

# University for development agencies and innovation UNACH proposal to the problems of the agricultural sector in Chiapas

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## Abstract

The Modelo de Agencia Universitaria para el Desarrollo (AUDES) created by Universidad Autónoma de Chiapas is formed by a group of teachers with a vast experience in technological development and innovation with a vision of relation with the agriculture. That manages to integrate the different actors of agricultural development as a supporting pillar, consultants and technological proposal generators and as a strategic partnership that contribute to the development of the agricultural sector and social enterprise and sustainable vision. The creation and implementation of the UNACH AUDES allowed having mechanisms to link all the potential of the university and the productive environment, creating bonds of cooperation and dialogue, as well as strategies and accurate dynamic response to the real problems presented by the agricultural sector, which has earned the recognition in the state and international, in areas of social and economic importance to the state, such as the cacao tree and organic milk production, this allow positioning the model of UNACH AUDES as an innovative example of effective impact of the university to the society, getting involved in its development.

*Key words:* Innovation – Transfer – Agricultural development

## Introduction

Today humanity faces serious problems related to poverty, marginalization and social exclusion of large sectors of the population, especially those living in rural areas. We also found environmental problems such as global warming, water pollution, soil erosion and increasing destruction of natural resources.

The state of Chiapas, is not immune to these problems, despite the great natural wealth, there are serious social, environmental and productive problems. It is considered that the state's economy based primarily on agriculture. However, the productivity of many crops and livestock systems is low; it is also noticeable how little modernization and receiving a small technical assistance to producers.

At present there are 20 product systems in Chiapas, 14 related to agriculture and six related to livestock farming. Of these, they stand

out for their environmental impact and economic and social importance, the cocoa product system, the product system and the system bovine milk cattle meat product.

For Mexico, cocoa rather than a food product represents tradition, a rich cultural heritage to preserve, a great source of natural wealth, generating jobs and economic livelihood for more than 50 principal thousand families cocoa production in Mexico is concentrated mainly in the states of Tabasco and Chiapas. The area devoted to this crop and annual production has been declining (Ramirez, 2008). The cocoa sector in Mexico has serious difficulties; in 2002 were reported 83.174 ha. of cocoa with a production of 46.194 tons of dry cocoa, in 2008, there were only 27.549 ton. and reported an area of 61.092 ha. According to estimates by the United Nations Food and Agriculture Organization (FAO) Mexican cocoa production decreases at an average rate of 0.5% per year, this may increase in the coming years. The average yield per hectare is estimated at 300 kg. This progressive decreasing in production has generated a crisis, directly affecting over 50,000 families, thereby increasing poverty in these communities, in itself already depressed. The migration of its people has generated further environmental degradation by the demolition of the plantations, and the shortage of Mexican chocolate industry, which has to import cocoa beans from other countries.

Livestock production is considered the second most important economic activity in the state. Approximately 2.8 million hectares are devoted to this activity and 87% is occupied by cattle, beef cattle inventory in the state is 2.3 million head, which generate 253.000 calves at weaning and 300 million liters of milk annually.

In the area of organic production, Chiapas ranks first nationally in the production of organic food, where producers 67.000 220 organizations engaged in this activity over 100,000 hectares. They grow 23 different products, highlighting the coffee, honey, cocoa and milk. The organic farming occupies about 3,000 ha., are operated more than 3,500 heads and produce about 2 million liters of milk annually. The municipalities of Tecpatán and Mezcalapa are among the most important at both the state and national levels in organic milk production. From the standpoint of social, economic and environmental, is becoming increasingly important in organic livestock Chiapas (Ruiz-Rojas, 2008).

In the case of Chiapas Ruiz-Rojas (2010) notes that in entity engaged around 2,300 hectares to cattle organic dual purpose. In the municipalities of Tecpatán and Mezcalapa are 80 ranches with 2300 ha. and 3,500 head of cattle, of which about 1,000 are milking cows that pro-

duce a total volume between 4 and 5,000 liters of milk. In 2010, with the support and advice of the UNACH, the Group Organic Milk Producers "The Pomarroza", from the Ejido Emiliano Zapata, was certified organic. Earlier this year the Group Organic Milk Producers "Malpaso" was also certified organic, becoming, in the main groups of organic milk producers in Mexico.

In response to these productive and substantial problems compliance with its functions, the Universidad Autónoma de Chiapas has been generating actions to the various problems that arise, so that the current administration headed by Rector Mtro. Jaime Vals Esponda mainly focuses its actions towards the Generation and Innovation Management (Academic Project from 2010 to 2014), the benefit of the Chiapanecos inhabitants.

Considering the leadership in research, innovation and generation capacity implement technology transfer programs by a group of teachers from the UNACH, the University, through the Dirección General de Investigación y Posgrado and the Consorcio de Ciencias Agropecuarias, promoted a series of activities to organize and promote collegial work for integration and structuring of the proposal for the formulation of Agencia Universitaria para el Desarrollo e Innovación Chain-Chocolate Cocoa "Cocoa-Chocolate AUDES", based on the "Institutional Program Agricultural Productivity Growth in Chiapas 2007-2018", drafted the first proposal of the Agency.

After this, there were two workshops for analysis, discussion and enrichment of the proposal, attended by directors of the Comité Estatal del Sistema Producto Cacao, representatives of producer organizations in the state of Chiapas, officials Fundación Produce Chiapas, and officials and researchers from the Universidad Autónoma de Chiapas. So officially in June 2010 establishing an Agency for the Development of University-Chocolate Cacao a structure that is aimed at strengthening the competitiveness and sustainable development of the cocoa-chocolate food chain in the state of Chiapas, through innovation technology.

With the same basis, in June 2011 establishing an Agency for Development University for the Production of Organic Milk, as an initiative of the Universidad Autónoma de Chiapas, which is considered a strategic priority area for sustainable development of the State of Chiapas and is an entity of research, technological development, innovation, training, production and services, acting as the legal and structural framework of the University, whose corporate purpose is

contemplated Scientific and Technological Development, oriented to the domain, the generation, the dissemination and the use of knowledge, the innovative technologies and the products, in order to contribute to improving the competitiveness of the supply chain quality milk in the state of Chiapas.

## **The model of the University Agency for Development and Innovation UNACH**

### **Methodology for the Formulation of AUDES**

For the formulation of the proposed Agencia Universitaria para el Desarrollo e Innovación de la Cadena Cacao-Chocolate, "AUDES Cocoa-Chocolate", the Universidad Autónoma de Chiapas through the Dirección General de Investigación y Posgrado and the Consorcio de Ciencias Agropecuarias promoted a series of activities to organize and promote collegial work for integration and structuring of the proposal. On December 4, 2009, the UNACH hosted a working meeting attended by cabinet members university, the Dean of the University and representatives of the Comité Estatal del Sistema Producto Cacao del Estado de Chiapas, as a result of this meeting signed a letter of intent, which was the basis for formalizing collaborative work to develop research, technological innovation, technology transfer and training in cocoa-chocolate chain in the state of Chiapas.

From this first stage was made the first proposal for the agency. Then there were two workshops for analysis, discussion and enrichment of the proposal, attended by directors of the State Committee of Cocoa Production System, representatives of producer organizations in the state of Chiapas, officials Fundación Produce Chiapas, and officials and researchers from the Universidad Autónoma de Chiapas.

The approaches of Cacao-Chocolate AUDES are aimed at strengthening the competitiveness and sustainable development of the cocoa-chocolate food chain in the state of Chiapas through technological innovation.

## Organization

The Agencia Universitaria para el Desarrollo e Innovación (AUDES) is a research, technological development, innovation, training, production and services, acting as the legal and structural framework of the University, whose corporate purpose is contemplated the scientific and technological development, oriented domain, generation, dissemination and use of knowledge, innovative technologies and products in order to contribute to improving the competitiveness of the agrifood chains in the state of Chiapas.

The AUDES is a business-minded organization, staffed by professionals with technical and scientific profiles, women and men, with multidisciplinary training, disciplinary experience in primary production, industry and enterprise development.

## Objectives

**General:** Contribute to integrated, competitive and sustainable food chains through Research, Technological Development, Innovation and Business Development, and Social Entrepreneurship.

**Strategic:** Placing the AUDES of UNACH as a model to the forefront of knowledge, technology and innovation in agrifood chains.

1. Promote organized production base with highly competitive business vision.
2. Promote the value added to agricultural products through organic production, processing and industrialization, development of products.
3. Build the foundation for the creation of a favorable investment environment based on innovation in agrifood chains.
4. To promote greater dissemination and transfer of science, technology and innovation for food chains.

## The field of agricultural AUDES

The AUDES is based on the functions of the University: research, teaching and extension and is oriented to the sustainable development of food chains, serving the needs of technology, training, production and services of producers, manufacturers and consumers.

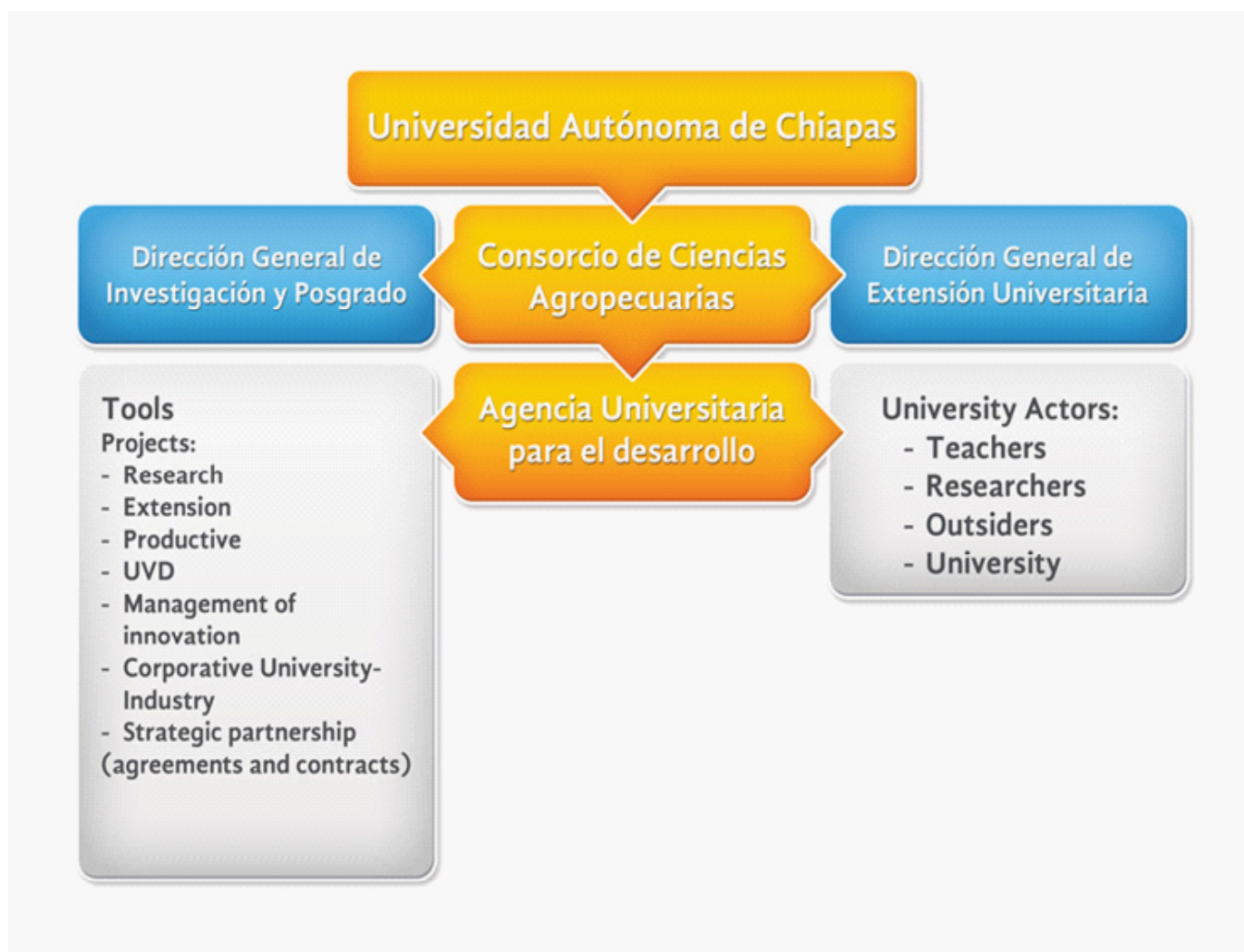


Figure 1. Tools and actors involved in the Agricultural AUDES.

In teaching, AUDES staff participates in undergraduate and graduate programs of the Consorcio de Ciencias Agropecuarias: Master of Science in Tropical Agricultural Production, Agro Specialties Tropical Plantation, Organic and Sustainable Agriculture Plant Health. At the same time, the AUDES is a space for students of these programs that develop practical work and research professional residences for thesis.

The results of the research, technological development and innovation, as well as impacting on the objectives and indicators of *Plan Institucional de Desarrollo 2018*, allow the connection with society in two ways: The first, through the dissemination of knowledge

through participation in scientific and academic publishing, technical and scientific articles, books and educational material. In another sense, it was establishing linkages with the productive sector industry and enterprise that leverage the results and innovations through technology, commercialization, and management of industrial property (patents, trademarks, designs and plant varieties, including other), production and service projects.

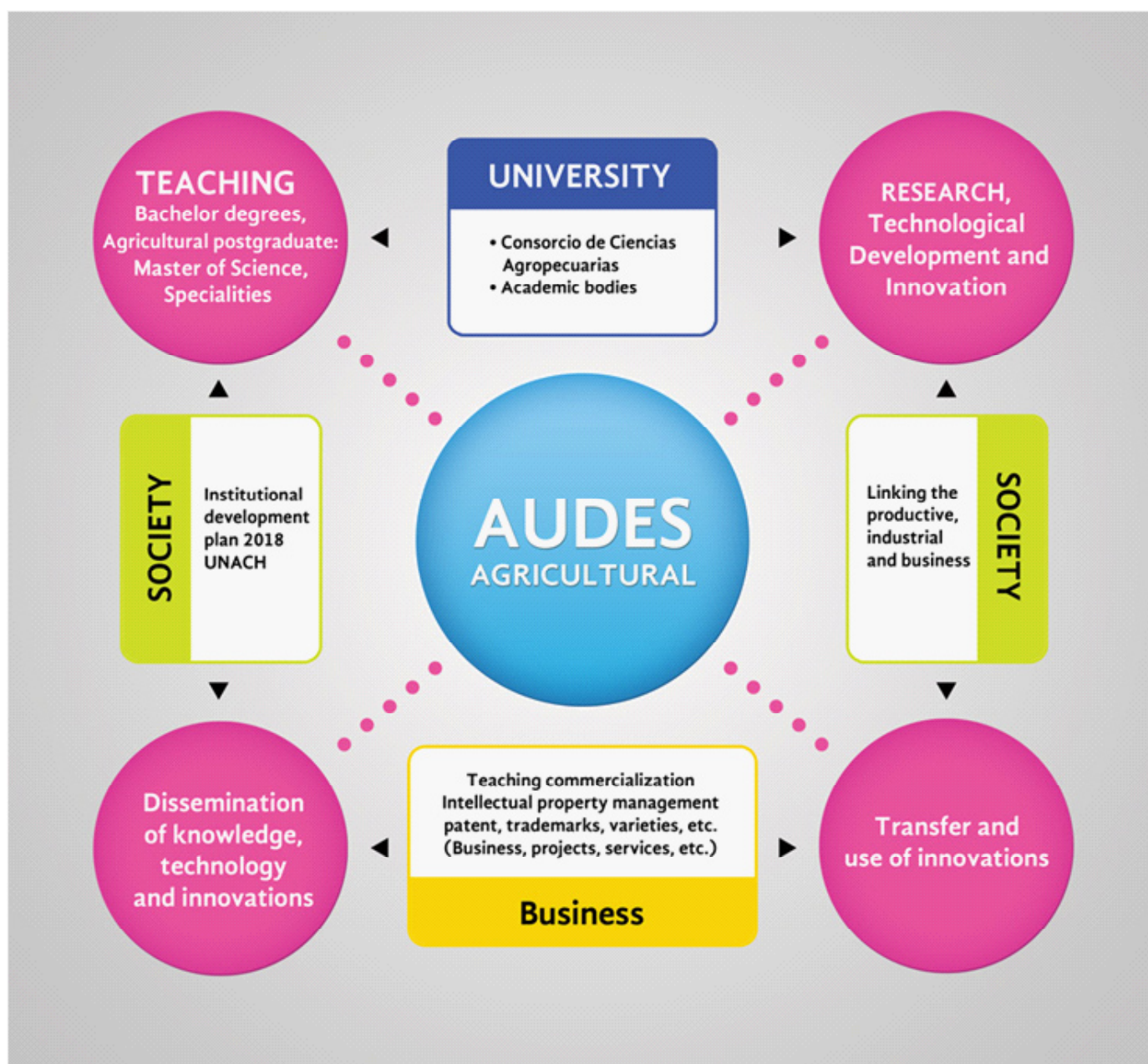


Figure 2. AUDES field of agriculture.



## The concept of innovation in agricultural AUDES

The AUDES endorses the concept of innovation defined by the Organization for Economic Cooperation and Development (OECD, 2009) as a complex process that brings ideas to market in the form of new or improved products, technologies or services. A technological invention culminating in the production, distribution and operation of a new process, product, business, business model, or model of logistics service to users. According to this organization, scientific research, technological development and innovation are essential precursors of competitiveness and economic growth.

Thus both the Cocoa-chocolate AUDES and the organic milk AUDES, from the Universidad Autónoma de Chiapas, integrated innovation as a strategic element for the development of its functions, and pretending to combine scientific and technological development, with the domain, the generation, dissemination and use of knowledge, innovative technologies and products, in order to contribute to improving the competitiveness of the agri-food chains in the state of Chiapas, impacting on the consolidation of the academic bodies and quality assurance programs Education and Graduate Degree.

In this sense, incorporates the joint and strengthening the chain “education-basic science and applied technology and innovation”, part of the proposals of the Ley de Ciencia y Tecnología (2002), renovated in 2009, the Ley de desarrollo Rural Sustentable (2001), renovated in 2007, and the policies of the Programa Especial de Ciencia, Tecnología e Innovación 2008-2012 implemented by the National Council for Science and Technology.

Technologies, products, designs, processes, trademarks, slogans and logos, among others, to be derived from the research and technological development will be protected (Figure 3) by registering with the Instituto Mexicano de la Propiedad Industrial (IMPI).

In the case of plant genetic resources represented as varieties, hybrids and clones and varieties of cacao tree species, timber, fruit and ornamental, developed as components of cacao agroforestry system, as established by the Ley Federal de Variedades Vegetales (1996) and Ley Federal de Producción, Certificación y Comercio de Semillas (2007) they shall be registered with the Servicio Nacional de Inspección y Certificación de Semillas (SNICS) of SAGARPA, Mexican organism responsible for the registration of property rights and issuing the Title of breeders of new plant varieties.

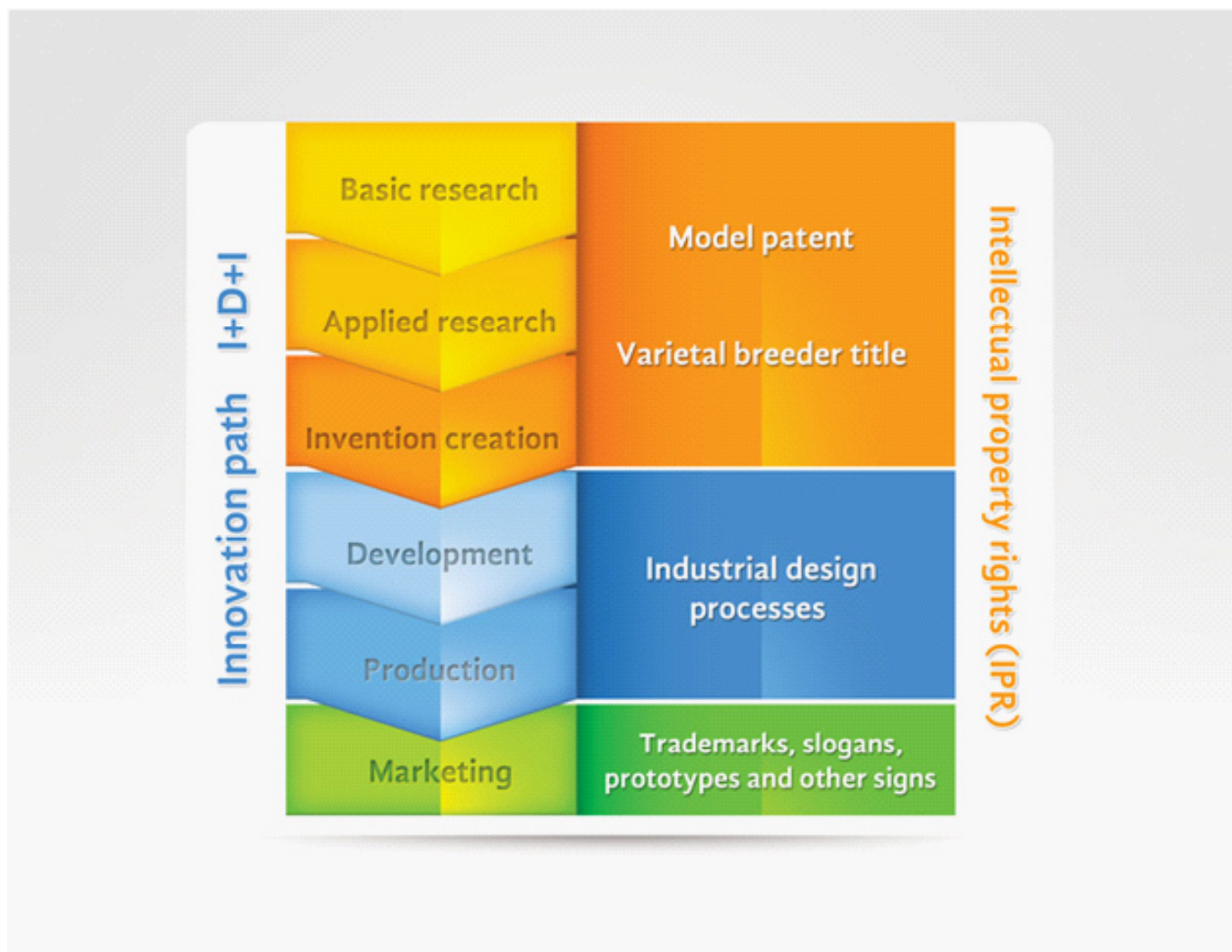


Figure 3. Articulation between scientific research, technological development and innovation and intellectual property rights and industrial AUDES raised in the UNACH

### Ecosystem approach to agricultural AUDES

The ecosystem approach (Altieri and Nichols, 2000) is a strategy for agroecological management of natural resources (land, water and living resources) with technology components that promote conservation and sustainable development.

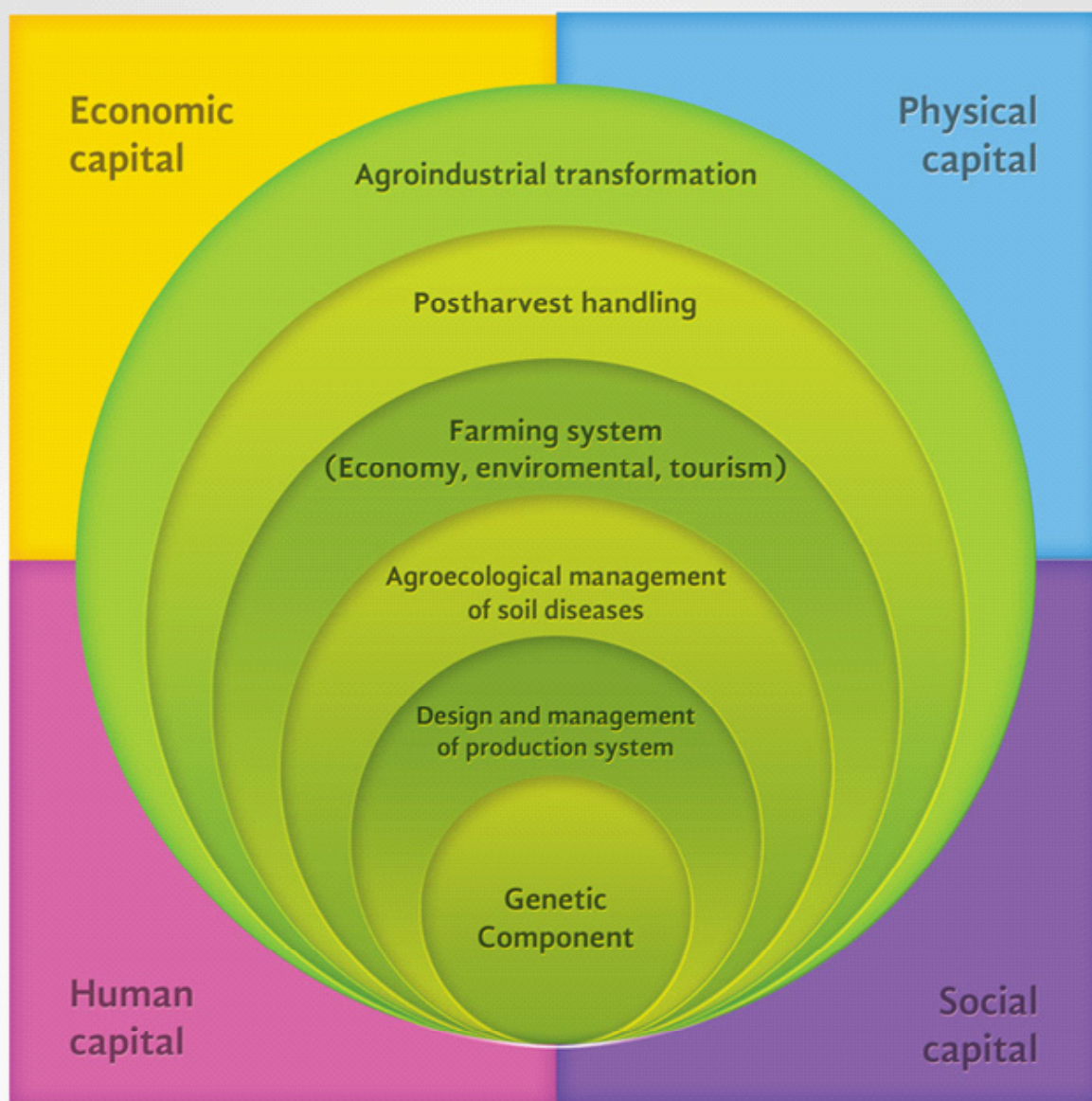


Figure 4. The ecosystem approach and development of economic capital, physical, human and social AGRICULTURAL AUDES.

It is based on the application of appropriate technologies and practices, focused on levels of biological organization, covering the structure, components, processes, functions and interactions both within and in the vicinity of the agro-ecosystem, with a high biodiversity, which can be well used. This approach poses a flexible

management of technology components, which although developed individually, are integrated into the agro-ecosystem to study their performance and profitability together (Figure 4).

The concept focuses primarily on the economic, social and environmental, and ecosystem services, and environmental agro-ecoturistic obtainable agricultural systems. It links the importance of conservation and sustainable use of these different elements to achieve long-term economic benefits. In this approach, people are integral components of the ecosystem approach coincides with the axes of sustainable rural development.

Under this perspective, AUDES organic milk and Cocoa-chocolate, intend to boost the development of organic production since the beginning of this type of agriculture promote the ecosystem approach, while allowing to add value to the raw material.

## **Operational Strategy of agricultural AUDES**

For its operation the Agricultural AUDES have a participatory approach, systemic and holistic, based on the components of sustainable rural development (Figure 5).

The point of departure is the framework in which the participation of producers, government representatives, academics and researchers and other stakeholders in the sector, based on an analysis of the Fortalezas, las Oportunidades, las Debilidades y Amenazas (FODA), problems were identified and defined the strategic actions to implement. To finance the activities of the Agency can point sources of international, national, state, municipal, public and private funds.

Thus, for the development of research and technological development has considered the possibility of obtaining funds from CONACyT in its various forms (Joint Funds, Sectoral Innovation) and Fundación Produce Chiapas. In these instances, the base will be the formulation of projects under these organisms calls issued each year.

For extension projects, production and service is considering raising funds from the programs implemented by the Federal Government (SAGARPA, SEDESOL, SEMARNAT, and CONAGUA), State and Municipal Government. In another perspective, there is the search for additional resources through contributions from NGOs and industry and business.

It is also possible to consider the contributions of the State Committee of the Product System, institutional funds of the Universidad Autónoma de Chiapas, including resources for the implementation of Unidades de Vinculación Docente (UVD) and Institutional Research System SIINV-UNACH, the contributions of producer organizations and business and industry and abroad.

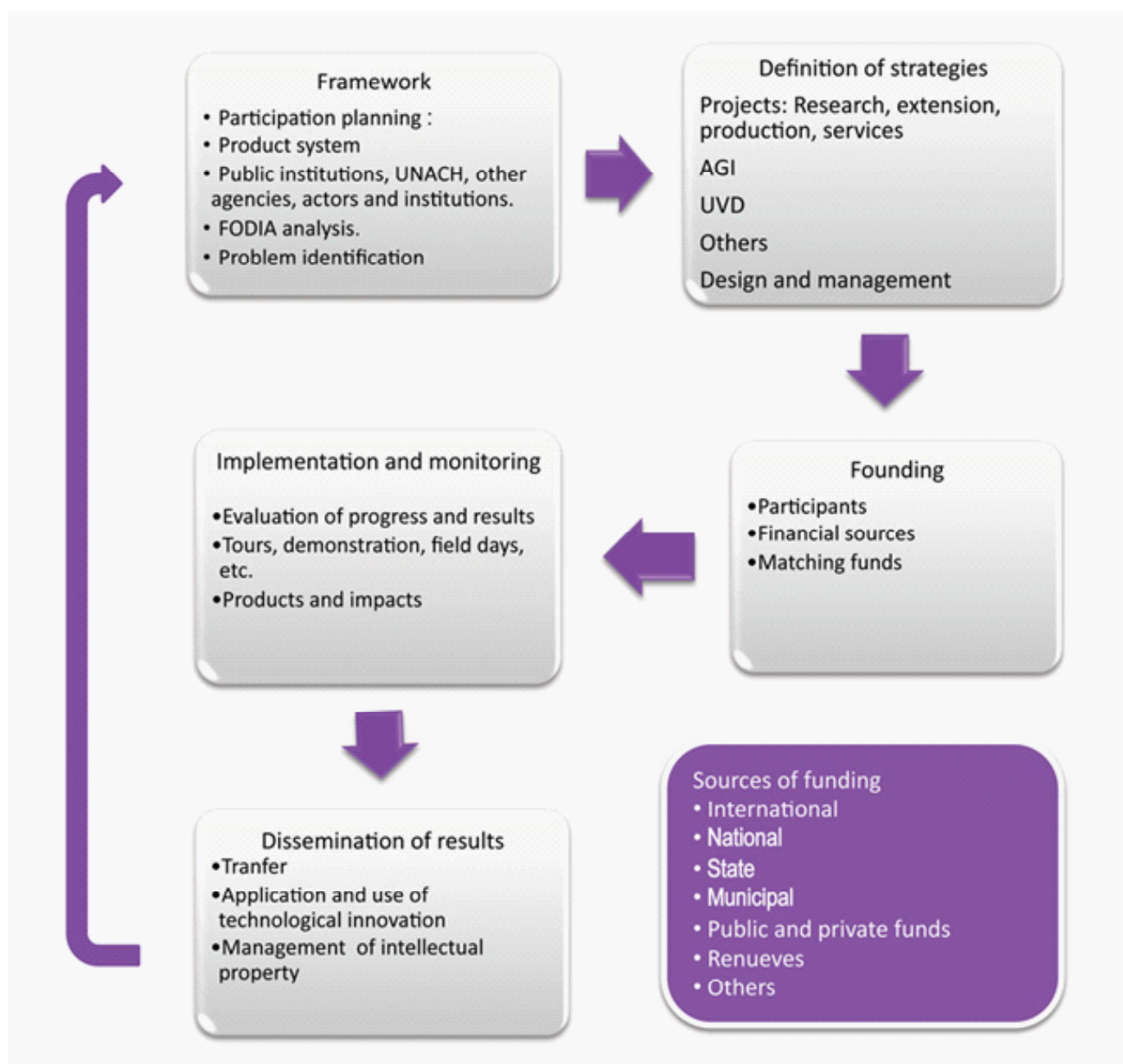


Figure 5. Operational Strategy of Agricultural AUDES

At a later stage, it is contemplated raising funds for advisory services, consultancy and training to companies and investors in the industry, the production of plant material and *agroinsumos*, and commercial exploitation of intellectual property rights (royalties and licenses exploitation).

In order to assess progress and compliance with the objectives, meetings shall be held annually and evaluation program in which presenting the progress, the results are discussed and the difficulties presented and proposed adjustments. These meetings will be held with the participation of researchers, managers of Product System Chiapas state, government representatives, participating institutions, funding sources, producer groups and university authorities.

These meetings will provide a space for dissemination to the scientific and research community, regional, national and international, the progress made, while allow interaction with researchers from other places that may be developing similar processes of development and technological innovation.

There are other scenarios of local, regional, national and international, to be utilized for the dissemination of the results of work of the AUDES, such as: conferences, seminars, workshops, symposia, meetings, conferences, exhibitions.

In order to establish networks, strengthen interagency partnerships through collaboration agreements that allow the integration of collaborative work.

## Main achievements of agricultural AUDES

### AUDES cocoa-chocolate

One of the main achievements that have had the cocoa-chocolate AUDES is the integration of cooperative partnerships with actors in the production chain, starting with Cocoa Producers Associations of both the state of Chiapas and Tabasco, Comité Nacional y Estatal del Sistema Producto Cacao, financial and industrial entities chocolate, mainly with the company ERCUS SA CV, clearly only company producing Mexican chocolates, so it has been possible to link together the major players in the cocoa-chocolate chain, AUDES being an important partner

for contacting and seeking consultation mechanisms to improve production primary marketing and processing.

With regard to training, it is primarily aimed at producers and technicians of the states of Tabasco and Chiapas, methods for the production of cocoa, made in different cocoa areas of these states as well as the realization of the First International Course on Techniques Modern for the production and processing of cocoa in Tapachula, Chiapas. Support organizational processes of the SPR Tecpateco Cocoa and continuous training of its members on issues of vital importance for the improvement of their cocoa plantations. Also it was conducted a socioeconomic and productive characterization of union members to the association, information vital to the implementation of development projects for cocoa communities.

There have been three UV to students from the Faculty of Engineering degree in Agronomy Mezcalapa Center of Agricultural Studies, contributing to the formation of human resources and supporting communities of cocoa producing in the Mezcalapa region.

Development of research projects funded by Fundación Produce Chiapas, CONACyT mixed funds, with impact on the generation of technologies to improve the cultivation of cacao, the product of which already have three patent records UNACH name of products developed for the control of pests and diseases affecting cocoa.

It has also participated in the selection and characterization of cocoa genetic material of high performance and quality of Soconusco areas, central and northern Chiapas State, finding materials tailored for each of the regions and with good yields and high chocolate quality parameters.

It is noteworthy that the first exhibition organized AUDES cocoa - chocolate and the first children and youth's drawing contest of cocoa in the city of Tuxtla Gutierrez, with great success and with the participation of Chiapas and Tabasco chocolatiers and with over 250 drawings with the theme of cocoa and lecturer of the leading research institutions, marketing, manufacturing, and public officials producer organizations (Figure 6).

## **AUDES organic milk**

The work on organic farming started in 2006, when it began the relationship with various organizations of producers in the central

Florida area. Since then it has carried out several research projects, technology transfer and technological innovation, with local funding, state and federal. It was implemented a UVD has been in operation continuously since 2007 to date.

It also has collaboration agreements with the Universidad Autónoma Metropolitana Unidad Xochimilco, the Universidad de Chapingo and the Colegio de la Frontera Sur. Of these projects it has been obtained the following results concerning human resources training, it has completed 23 graduate theses, dissertations and 3 is supporting a PhD thesis.

Regarding scientific production, it has been organized and presented 37 papers at regional, national and international, it has been also published articles in refereed journals indexed and research and extension (English, Italian, German and Spanish), have written 7 book chapters, a book, 5 manuals and various documents. In regard to training and technology transfer, it has been given more than 20 courses to over 1,000 producers, technicians and students from various municipalities and institutions, both in Chiapas and other states.

Within the systems product UNACH is the vowel system in the product organic milk and beef in organic beef cattle. Among the several hundred groups Cattlemen Validation and Technology Transfer (GGAVAT) that exist in the country, only four are organic, which were formed by management UNACH with producers and Ocoatepec Tecpatán.

In 2010 the first group certified social nationwide organic milk producers and earlier this year the second group, which Chiapas ranks as the national leader in this area. It is currently under construction in the town of Raudales Malpaso, the first organic dairy processing plant in the country, the social sector. Future projects continue. The greatest achievement is that it has created awareness among farmers of the region of the importance of caring for and conserving water, land, animals and people involved in the production of healthy food, fresh, quality, produced environment-friendly manner (Figure 7).

## Discussion and conclusions

Research and technological development, technology transfer and extension work, they are elements of agricultural development



accelerators. Technology transfer is to disseminate new things and more efficient forms of production in this context the transfer of technology has an important role in Rural Extension.

The agricultural extension work as a concept, it involves sharing knowledge, information and technologies generated at an institution of education and/or research, to users whether they are individuals, groups, productive organizations, companies or government programs.

Since the beginning, in the nineteenth century, formal education in Agronomy universities, the transfer of research results in the form of knowledge and technology to producers, it was considered of utmost importance. This new knowledge and ways of doing things, when applied to daily work on farms, resulted in an increase in yields, more efficient ways of production and a decrease in production costs, ie. net profit in producer incomes and greater food supply for the population.

In Mexico, despite the high number of universities that teach agriculture at the national level, the involvement of these institutions is low in the development of the agricultural sector, therefore, technological development and transfer of technologies and knowledge to producers and companies sector is very limited, both in importance and in the form of transferring technological innovations generated.

It coincides in this sense with the observation that in OECD Mexico there is no efficient agricultural extension service and colleges participate very little in it.

In another context, the figure of the Academic Bodies (CA) is institutionalized in UNACH on the basis of the Faculty Improvement Programme (PROMEP) of the Secretaría de Educación Pública. In the agricultural area are recorded in the UNACH currently 10 academic bodies.

However, the institutionalization of CA and these efforts lead to the degree of consolidation, the results have been unsuccessful, the consolidation is difficult to reach and some of them show little development in recent years, highlighting the lack of financing mechanisms and allowing scholars meet PROMEP activities required to achieve the consolidation of their respective CA.

In this regard and in order to generate initiatives that lead to better standards of consolidation of CA, the AUDES allows formalize linkages and collaboration networks between CA and programs, both within and outside the UNACH, it through networks that favor the generation of intra and inter-agency support in the areas of research, teaching, extension and services, ensuring academic and administrative structure with greater flexibility, promoting participatory and collaborative work between academics and programs.

From the point of view of financing, the AUDES allows access to public and private funds to attract external funding through traditional channels which is complicated institutional and inoperable.

Thus, the creation and implementation of the UNACH AUDES, has helped establish mechanisms to link all the potential of the university and the productive environment, creating bonds of cooperation and dialogue, as well as dynamic responses and strategies accurate to the real problems presented by the agricultural sector, which has allowed national and international recognition for UNACH *expertis* maintaining in sectors such as cocoa and organic milk production.

This model allows to address the deficiencies in the Mexican Rural Extension, thus involving an institution of higher education as the way not only UNACH agronomy professionals, but is involved in rural development through research, development technology, technology transfer, production organization, integrating vision, business and sustainable development.

The AUDES is a comprehensive model that manages to link the main actors involved in agricultural development, so they are a tool with great potential for the University to be linked, act and generate innovations and development in high-impact sectors agricultural state.

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