

## **Attitude of the agricultural producer before the transfer of technology in the central region of Sinaloa**

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### **Abstract**

The attitude of the agricultural producer in the central area of Sinaloa (Mexico) was evaluated in the face of technology transfer, to generate strategies that facilitate technological innovation in agriculture. A questionnaire was used for the producers, who were selected using the method of batch sampling of quality control (LQAS), conforming five lots, applying 19 questionnaires in each. It was found that most of the producers use the new technology once applied by other producers that had positive results, they resort mainly to the supplier to solve a technical problem, the farmer does not mean things that do not affect him immediately, but when considers that his interests are affected directly and immediately, his attitude is different. It is does not care about the meetings on technology transfer because he does not know the usefulness of them, the behavior of the farmer is influenced by the opinions of family members and suppliers, the main source of information on agricultural technology is the supplier of inputs, but also they are informed through the friend or relative, as well as; through demonstrations on technological developments and agricultural exhibitions.

**Keywords:** conduct, family, innovation, provider.

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In the present research work, technology transfer is studied in the context of the problem of the rural environment that the Mexican government has tried to solve over several years and from which the Sustainable Rural Development Law is formulated (LDRS), which in its article 32 indicates that the actions and programs established to boost rural development will be aimed at increasing productivity and competitiveness in rural areas, in order to strengthen employment and raise the income of producers.

For this, in the same article in section I it is indicated that the following will be promoted: the impulse to research and technological development, the appropriation of technology and its validation, as well as the transfer of technology to the producers (Cámara de Diputados del H. Congreso de la Unión, 2012). The problem of agricultural unproductivity also applies to Sinaloa, where in 2013, 838 278.58 ha were planted in the irrigation area and 369 895.59 ha in the temporary area. Between both production systems there are differences in yield, for example, in corn under irrigation system, in 2013 an average of 10.13 t ha<sup>-1</sup> was obtained and in temporary it was 1.04 t ha<sup>-1</sup> (SIAP, 2013).

Also, within the irrigation zones there are also differences in productivity, although there is technology to increase production and quality per unit area, as there are production techniques that are more environmentally friendly and reduce production costs, which are not widespread among farmers, so their application would allow greater profitability and sustainable management of natural resources.

Most of the producers do not immediately adopt the new technological proposals generated in the research centers. For example, Fundación Produce Sinaloa has recommended sowing corn seed in double rows or a separation between rows of 50 cm to obtain higher yields compared to traditional separation (75 or 80 cm), but producers have not yet adopted it, since the technological transfer implies a planned transfer of the information and techniques of how to carry out the activities of adoption, assimilation and learning of skills and knowledge (Herrera, 2006), therefore it is necessary to have knowledge about the attitude of the producer.

In addition to the above, there are other factors that limit the correct application of the new technology (Damián *et al.* (2007). In the process of diffusion of the technology, the producer can go through different stages, in which the different attitudinal elements, such as value of importance, behavior, intention and knowledge (Corro, 2007). There are agricultural producers that reject the proposal of technological innovation, although some that do adopt technology immediately.

Knowing the attitude of the agricultural producer to the proposal of new forms of agricultural production is very important to generate strategies that are efficient in the process of technological innovation, since the processes of technology transfer require promoting more producers to test all or at least some of the technological components to achieve the transfer of knowledge (Hernández *et al.*, 2008). The objective of the work was to determine the attitude of the agricultural producer before the new proposals of technological innovation, to generate strategies that allow to facilitate the technological innovation in agriculture.

The study was conducted in the central area of the state of Sinaloa, located between 22° 20' and 27° 07' north latitude and between 105° 22' and 109° 30' west longitude and an altitude that varies from 0 to 2 520 m (INEGI and Gobierno del estado de Sinaloa, 2012).

Producers were chosen by the batch sampling method of quality control (LQAS); (Davis *et al.*, 2009; FAO, SAGARPA, 2010). Five lots were formed based on the rural development support centers (CADER), which are in the center of the state. The Culiacan Altos CADER and the Badiraguato CADER were merged, since temporary agriculture is developed in both. Also, the Navolato CADER merged with El Tamarindo, because in them there is a geographical interaction and in both of them irrigation agriculture is developed. The resulting five lots are: Culiacán Valle (1); Eldorado (2); Angostura (3); Navolato-El Tamarindo (4); and Culiacán Altos-Badiraguato (5).

The sample size was calculated based on LQAS tables, with a 95% confidence level, obtaining a sample size of 19 producers per batch, for a sample size of 95. Subsequently, a simple random sampling was performed to select to the producer to survey. For this, the sampling interval was estimated by dividing the number of producers in each batch by 19 as indicated by the model. In addition, the list of beneficiaries by lot was sorted alphabetically and assigned a number in ascending order.

Subsequently, the 19 numbers were calculated systematically from the first randomly selected value in the Excel spreadsheet, indicating that the minimum value is 1, while the maximum value was the sampling interval. Provided that some producers did not respond to the interview, a list of replacements was made equivalent to 20% of the total sample per batch, based on the procedure described above.

Surveys with open and closed questions were used, with three sections: a) Identification of the Producer, in which questions such as education level, sex, age; b) dissemination of technology transfer; and c) attitudes, which were subdivided into value of importance, intention, action, control and regulation.

The surveys were applied during the months of February and March 2012. For this, the questionnaire was examined by means of a pilot test with different producers to detect editorial problems that would lead to the misinterpretation of the question, as well as to calculate the duration of the interview, the logical sequence of the questions, see if the measurement scales were sufficient, the coding and processing of the information. To determine the reliability of the questionnaire, the Conbrach Alpha reliability coefficient was applied, which allowed the consistency of the results obtained to be evaluated (Table 1). This coefficient was measured by the variance of the items and the variance of the total score.

**Table 1. Reliability coefficients of the questionnaires used.**

Attitude variable	S <sup>2</sup> population	S <sup>2</sup> of the sum of items	Num. of items	Cronbach's alpha
Value of importance	22.9	126.22	18	0.87
Subjective regulations	28.74	94.71	21	0.73
Perception of control	14.05	55.84	10	0.83
Intensity	9.86	36.01	7	0.85
Actions	14.05	55.84	10	0.83

With regard to the search for technological information on agriculture, it was found that 3% of them never do, 18% almost never does not, 37% sometimes, 23% almost always seeks information and only 18% of producers are always trying to obtain information that allows you to improve your production process. In addition to the above, the agricultural producer considers that when a problem is always presented (40%) or almost always (35%), it is based on his experience as a producer to solve it.

It was found that 2.04% of the producers apply the new technology when participating in the validation of technology together with the researchers, 18.37% apply the new technology as soon as they have knowledge of it, 6.12% do it very rarely, while 37.76% apply the technology once you saw that other producers applied it, 33.67% do it until you see positive results in the other producers and only 2.04% never apply the new technology. This coincides with the diffusion curve of Rogers technology (2003). However, even if the diffusion curve is maintained, producers can be influenced so that the assimilation time decreases among each group of farmers, disseminating the results obtained by the first producers adopting the new technology.

It was observed that 43% of the producers have internet service in their homes; however, only 7% of producers use it. In this regard, González (2012) indicates that there are opinion influencers, who are those who, when they find information on the internet that they like and attract attention, they discuss it with their acquaintances. If the producer does not access this service, his relatives do, then it is important to turn to the influencers to transfer technology.

It was found that 27% of the producers always turn to the supplier of inputs to seek advice on a problem related to agricultural production and 37% almost always resort to it. This reflects the importance that the input supplier has for the producer. On the contrary, 66% of producers never or almost never turn to an educational or research institution to request advice. One of the reasons for this may be that there are no adequate linking mechanisms between institutions and producers, in addition to the fact that the researcher discloses his knowledge through journals and scientific events, to which the farmer does not have access.

It was observed that the farmer gives more importance to the things that affect him immediately, because 57% of the producers give too much importance to the application of nitrogen to the crops and 31% give it a lot of importance, so he always performs the applications of this nutrient. It also gives a lot of importance to the quality of the seed, because it knows that its characteristics are determinants in crop yield. This means that the behavior of the producer will be influenced according to the importance he gives to a given phenomenon (Ajzen and Fishbein, 1980).

On the other hand, it was observed that only 11% of the producers have technology transfer events. While 28% transfer meetings are of medium importance. One of the reasons for these results is that they do not know the usefulness of these events. The producer rules his behavior by the opinion of the relatives. A large percentage do so to satisfy the opinion of the family, since 38% indicate that almost always and 18% point out that whenever they make adjustments in their way of producing it is to please family members.

In this regard, Bravo *et al.* (2006) indicate that the family influences so that the young adult acquires a certain product. Many of the agricultural producers have had, have or will have their children studying in an agricultural school. This may be the means for technology to be transferred to farmers. Another character that greatly influences the producer's behavior is the supplier of inputs. The farmer considers that the supplier wants the new technology to be applied. 54% believe that the supplier almost always wants them to apply the new technology, while 34% indicate that they want to innovate all the time.

52% of the producers think that government authorities are not interested in the application of new technology in the field, while 30% think that they are almost never interested in the producer applying new technology. In the short time it is very difficult to change the opinion of the producer. Given this, the government can use other instances, such as the research institutions and the providers themselves. 28% of producers believe that the family always wants them to apply the new technology, while 35% perceive that the family does want to change their way of working the land.

Producers believe that the duration of the meeting should not be longer than 2 hours, that the place for meetings to be held is in the field or in the space where producers regularly meet. It is important to hold work meetings in the appropriate space for this. That is why you must go previously to the place where the producer meets daily, and then take them to other spaces through motivation (Salinas *et al.*, 2006). The vast majority of producers believe that meetings on technology transfer were on Saturdays or Sundays at 10:00 h.

## Conclusions

To make technology transfer more efficient, we must rely on producers whose objectives merge with those of their membership group. They will be responsible for transmitting their knowledge to other people in the community. It is must seek collaboration with the companies that provide supplies so that their technicians attend workshops where the technology is transmitted and validated by the different research centers of the entity, so that they are the vehicle through which the technology is transferred to the producers. The producer must be motivated, first to attend the meeting or the field demonstration, then have the ability to motivate him to apply the proposed new technology, making him aware of the benefits he can obtain in them.

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