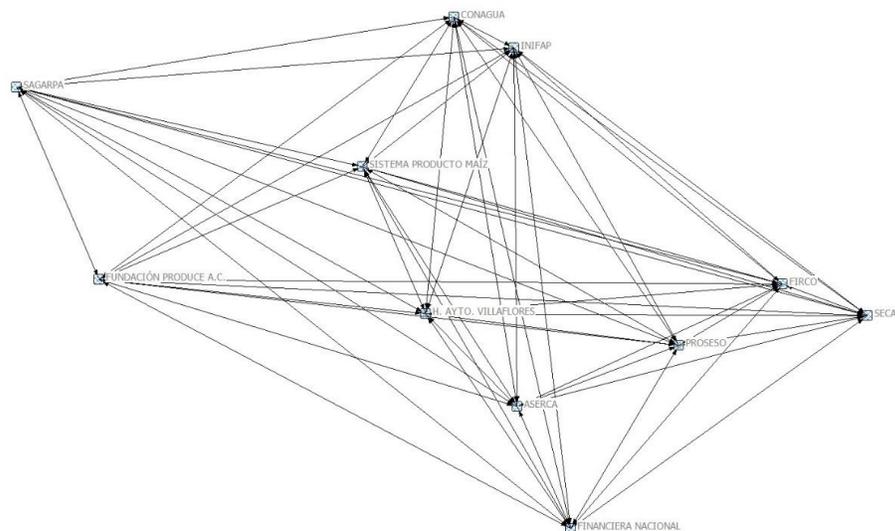
5. Partnering	Share objectives and projects	Trust
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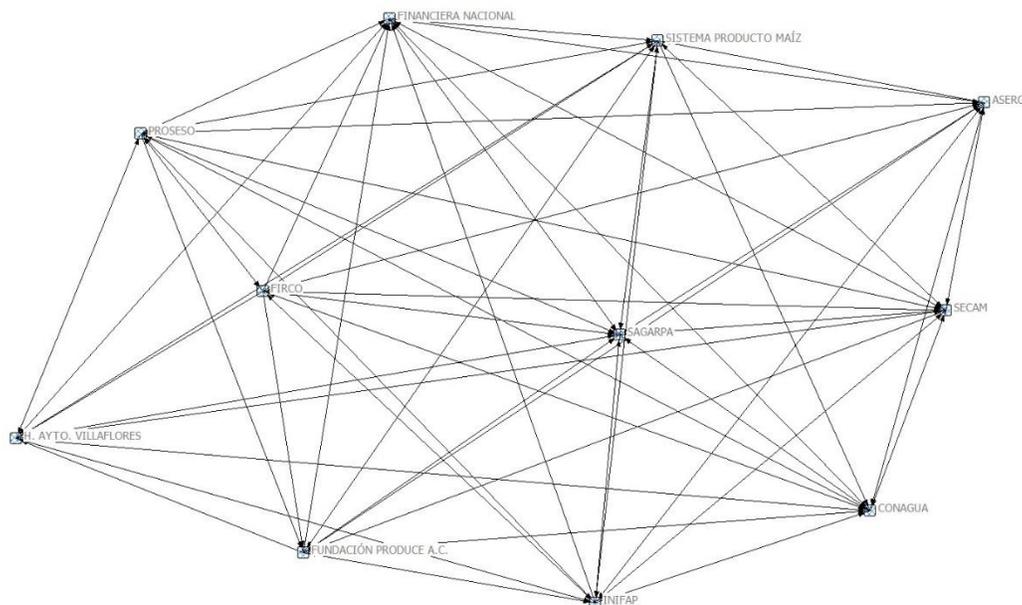
Source: Own elaboration based on: Rovere, M. (1999).

The participating institutions were, of the Federal Government: INIFAP, FIRCO, ASERCA, CONAGUA, SAGARPA, RURAL FINANCE and FIRA (Bank of Mexico), of the State Government: SECAM, Municipal Government: H. VILLAFLORES CITY COUNCIL, Private initiative: FUNDACIÓN PRODUCE CHIAPAS, A.C.; SYSTEM MAIZE PRODUCT, A.C. and PROSESO SEED. Based on the levels described by each one of them regarding the work of the others, the following was found:

At the level of recognition where each of them recognizes the other institutions, the following relationship levels were found: In Figure 1, it can be seen that everyone recognizes the institution as such and understands its work in the rural area, this recognition is given by the links between them and for the case of the level of "know" relationship, the level of fabric and links are similar since everyone knows the objectives, mission and mandates of each of the institutions that participated, the social fabric is seen in the following figure: a very dense network.

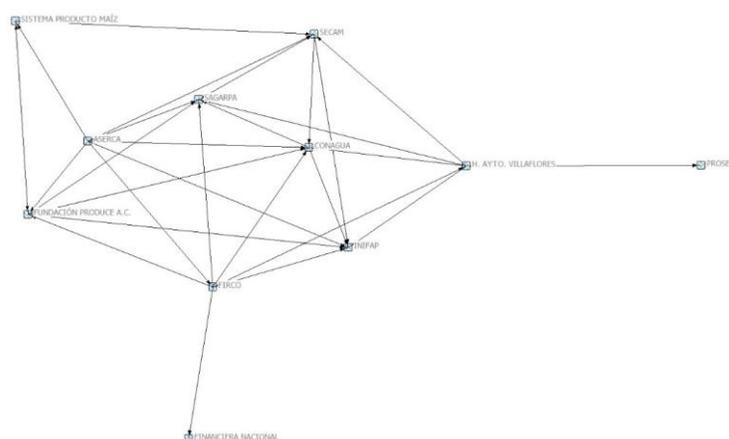
**Figure 1. Relationship level "Recognizes" among the participating institutions, Villaflores Chiapas, Source: own elaboration from Rovere (1999).**





**Figure 2. Relationship level "Knows" among the participating institutions, Villaflores Chiapas, Source: own elaboration from Rovere (1999).**

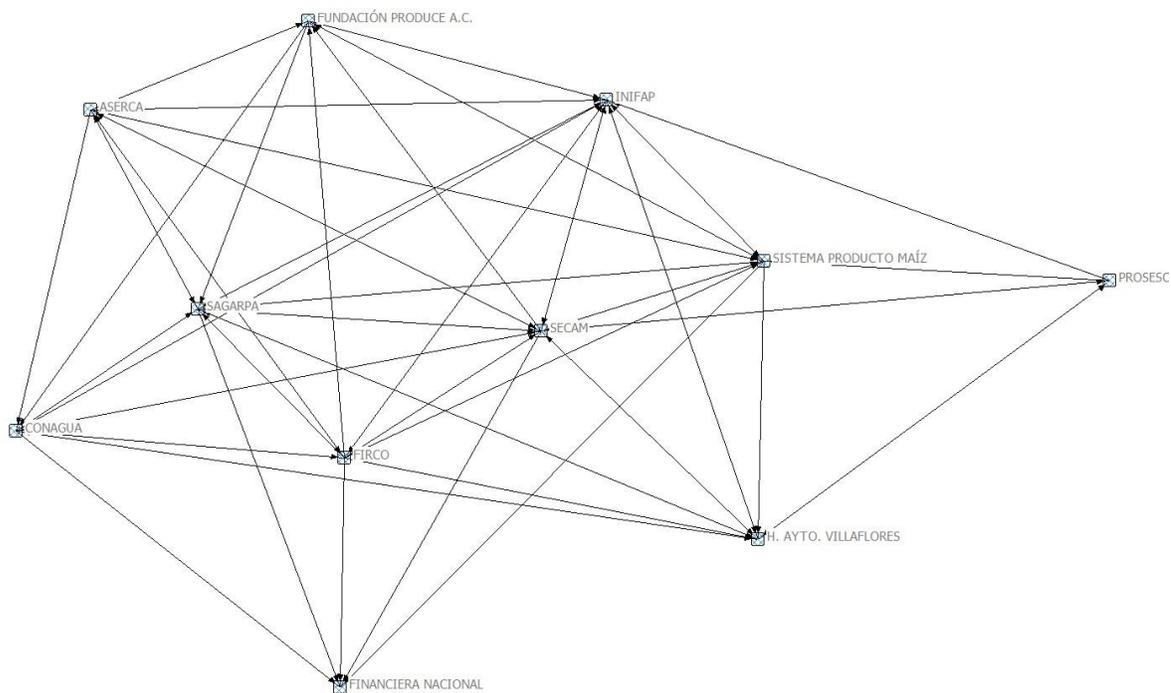
It is clear that all actors know what each one does within the scope of their mandate and what interference they have within public and commercial policies. On the other hand, part of the methodology establishes another type of relationship where the actors of the network "collaborate" with each other, which was manifested by them and plotted in the following figure



**Figure 3. Relationship level "Collaborate" between the participating institutions, Villaflores Chiapas, Source: own elaboration from Rovere (1999).**

In the figure it can be seen that the links between the institutions begin to fade, which in theory is normal since each one can "collaborate" with each other in the scope of their competence, given that they are of different levels of government, in addition of the individuals who benefit from the programs, of the twelve institutional relations, only two are outside, one of federal character and one commercial company, who only have a link with the other institutions, while the remaining 10, of some way or another collaborate in the operation of public policies depending on the level of government to which it refers.

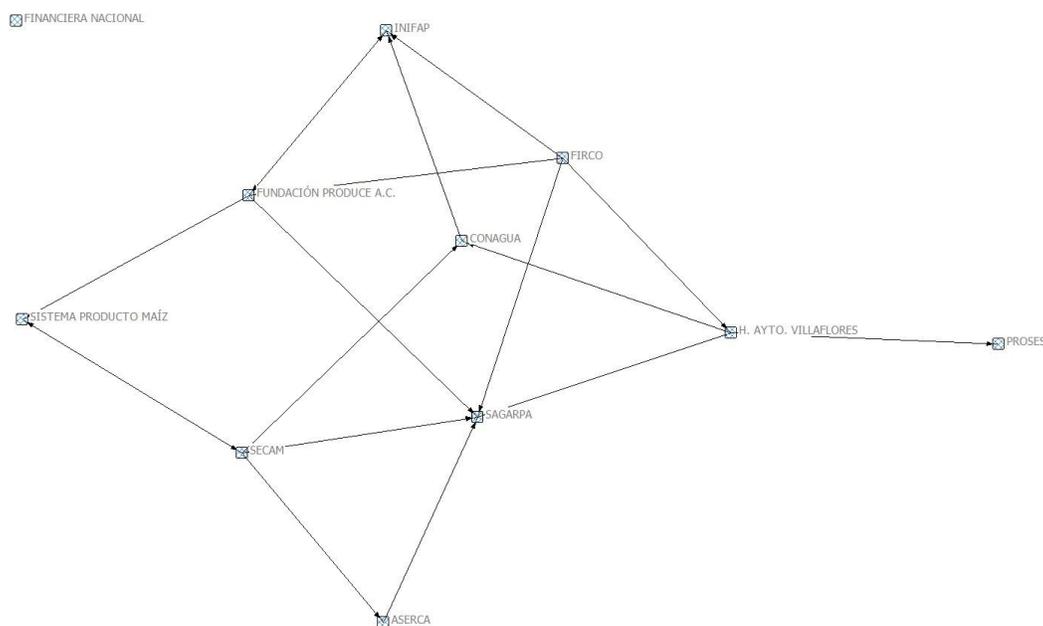
When asked if they "cooperate" among themselves; that is to say that they exchange resources and carry out activities together, the links were even less frequent, as can be seen in the following figure:



**Figure 4. Relationship level "Cooperates" among the participating institutions, Villaflores Chiapas, Source: prepared by Rovere (1999).**

The last of the referred links between the institutions was to "Associate" with what the institutions do not do, mainly due to the regulations that each of them has and for the scope of

their mandate, although they all intervene in the same territory, not all can, although they would like to associate to put as much material, financial and human resources for the development of some activities. In the following figure, we can see that the links between institutions are less and less, and that is because there are different internal regulations that must be met by each of the summoned



**Figure 5. Relationship level "Associate" between the participating institutions, Villaflores Chiapas, Source: prepared by Rovere (1999).**

In each graph and each interrelation of the study of large Chiapas actors shown above, they coincide with the work done by Zambada, *et al.*,(2013); and Jácome, *et al.*,(2016), in which they conclude what: the potential participation of institutions is limited by the internal regulations of each one, of the three levels of government in Mexico. For his part, Aguilar, (2015), found by doing research in at least six states in southern Mexico, which, to achieve levels of technology adoption through social network analysis found that: "it is overlooked that Agricultural innovation processes do not occur in isolation, but through the interaction of different actors, that is, innovation is determined by the pattern of interactions established by the producer with their peers and other actors. Therefore, there is a need to investigate adoption processes from a network approach ... "(SIC); On the other hand, Holmes, *et al.*, (2016), found in Colombia that, when reviewing the degree of interrelation between actors and institutions in 50 identified articles, authors from 28 different institutions participated; 70% have been published by researchers belonging to the same institution. The findings of this study allow us to conclude that the actors that generate knowledge about rural extension in Colombia present a scarce intra and interinstitutional articulation which makes it urgent to strengthen public policies and incentives to foster relationships between research groups and between institutions. . For this reason, the

links between the institutions and the institutional framework have to do with the potential supports that can be granted to the producers participating in the southern grain project, which, as a pilot project, and according to the results obtained in this year dissimilar, with respect to the atypical characteristics of the storm that had its repercussions in the decrease of the "napa" phreatic, and with it the abatement of the sources of water supply. The institutions represented agreed at the time of intervention and agreed that, in order to support current and potential producers to continue producing corn in irrigation, the necessary irrigation point: the organization of producers, the productive projects to be channeled to the different windows that are opened for such purposes and to enroll in marketing support programs.

#### **4. CONCLUSIONS**

Although the Institutional Linking Forum was held and commitments were made among the main actors; it is also opportune that no one in writing was manifested in such a way that there were tangible commitments in time and space to plan a second stage of the corn production project, on a larger scale and led by the municipal mayors where it was tested and validated the production model of southern corn grains. The experience obtained in the present study, leads to establish that to guarantee better results to the extensive application of the model of production of corn under irrigation Granos del Sur, a reengineering of the same is necessary that includes adaptability studies of hybrids of white and yellow corn, as well as aspects of irrigation technology, population density, sowing dates and nutrition, according to the new conditions imposed by climate change.

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