TITLE: MISIONES TECHNOLOGICAL PARK IS THE CREATOR OF AN ENVIRONMENT WHICH IS THE DRIVING FORCE OF REGIONAL DEVELOPMENT.

1. SUMMARY

This research work tries to demonstrate how a Technological Park, product of the synergy between the knowledge, the state and the manager sector, becomes into a real tool for regional development.

It arises as an initiative from the knowledge, Misiones National University and the National Institute of Agricultural Technology and it is the product of a University which evolved from a RESEARCHING university into an ENTERPRISING university.

The relationship between the university-the enterprise and the government evolved towards the Triple Helix model and allowed, through a new strategy of innovating University, the understanding of the research work as researching at risk, this is the integration of the scientific production and the management of the results as a global tool, which means the generation of knowledge plus the generation of value; and a cooperative researching, which bears the step from the **management of the offers to the management of the cooperation**, through facility units, technological centres, Integrated Projects and **the Technological Park;**

In a short period of time, Misiones Technological Park could generate and establish in its location technologically based enterprises of high impact towards the productive sector, propelling a Forester Productive Briquette (cluster) for the technological innovation of the 900 pymes of the sector which are in the region thus, generating an incubators net in the boundary region of the Province of Misiones with the States of southern Brazil and Paraguay, with a very important socio economic impact in the influenced region and particularly towards the agro forester small producer.

It became a very important local actor in the new economic spaces, where it strongly promotes the innovating paper in the developing processes. It can be said that it could become a new model of regional development which reaffirms the role of the local and regional as an alternative for the economic policy carried to a state level.

Clue words: Innovating University, Cooperation management, Misiones Technological Park (PTMi- initials in Spanish), Regional Development.

2. Introduction

2.1 Background

In the year 2003 as an initiative of the National University and the National Institute of Agricultural Technology arose the idea of creating a Technological Park as a response to a crisis in the province economy which requires a deep reconversion which the manager sector is not in condition of producing it in isolation, without the support of the State and the help of the knowledge.

The provincial and local government where touched, as well as the private sector represented by the manager associations and chambers representing the main agricultural and forester economic activities of the province.

The basic objective was *"**to promote among the regional development agents a new paradigm of regional development which has to be democratic, socially fair, sustained and competitive within the context of the global economy and the knowledge society"***, being the driving force for the creation and location of technologically based enterprises, making their products innovating and competitive not only in the regional market, but also in the international one. [1]

2.2 Main partners and role performance

The Management model adopted by Misiones Technological Park is a foundation with equal participation: one third the knowledge, one third the state and one third the private sector. This representation of the sectors was wise and fundamental because in this way there is no possibility for one sector to predominate over the other and it offers a situation of equality for discussion and in taking decisions. Figure 1.

Figure 1

2.2.1 The knowledge

Misiones National University

In this new context Misiones National University is oriented as a knowledge institution geared to the social environment. The institutional developing politics for the Science and Technology areas propose, among other aspects to:

- Institutionalize and Rank the activities of technology transfer and relation with the socio-productive sector, optimizing the institutional participation by strengthening the interface between the I + D groups, the productive sectors and the Provincial State in order to achieve greater integration of the University into the socio-productive net of the region.

- Develop and implement specific strategies dynamic the interaction with state and private agencies in order to satisfy the demands.

With the formulation of these politics, we are starting to go through a new university model where the technology transfer plays an important role in its institutional strategy. This is reflected in the step from the research as a primarily academic objective to the I+D as a competitive and strategic resource; i.e. I+D with academic, social and economic value.

The research is taken as a resource vertebrated with social and economic objectives, sustainable within a competence and financial weakness framework, and value generator.

Misiones National University evolved from a RESEARCHING university into an ENTERPRISING university.

Within this scheme, the research work is understood as:

- a risk generator of business opportunities (patents)
- Cooperative, base for strategic alliances with the enterprises and the social agents.
- Promoter of entrepreneurship (spin off)
- Competitive so that they can successfully perform in the international market of science and technology.

The new strategies as an INNOVATING UNIVERSITY are:

- Researching at risk, this is the integration of the scientific production and the management of the results as a global tool, which means the generation of knowledge plus the generation of value;
- Cooperative Researching, which bears the step from the management of the offers to the management of the cooperation, through facility units, technological centres, Integrated Projects and the Technological Park;

- Promotion of Entrepreneurship, monetizing research, moving towards the self-management of new business; technology transfer and technological services to spin-off

National Institute of Agricultural Technology

Organism created with the purpose of "promoting and invigorating the development of the agricultural research and extension, as well as accelerating with the benefits of these main functions: the technification and the improvement of the agrarian enterprise and the rural life"; which main objective is to contribute to the competitiveness of the agricultural, forestry and agro industrial sector throughout the national territory, within a framework of social and ecological sustainability.
In the new context of the Technological Park it is set as goals:

- To promote the development of new product and processes technologies overcoming the traditional industrial technologies and promote the development of technologically based Companies with new actors within societies.
- To expand the capabilities and the knowledge frontier for the development of new products and processes and the development of new markets.
- To promote the development of scientific and technological capabilities towards the development of products and processes, with high probability for the defense of the industrial property law, internationally competitive.
- To promote the creation of technologically based enterprises from the development of their research institutes. To promote the spin-off of the professionals who developed the technology, under a consistent policy of human resources.

2.2.2 The State

The government of the province of Misiones and the Municipal governments, from their participation in the administration of Misiones Technological Park, began to play a key leadership role by creating a favorable climate which is reflected in an active state participation betting on technological innovation, making spin-off emergency possible, allowing the internationalization of the cooperative processes, establishing technological alliances, giving concrete financial support, managing bi national interface consultancy for the incubation of technologically based enterprises and using innovation as a primary lever of development.

2.2.3 The enterprise

The participation of the management sector in the administration of the Technological Park is reflected in sharing the synergy produced by the knowledge and the decision to implement high impact projects for the regional development. Thus, in this roundtable discussion it was reached that the business associations put aside their sectarian demands, providing their participation and favorable opinion on knowledge management to realize technologically based enterprises which incorporate added value to the value chain of agricultural and forestry production of the Province of Misiones.

3. Position of the Art about this topic.

A PTMi analysis lets us see it as one of the structural initiatives of a Project of the Province of Misiones for the future. The characteristics which base such perceptions, in particular, are:

- The park transcends the limits of its first fifty hectares in the city of Posadas, between Misiones University campus and the INTA (initials in Spanish). At the moment is projecting to have other operative units in the province of Misiones, thus, enlarging its contribution towards the building of procedures and ways of thinking leading the province to hop towards the new paradigm.
- The park has an innovating System of Identification of Opportunities and Enterprise Development. In addition to articulating several enterprises incubators in Misiones, this system promotes the establishment of cooperative research and development projects oriented to the creation and development of enterprises and business alliances, in areas of Argentina and other MERCOSUR countries.
- The implementation of the Park motivates and is the driving force for the creation of politics and procedures so that the society can take advantage of the large possibilities offered by the new knowledge era.

Finally, within the group of innovations given by the Park, emerges an institution consortium, designed to offer support to a newly born Latin American school of thought and action in innovating regional development. [1]

The PTMi settled down on an area of 50 hectares, 7 km away from the urban zone of the city of Posadas. This geographical location is strategic, in the geographical centre of the MERCOSUR with a large potential market.

It is a medium-sized park (IASP classification), multi sectored or open to intensive enterprising in knowledge; with a wide range of sectors, but the food biotechnology and the TIC's development areas are top priorities. It is a technological enterprise that accepts the full cycle of production of intensive enterprises in knowledge, including research and development of lines of production, administrative and commercial sector.

The PTMi incubation system has two technologically based incubators, the INCUTEMI, within the location of the University Campus in the city of Posadas, and the INCUTEL, within the location of the School of Forester Sciences in the city of Eldorado, 220 km away from the Park headquarters.

Four years after its creation it graduates its first five enterprises, one in Plant Biotechnology, one in Food Technology and three in Tic's, but in turn it generates high impact projects to local and sectarian development

4. Researching focus

To demonstrate that the representative institutions of the knowledge in the Province of Misiones, the National University and the National Institution of Agricultural Technology

evolved in their relationship with the government and the enterprise going from the static to the Triple Helix model and from this relation emerges a Technological Park which generates high impact enterprises towards a local and a sectarian development.

5. Methodology

Until the year 2,002, the relationship between the State, the knowledge and the enterprises answered to a static model with spasmodic bilateral actions, product of short-term needs, which mean the demands of certain studies, projects, technological services and some isolated training of human resources.
Since the creation of the PTMi, a strong, participative and dynamic relationship among the actors was structured, with very positive and impact results towards development, with the incorporation of knowledge and technology transfer to the value chains of production which are generating positive impacts on development.
As a consequence, a relationship model among the State, the knowledge and the enterprise was definitely established, and it was spread to other local organizations, the Agglomerate Productive Forester Foundation and the Agency for the Development of Misiones.

6. Results, contributions and their implications.

- 2003- Creation of the PTMi
- 2004- Creation of the INCUTEMI, technologically based enterprises incubator within the Park location, in the city of Posadas.
- 2006- Creation of the INCUTEL, technologically based enterprises incubator within the School of Forester Sciences location of Misiones National University, in the city of Eldorado 220 km away from Posadas.
- November 2006- A net of technologically based incubators is created due to the PTMi, formed by 5 incubators in Argentina and 10 from the nearby states of Brazil.
- December 2006- The PTMi got the financial support from the World Bank in order to build a Forester Cluster in the Province of Misiones and in the north op the Province of Corrientes, in a summons of the Nation Secretary of Science, technology and Productive Innovation.
- November 2008- The first five enterprises, one in Vegetal Biotechnology, one in food technology and three in Tic's
- April 2010, a graduation party of four new enterprises will take place.
- Nowadays: 18 enterprises are in incubation, 9 enterprises are in pre incubation and there are 10 Project Ideas.

Picture 2 shows part of the PTMi urbanization can be seen, as well as images of the two enterprises incubators which are working nowadays.

Picture N° 2 PTMi initial urbanization and EBT`s incubators

7. Contributions and their implications.

7.1 First impacts upon the development

- **Micro propagation in vitro of vegetal species**

It is an enterprise in vegetal biotechnology, called Biofactory, and it constitutes a facility for the production of in vitro plants in different stages of development and of high genetic and phyto sanitary quality. The obtainment of in vitro plants by means of technologies via organogenesis allows the rapid obtaining of 8,000 to 10,000 plants from an elite plant of equal quality as the donor plant. Through this cloning process it is possible to reach high productive efficiency and the subsequent high incomes due to the sale of its products of high added value.

The strategic characteristic of Misiones Biofactory, lies in the possibility of develop massively a sustainable agriculture because in this way it will be possible to increase the performance with the same cultivated surface without affecting new lands. Covering today the native forest; and reducing the burden of agrochemicals by the use of varieties better adapted to environmental conditions and specifically to the pest attack.

The implementation of "Vegetal Biotechnology" projects from a Biofactory that carries to a commercial scale the process of Vegetative Micro propagation have not been done in the country before. The opportunity is about a market for products of vegetal origin, segmented into the forestry and agro- food sector which are growing and getting mature, demanding high quality plants, in terms of a productivity performance, pest resistance and uniformity for the mechanization and a technological process that could lead to a successful conclusion.

The Project is finished and in production, with a production capacity of 10 million vitro plants per year and an investment of $ 3,000,000, fully financed by the Provincial State; it is the first graduated technologically based enterprise within the park location, it is a limited company with majority state capital, with shareholding INTA, the University and private sectors, represented by nurseries businessmen and the agricultural cooperatives of the province of Misiones.

The species originally planned are: pineapple, manioc or cassava, mammon or papaya and sugar cane, among the agricultural, and, pine, eucalyptus and some other native species such as cedar and incense, among the forester; in addition, they are also working on protocols for the production of ornamental, especially orchids.

- **Production of natural sweetener**

In Misiones National University, after fifteen years of investigation, a researcher was able to obtain a variety of Stevia Rebaudiana rich in glucoside, Rebaudosido A, recently approved by the FDA to be used as natural sweetener. In 2,004 started the incubation process of the enterprise in Misiones Technological Park as part of a Program for the crop development and industrialization of Stevia Rebaudiana in the Province, becoming the first university spin off of PTMi.

Simultaneously, during the incubation process they began to build, within Misiones Technological Park location, the first industrial pilot plant for the production of natural sweetener from the leaves of Stevia rebaudiana.

As a direct impact of this project is the development of a social program for small agricultural farmers, looking for a highly profitable diversification, aimed at improving their quality life and reversing the current reality of the lack of profitability of small "*minifundios*" which resulted in abandonment of them.

- **TIC's solutions for agro- forestry development.**

Development of an open prototype based on a framework for TIC applications and solutions which responds to the new paradigm of manager systems of business processes. Comprehensive management portal for trading center of agro products, which allows the realization of sales transactions between different market players, the cancellation of transactions, compliance monitoring of prices and the generation of economic and financial information of the market, providing a predictability framework to business actors, prevent product loss and the consequent reduction in cost of raw material with harmful effects on economic actors and the entire community. It is the first PTMi graduated enterprise in TIC.

- **Forestry Productive Agglomerate**

In 2,006 the PTMi obtained a four million dollars funding for the creation of a forestry cluster as a response to a call from the Ministry of Science and Technology and Productive Innovation of the country with funds from the IDB.

The main objective of this cluster is to obtain a synergy between the public and private sectors, in a value chain of the forestry sector of Misiones and Corrientes in order to sustain a virtuous dynamic in the technological innovation, for environmentally sustainable productive environment, based on quality systems, supported by highly trained human resources, through the promotion of investment, research and development, impacting on the growth of the growth of small and medium enterprises, and generating an equitable distribution of wealth and employment in the region[1]

- **Bioethanol production from biomass**

To assimilate at Pilot Plant level, environmentally compatible technologies for the obtainment of bioethanol and co products using different alternative sources of lignocellulosic biomass, in order to achieve its use as fuel in a direct way or as a raw material for other products of higher added value.

Specific objectives:

i. Create conditions to develop and evaluate, at a pilot plant level, the first in the country, alternatives of lignocellulosic waste pre treatment by using chemical-physical and biological processes, as well as their possible combinations.

[1] BENKO, G., LIPIETZ, A. Edits. (1994): Las regiones que ganan. Distritos y redes. Los nuevos paradigmas de la geografía económica, Valencia, Insti. Alfonso el Magnánimo.

ii. Create conditions for research biological processes that allow studies of the best alternatives for enzymatic hydrolysis and alcoholic fermentation at pilot plant level.
iii. Determine at pilot scale level, procedures for obtaining co-products of commercial interest from the waste generated in the technological processes used in obtaining bioethanol from lignocellulosic biomass.
iv. Evaluate the technical, economic and environmental feasibility of the technologies to obtain bioethanol fuel and co-products based on the availability of lignocellulosic biomass and the scaling of the installation to an industrial level.

The production of ethanol from forestry lignocellulosic biomass can be done starting from forestry or wooden waste, or from primary inputs (trees). The productive process requires a previous treatment, a saccharification stage, a fermentation stage and a purification stage of the obtained ethanol.
From the FODA analysis of the process and its cost emerges the need to optimize the saccharification stage because the cost of the commercial enzymes produces an increase in the cost of production.
That is why the innovation of this project arises in the use of enzymes produced by autochthonous organizations and the generation of genetically modified organisms for summarizing the stages of saccharification and fermentation in a single process.
The rich biodiversity of the province gives us the possibility of wild organisms with a capacity for lignocellulolític enzyme secretion of biotechnological utility which will be use in this project.
We are working on the development of genetically modified organisms capable of producing an enzyme cocktail to improve enzyme production. On the other hand, we also work in the generation of organisms producing fermentative and hydrolytic enzymes that allows the saccharification and fermentation in one step.

7.2 A model that maximizes the relationships

The model used is equal participation in management and decision-making and is represented on the distribution in the Management Board of Misiones Technological Park Foundation, in a third by the knowledge, a third by the state and a third by the private sector. This representation ensures that no one sector dominates another, feature that is turned into the main strength of the model. In practice, it is the state that has a decisive role, but it is always accompanied by other actors. The role of the state is critical because it finances a high percentage of all the actions, this a typical feature of most Latin American countries where public investment in I+D is a majority in a 8-2 ratio in relation to private investment.

7.3 Nets and socio-institutional innovation

Cooperation between the institutions, associations and agents of one form or another are active in the operation of the production system, it is a need, or perhaps a requirement to create a local environment innovative and open to change.

This cooperation is based on mutual trust, driven by feelings of collective identity, it is the so-

called social capital reflected by a set of rules, institutions and organizations that promote trust and cooperation.
There are two aspects to take into consideration, the first one is to identify the actors, their characteristics and attributes, and the second are the nets that connect and relate, and that in turn stimulate interaction processes, collective learning and innovation.

The economic dynamism experienced by the Province of Misiones is closely linked to the net of socio-institutional actors, as well as the density of relationships between them, which has grown and developed significantly in recent years.

The comparison of the socio-institutional net of Misiones at two different times (2.002 and 2,009) lets us appreciate the maturation and development achieved by the net. (Figure 3)

SOCIO-INSTITUTIONAL NETS OF INNOVATION AND ENVIRONMENTAL CREATION IN MISIONES AND THE NORTH OF CORRIENTES

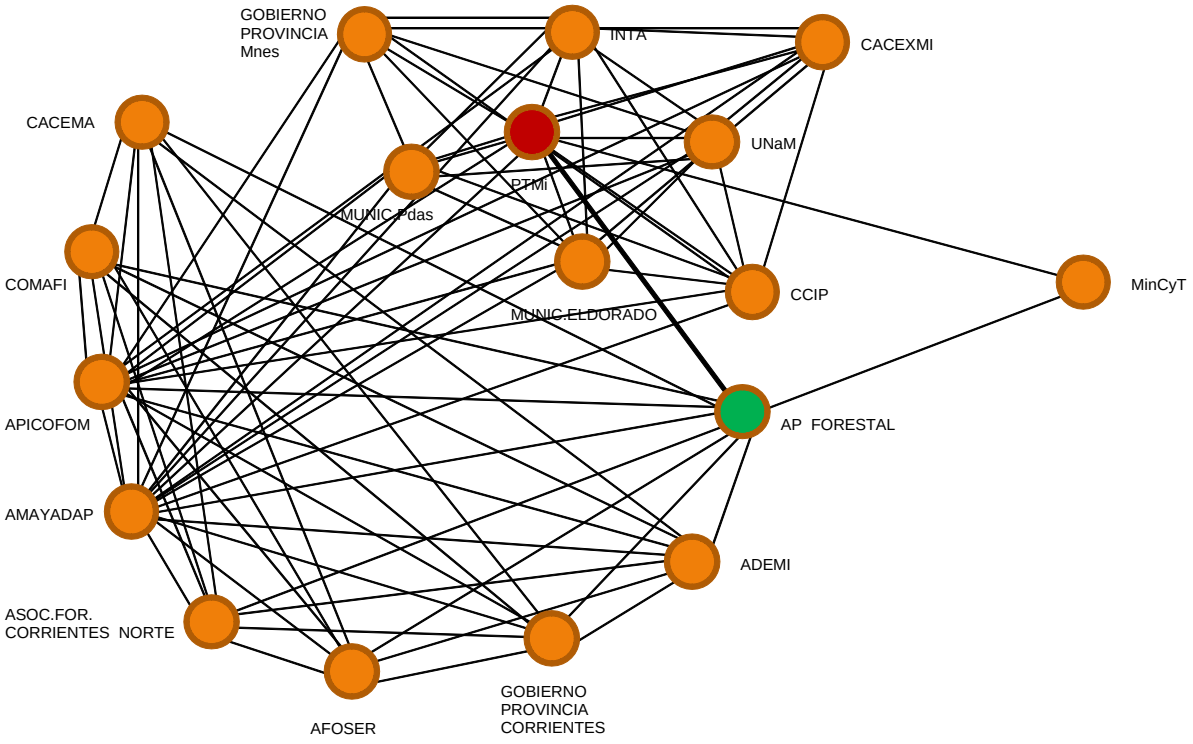

Figure 3

- Two new actors appear: Misiones Technological Park (2,003) and the Forestry Productive Agglomerate, created by the PTMi itself (2,006) which, brings the number of nodes from 11 to 18.

- The more complex the net to enhance the linkages between the different actors.
- In parallel, the actors belonging to supra local scales acquire growing significance that is the case of the Ministry of Science, Technology and Innovative Production of the Nation.
- Misiones Technological Park is the leading player in the network, because of the number of connections established with the rest.

The important thing is multiplication, diversification and connectivity of the actors, but more than that is the fact that most of them correspond to a Supra provincial scale then, with this, it is evident the capacity and autonomy that community members have in order to access to areas beyond the local level. Aspect that seems to be decisive for the social capital of an area to reproduce, to positively influence the processes of collective innovation and contribute to weaken the potential resistance of the business and social net in the incorporation of innovations and collective learning.[2]

Moreover, the PTMi is also integrating with external nets, although not directly linked to the productive system; they contribute to relate the technological Park with other areas. In this case is the participation of Misiones technological Park in:

- Net of the Argentinean Association of Incubators, Parks and Technological Poles in Argentina
- Net of the International Association of Technological Science Parks-IASP-
- Regional Incubators net, driven by the park itself and now has 15 nodes, business incubators in the border area to the province of Misiones, The states of Rio Grande Do Sul, Parana and Santa Catarina in Brazil, and Paraguay

7.4 Conclusions

- Technology parks become a useful tool to promote the transfer of technogical innovation to the productive sector and real catalysts or drivers of regional development processes in developing countries, although their objectives and operating modes differ according to the country, region or area of the productive sector in which they operate.
- There must be a favorable political climate resulting in the necessity of proactive governments, to understand from political instances, the role perform by universities and research institutions as levers for development, which will implement active policies to promote the university link in the development of society.
  We need the active participation of the state betting on technological innovation, making possible the emergence of spin-off, promoting the internationalization processes of cooperation, establishing technology partnerships, providing funding specifically for the incubation and establishment of technologically based enterprises, and using innovation as a key lever for development.

[2] CARAVACA, I., GONZÁLEZ, G., MÉNDEZ, R., SILVA, R. (2002): Innovación y territorio. Análisis comparado de sistemas productivos locales en Andalucía, Sevilla, Consejería de Economía y Hacienda, Junta de Andalucía.

- There is a close relationship between the complexity of enterprise nets, resulting in growth of production and maturation of the socio-institutional nets leading to an increase of social capital. The socio-economic dynamism is directly related to the expansion of value chains and increase competitiveness, the dynamics of interaction between companies and institutions, interagency cooperation and integration in the space of nets.
- There is a "before" and "after" according to the UEG Relationship Model of the Triple Helix.
- The internal changes of each helix form a real field of research and development yet to be sizing us.
- The implementation of the triple helix model constitutes an alternative to overcome crisis.

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