

Reforming higher agricultural education institutions  
The case of the School of Agriculture at Monterrey Tech (ITESM)



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at Monterrey Tech (ITESM)

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Food and Agriculture  
Organization of the  
United Nations



International Institute  
for Educational Planning

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## Foreword to the series

*Education for rural people* is crucial to achieving both the Education for All (EFA) goals, and the Millennium Development Goals (MDGs) of eradicating extreme poverty and hunger, ensuring universal primary education by 2015, promoting gender equity and ensuring environmental sustainability. In 1996, the World Food Summit in Rome stressed increased access to education for the poor and members of disadvantaged groups, including rural people, as a key to achieving poverty eradication, food security, durable peace and sustainable development. The 2002 World Summit on Sustainable Development, held in Johannesburg, also emphasized the role of education.

As the majority of the world's poor, illiterate and undernourished live in rural areas, it is a major challenge to ensure their access to quality education. The lack of learning opportunities is both a cause and an effect of rural poverty. Hence, education and training strategies need to be integrated within all aspects of sustainable rural development, through plans of action that are multisectoral and interdisciplinary. This means creating new partnerships between people working in agriculture and rural development, and people working in education.

To address this challenge, the Directors-General of FAO and UNESCO jointly launched the flagship programme on *Education for rural people* (ERP) in September 2002 (<http://www.fao.org/sd/erp/>), during the World Summit on Sustainable Development. This initiative involves an inter-agency approach to facilitate targeted and co-ordinated actions for education in rural areas.

It is within this framework, and to provide inspiration for the flagship initiative, that the FAO's Extension, Education and Communication Service and UNESCO's International Institute for Educational Planning (IIEP) have jointly launched a series of publications. This series is co-ordinated and edited by David Atchoarena (IIEP) and Lavinia Gasperini (FAO).

## List of abbreviations

ANUIES	<i>Asociación Nacional de Universidades e Instituciones de Educación Superior</i> (National Association of Universities and Institutions of Higher Education)
EISAC	<i>Enseñanza e Investigación Superior, A.C.</i> (Council of Education and Research)
GATT	General Agreement on Tariffs and Trade
HAE	Higher agricultural education
IAA	<i>Ingeniero Agrónomo Administrador</i> (agronomy engineer with a minor in administration)
IAF	<i>Ingeniero Agrónomo Fitotecnista</i> (agronomy engineer in phytotechnology)
IAP	<i>Ingeniero Agrónomo en Producción</i> (agronomy engineer in production)
IAZ	<i>Ingeniero Agrónomo Zootecnista</i> (zootechnology engineer)
IIA	<i>Ingeniero en Industrias Alimentarias</i> (food industries engineer)
IPT	<i>Ingeniero Agrónomo Parasitólogo</i> (agronomy engineer in parasitology)
ITESM	<i>Instituto Tecnológico y de Estudios Superiores de Monterrey</i> (Monterrey Institute of Technology and Higher Education)
LAN	<i>Licenciado en Comercio Internacional con especialidad en Agronegocios</i> (Bachelor in international commerce with a minor in agribusiness)
NAFTA	North American Free Trade Agreement
OECD	Organisation for Economic Co-operation and Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
WTO	World Trade Organization

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## Executive summary

The School of Agriculture at the *Instituto Tecnológico y de Estudios Superiores de Monterrey* (commonly known as ITESM or Monterrey Tech) was founded in 1948 in the Mexican city of Monterrey in the state of Nuevo Leonin as a private university with Rockefeller Foundation support. The initial academic curriculum included a non-specialized agronomy course. Soon thereafter, the school began offering a more diverse academic programme that consisted of eight bachelor degrees in the field of agronomy. In 1960, the Graduate Programme began its activities, administering seven masters degrees and two doctoral degrees.

After a very long period of growth and expansion of the school's student body and academic programmes, the enrolment of new students declined significantly, reaching its lowest level in 1987. This large decline in student enrolment in agronomy degree programmes was attributed partly to the severe economic crisis of 1982, which strongly affected the agricultural sector. Other factors that deeply influenced the decline of enrolment in higher agricultural education (HAE) at ITESM were the definitive entry of Mexico as a global commercial player and growing emphasis on the food industry and services to add value to food and natural fibre products.

Gradually, the weight of the agricultural sector in the national economy decreased. The government, which was once an attractive employer, reduced its relatively large demand for agriculture professionals. All these factors combined to make a career in agronomy appear much less attractive, and the decline of HAE enrolment was bound to continue.

To overcome the decline in student enrolment, the School of Agriculture at ITESM engaged in a major reform of its education strategy, which mainly consisted of:

*Executive summary*

- designing and implementing new curricula in food technology and agribusiness, in addition to traditional curricula in agronomy;
- re-engineering the teaching-learning process so that students would better learn how to learn, using modern information and computer technologies, as well as rethinking the role of the professor from that of traditional lecturer to that of facilitator;
- providing students not only with technical training, but with an integral education that takes into account the importance of attitudes, ethical values and capabilities (many specific programmes were gradually launched for this purpose, namely: the Leadership Programme; Quality Culture Programme; Export Programme; and Support to the Community Programme);
- instigating an Entrepreneurship Programme, which was designed not only to provide students with practical experience in the creation, launching and development of an enterprise, but also to help them learn to formulate and build on ideas favouring critical thinking; and
- implementing an Internationalization Programme, which aims at providing students with an international experience either through studying or working. Thanks to this programme, students can expand their vision and abilities and are thus more prepared for job markets outside of Mexico.

To put these changes into practice, it was necessary to significantly adjust the administrative, operational and academic organization of the School of Agriculture.

From 1995 to 2001, student enrolment increased by 18 per cent. Aside from the new academic programmes in food industry engineering and agribusiness, which largely contributed to the stabilization of the student body, other important outcomes are worth mentioning:

- attitudes among staff to the changes differed. Young professors adapted with little difficulty to the new teaching paradigm. Older professors, however, expressed more dissatisfaction and distrust. Former ITESM students adapted more easily than students coming from a different academic environment;
- even though (according to ITESM's objectives for 2005) the transformation process is still continuing, the advantages of a more holistic

and integral education have already become evident. In particular, it is bringing positive results for students both in terms of their professional performance and in terms of their flexibility to adapt to changing environments;

- the process of transformation of ITESM is clearly in line with the objectives and educational challenges recognized by UNESCO and ANUIES (the National Association of Universities and Institutions of Higher Education) in terms of learning to know, learning to do, learning to live together and learning to be.

The main lessons learnt from this reform process are:

- before implementing educational innovations, it is important that staff be made aware of and prepared for the coming changes;
- information and telecommunications software and hardware are valuable resources that should be used as a modern and effective educational tool;
- technical and scientific training should be complemented with an education in the humanities, including in ethics, which fulfils the need to develop knowledge, abilities, attitudes and human values in higher education.

To date, the results of the reform indicate that many of the changes and innovations brought about by the transformation process at ITESM can easily be transferred to and implemented in other institutions in Mexico as well as in other countries.



# Introduction

Over the past two decades, the School of Agriculture at ITESM (*Instituto Tecnológico y de Estudios Superiores de Monterrey*, commonly known as Monterrey Tech) has restructured its educational model, academic strategies and logistics in order to successfully fulfil demands for better skilled professionals in the country and in a world in constant evolution.

The objective of this case study are to describe critically the response patterns and reforms that ITESM and its School of Agriculture have carried out to face the challenges of a new era of change and rapid transformation.

The approach used to develop this case study involved gathering information from past and present administrative systems as well as from material resources. Other sources of information were official documents, specialized papers and periodic administrative reports. Other relevant sources of information included many personal interviews of academic authorities and faculty, several volumes of the history of ITESM as well as publications from UNESCO and ANUIES (National Association of Universities and Institutions of Higher Education).

These pieces of information were put together in an attempt to define the paradigm and conception of a reform that was known to be inevitable.

The paper covers the following six major areas:

1. Background;
2. The profile of ITESM before the change;
3. The process of transformation of higher agricultural education;
4. The profile of ITESM after the change;
5. Outcomes of the transformation process; and
6. Lessons learnt and their potential contribution to the reform process in Mexico and other countries.



# Chapter 1

## Background

### **1. The founding of the School of Agriculture at ITESM (1948)**

The origins of the School of Agriculture go back to 1943 when, at the request of the Government of Mexico, the Rockefeller Foundation initiated a Programme of Technical Assistance in Agriculture in co-ordination with the Mexican Ministry of Agriculture. The Programme consisted of developing research projects to improve agricultural production and training technical specialists at the higher education level.

The training of specialists began with research assistants in agricultural engineering and some biology researchers who worked on projects of the Foundation. After two years of training and completion of their bachelor degree thesis, the students received their professional title. The most outstanding students were granted scholarships to undertake postgraduate studies at a North American university. At the time, there were no institutions in Mexico that granted graduate degrees in the field of agriculture.

During that period, agriculture was an area that major Mexican industrialists and financiers knew little about. As a result, the Council of Education and Research, A.C. (*Enseñanza e Investigación Superior, A.C.* – EISAC), which had founded ITESM as a private university in 1943, sought advice from the Rockefeller Foundation on starting an agriculture programme at ITESM. The Department of Agriculture was finally established in August of 1948, when it initiated a degree with a major in agronomy engineering with 44 enrolled students.

## **2. Growth and expansion of the School of Agriculture at ITESM (1950-1980)**

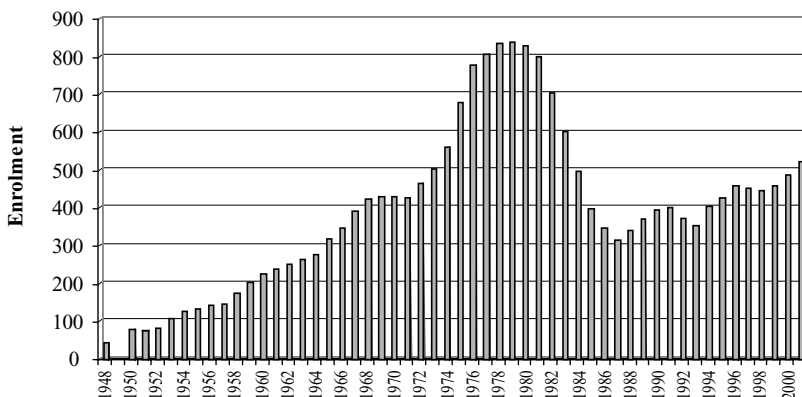
Within ten years of its foundation, the Department obtained the rank of School of Agriculture thanks to its agronomy engineering major, which was offered between 1948 and 1961. It began to expand when minors in zootechnology (*Ingeniero Agrónomo Zootecnista – IAZ*) and phytotechnology (*Ingeniero Agrónomo Fitotecnista – IAF*) were implemented in 1960 and 1961 respectively.

Student enrolment expanded during the period 1960 to 1980, and in particular during the 1970s (*Figure 1.1*). This was in great part due to the Green Revolution that took place in the mid-1960s and resulted in important public investments in agriculture. In 1968, ITESM introduced a new major, agronomy engineering with a minor in administration (*Ingeniero Agrónomo Administrador – IIA*), which was offered until 1991. The agronomy engineering in production degree (*Ingeniero Agrónomo en Producción*, with an emphasis on plant sciences – IAP) has been taught since 1972; however, the agronomy engineering in phytotechnology (IAF) degree, which was also started in 1972, was discontinued in 1977.

In 1973, the agronomy engineering in parasitology (*Ingeniero Agrónomo Parasitólogo – IPT*) programme was introduced. This minor specialized in the management and control of weeds, pests and diseases, and was offered for 13 years. It was discontinued in 1986 due to the low number of new students.

An important change that favoured the growth and expansion of the School of Agriculture was the creation of the Graduate Programme in Agriculture, which produced a synergistic effect that helped to increase the number of students. In 1965, a masters degree in agricultural parasitology was begun; later, other graduate degree programmes were offered, including doctoral programmes in various areas. In addition, the ITESM system opened two other schools of agriculture: one in the north-west region of Mexico and the other in the centre region.

**Figure 1.1 Yearly student enrolment, School of Agriculture at ITESM (1948-2001)**



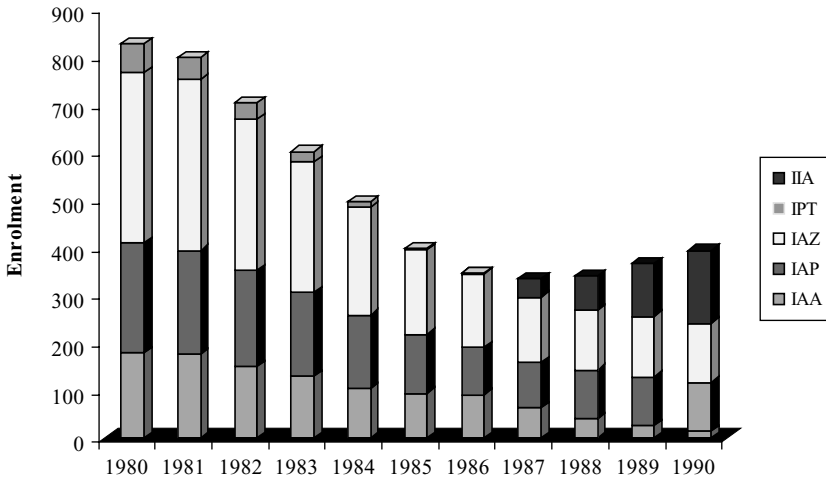
Source: ITESM Academic Statistics Department (unpublished).

### **3. Growth and expansion of the School of Agriculture at ITESM (1980 to present)**

In the 1980s, student enrolment at the School of Agriculture declined significantly, reaching its lowest level in 1987 with enrolment numbers similar to those of 1965 (*Figure 1.2*).

The large decline in student enrolment in the agronomy degree programmes was attributed partly to the severe economic crisis of 1982, which strongly affected the agricultural sector. In response to this decline, ITESM started a food industries engineering degree programme (*Ingeniero en Industrias Alimentarias – IIA*) in 1987. The justification for this new professional programme was the growing industrialization of Mexico that had flowed on from new policies aiming to develop the country's oil resources, and was stimulating an interest in careers in industry, administration and information systems.

**Figure 1.2 Student enrolment evolution at the ITESM School of Agriculture by degree programme (1980-1990)**



Source: ITESM Academic Statistics Department (unpublished).

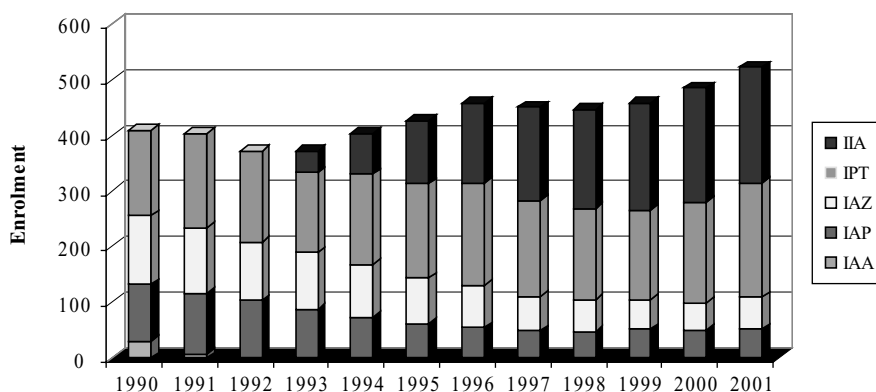
Note: IIA: food industries engineering; IPT: agronomy engineering in parasitology; IAZ: zootechnology engineering; IAP: agronomy engineering in production; IAA: agronomy engineering with a minor in administration.

As can be observed in *Figure 1.2*, the strong declining trend in student enrolment that took place from 1980 to 1987 was reverted by the creation of the food industries engineering (IIA) major in 1987.

Following trends in the global environment and in an attempt to prepare itself for the future, the School of Agriculture created the Division of Agriculture and Food Technology in 1993, which offered a bachelor in agribusiness (*Licenciado en Comercio Internacional con especialidad en Agronegocios*

– LAN) degree programme. This new major filled an important niche, as it anticipated the need for training agriculture professionals that was to arise from the NAFTA (North American Free Trade Agreement), which came into effect in 1994.

**Figure 1.3 Evolution of student enrolment at the ITESM School of Agriculture by degree programme (1990-2001)**



Source: ITESM Academic Statistics Department (unpublished).

Note: LAN: bachelor in international commerce with a minor in agribusiness; IIA: food industries engineering; IAZ: zootechnology engineering; IAP: agronomy engineering in production; IAA: agronomy engineering with a minor in administration.

The student population at the School of Agriculture began to increase in the 1990s, mainly due to the introduction of the degree majors in food industries engineering (IIA) and a bachelor in international commerce with a minor in agribusiness (LAN) (Figure 1.3).

#### **4. Patterns of change in agriculture in Mexico**

Over the last ten years, the agricultural sector in Mexico has shown a series of structural changes, mainly related to trade in agricultural goods. These changes were inevitable and had been easy to predict since the early 1980s. Additional changes were made to agrarian and sanitary regulations, and government participation and intervention in agricultural productive systems weakened.

Direct and indirect changes in Mexican agricultural policy have influenced the transformation process of the School of Agriculture at ITESM.

The main impetus for change was the recognition that agriculture is not an isolated primary economic sector, but rather the first link of an agrolimentary chain that generates value in goods and services. Agriculture also generates diverse industries, one of the most important being the food and beverage industry.

Some of the main external and internal elements that determine change in agriculture in Mexico are indicated below.

- ***GATT/WTO/OECD***

Mexico began to formally open its market in 1986, when it negotiated its entry into the General Agreement on Tariffs and Trade (GATT). This move was supported by a change in Mexican economic development policy towards greater industrialization of the productive sectors and growth of the service sector. Later, in 1995, Mexico became a member of the World Trade Organization (WTO) and also joined the Organisation for Economic Co-operation and Development (OECD).

- ***NAFTA***

In 1989, Mexico took another step to further open its market by signing the NAFTA agreement, which took effect on 1 January 1994.

This event marks a definitive turning point in the perception of agriculture. Several sectors benefited from this process, including vegetables, tropical fruits,

flowers and bee honey, among other products. Other sectors suffered and were forced to restructure in order to be able to compete in an open market. Meat, milk derivatives and basic grains (corn, soybean, and sorghum) were particularly affected.

- ***Reduction of subsidies***

Subsidies for the agricultural sector were reduced when the economy started to become more oil-dependent (1980s), a trend that increased with Mexico's adherence to GATT and NAFTA. The importance of the primary sector in the national economy was thus diminished, which in turn stimulated a reduction in subsidies.

## **5. Trends in rural labour markets**

Employment opportunities for professionals and technicians in agriculture diminished after impressive growth during the 1960s and 1970s. The economic crisis at the beginning of the 1980s, as well as the high number of graduates from numerous public universities, led to a saturation of the labour market for agronomists in the country.

Moreover, when the government ceased to be the main employer of agronomy graduates, the attractiveness of studying agriculture declined significantly. In other words, when the government agencies that support the agricultural sector (including the extension studies service, research, hydraulics, insurance, financial institutions, and fertilizer and seed production industries) stopped being the main source of work, opportunities for graduates were reduced.

Moreover, the structure of the Mexican agricultural production sector was highly fragmented and poorly adapted to the demands of industry, business and open markets. Even though production units are still fragmented, the sector is now being reformed, with a strategy that is supported by economic, commercial and rural development policies that are more in tune with present times.

## **6. Public policies for rural development**

Public policies for rural development in Mexico have changed from being protectionist within a closed market to promoting competitiveness in an open market environment.

At present, the Mexican Government is applying a development policy based on the competitiveness of the agricultural sector and oriented towards strategic markets, calling for increased investment in training, research, technology and market analysis. This policy places the food industries engineering (IIA) bachelor degree with a minor in agribusiness (LAN) in a better position with regard to the labour market.

## Chapter 2

# Profile of ITESM before the change

### 1. Institutional mission

In 1985, the ITESM System initiated a strategic planning process in order to define the concepts and basis for its operation, as well as its organizational structure and vision for the future.

The ITESM System mission that was defined in 1985 was given ten years to reach its objectives, which were as follows:

“The ITESM System has the fundamental mission to train undergraduate and graduate professionals to attain levels of excellence in the field of their specialty.”

The Institute, by means of specific educational programmes and academic policies, seeks to develop the following qualities in its students:

- an innovative and entrepreneurial spirit;
- leadership committed to community development;
- honesty;
- respect for the dignity of humans, their duties and inherent rights, such as the right to truth, freedom and security protected by law; and
- appreciation of the cultural, historical and social values of the community and of the country.

In order to achieve the desired level of education and quality, the ITESM System instituted a philosophy of continuous improvement.

## **2. Strategies and actions to reach mission goals**

The basic strategies that the ITESM System designed and implemented in order to reach its mission goals were:

- *quality in its operation* through a process of continuous improvement, particularly in areas that affect the fulfilment of mission goals: better selection of students, continuous training of academic staff, better qualified professors, lean administration systems, relevant degree programmes, adequate library services, applied research and development, increased number of extra-academic activities, and an adequate academic-administrative system;
- *innovation in its operation*, including in the products and services that are offered, such as academic programmes, research, teaching-learning methods, as well as in its infrastructure, including laboratory equipment, computers, etc.;
- *community impact* through activities that promote a culture of entrepreneurship, ecology, quality and values in the community.

In order to implement these basic strategies, a set of key actions and projects were defined. These aim to:

- increase the level of academic staff by encouraging full-time professors to study for masters and doctoral degrees abroad, and by hiring full-time professors and instructors with masters and doctoral degrees;
- promote career advancement of professors through regular review of the Professors' Classification System, and by providing economic recognition for achievement at different levels;
- consolidate the doctoral programmes through co-operation with participating universities;
- consolidate research programmes;
- build logistic support for extension courses and activities;
- initiate a programme for high-level executives;
- prepare the academic curricula of the 'ITESM seal courses'

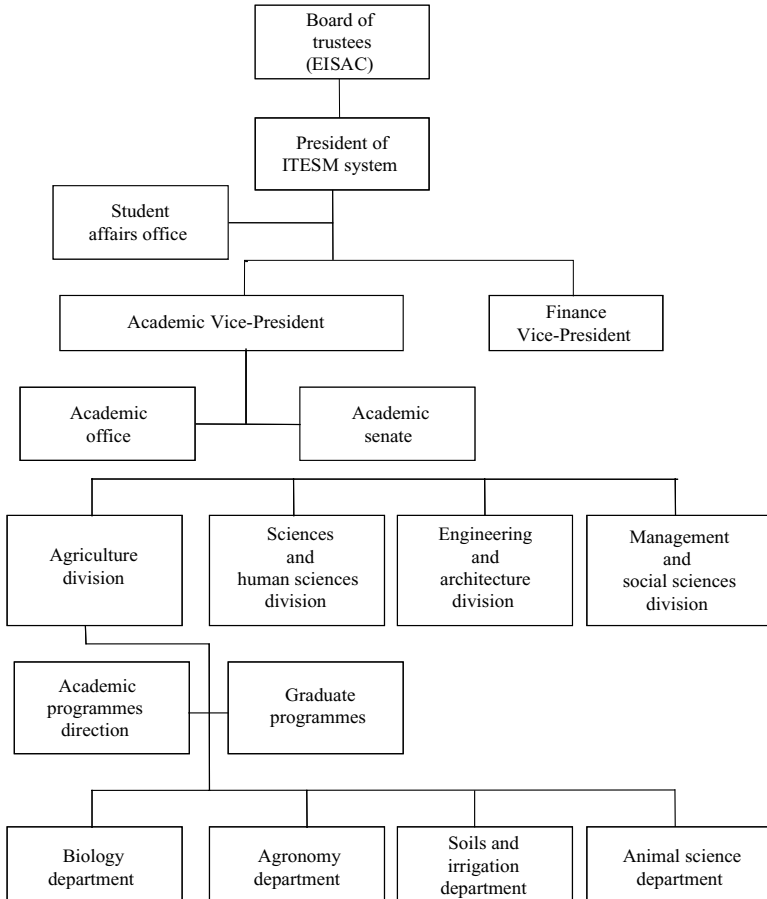
- continue the entrepreneurship programme, initiate the Programme of Ecological Culture, develop a complete educational package on value and quality, and promote development; and
- consolidate a quality control programme for academic-administrative support systems. The most important method for ensuring quality control consists of an academic poll, which students fill out at the end of each term.

### **3. Organizational structure**

ITESM operates according to a principle of academic departments, which means that it has specialized professors who teach only specific subjects in different curricula at the undergraduate and graduate levels. This organizational scheme allows for maximum efficiency and optimization of resources, both human and financial. All academic departments belong to a ‘division’ that offers a number of career paths and are integrated by a Campus President. The Campus President reports to a System President, who reports to the Chancellor of the System, who in turn reports to the Board of Trustees (EISAC), the highest authority of the ITESM System.

The ITESM organizational structure that was in effect before the change process occurred can be observed in *Figure 2.1*.

**Figure 2.1 ITESM organigram of 1985**



Source: *ITESM Estatuto General* (unpublished).

#### **4. Staff profiles**

From the beginning, ITESM wished to offer an excellent level of education and hired full-time professors of both genders. This philosophy has been one of the most valuable traditions of the institution. ITESM also hires part-time professors and lecturers.

Prior to the changes instituted at ITESM, professors were mainly responsible for teaching and research. Full-time professors therefore served as advisors for undergraduate and graduate level research theses. The work of students in the classroom also involved laboratory work, fieldwork and bibliographical research.

From the founding of ITESM until 1985, most professors held only undergraduate degrees. Over the last 17 years this has changed, and professors now must have degrees that are higher than the level at which they are teaching; that is, they need a masters-level degree to teach undergraduate courses, and a doctoral degree to teach postgraduate courses. This educational reform was a radical change in the history of ITESM.

#### **5. Funding sources**

Since its inception, ITESM and its School of Agriculture has been a private university system, with funding being generated by external sources only. These include:

- student fees (approximately 50 per cent);
- financial support from the Board of Trustees (15 per cent);
- income from periodic *Sorteos Tec* (raffles) (20 per cent);
- income from extension and continuous education courses and from applied research (5 per cent); and
- high-level fundraising campaigns (aimed mostly at private enterprises; 10 per cent).

ITESM has received no subsidies or direct funding support from any official government agency, at either federal, state or local level. It has

nonetheless always been a reliable service provider for many government initiatives, such as extension courses and development programmes, which include training and research. The provision of each service is negotiated separately.

When HAE began to decline during 1982-1984, it became imperative to adjust to the reduction in income derived from student fees. In 1984, ITESM decided to increase the workload and responsibilities of its academic staff by 25 per cent for a reasonable period of time, or at least until HAE enrolment and external economic pressures were stabilized. The increase in workload lasted for at least four years and was then gradually brought back to its original level.

## **6. Trends in student enrolment**

When ITESM began to operate in 1943, it had 227 students. This number has grown steadily (see *Table 2.1*), reaching 95,697 students in 2001. The enrolment trend for the School of Agriculture from 1980 to present is shown *Table 2.1*.

**Table 2.1 Enrolment trends at ITESM from 1943 to 2001**

Year	Number of students
1943	227
1945	407
1947	1,000 (31% having scholarships)
1953	2,065
1955	2,623
1956	3,000
1957	3,300
1958	3,361

**Table 2.1 (continued)**

Year	Number of students
1959	4,458
1960	4,858 (77 women; 6 in agriculture)
1962	5,000
1963	5,928
1967	10,782
1978	25,199
1984	34,461
1993	58,000
1997	75,000
2001	95,697

Source: Elizondo, 1993.

**Table 2.2 Enrolment in HAE and at ITESM Campus Monterrey (1980-2001)**

Year	HAE	ITESM Campus MTY	% HAE respect to ITESM-MTY
1980	828	8,153	10.2
1981	800	8,758	9.1
1982	703	8,980	7.8
1983	602	9,012	6.7
1984	497	9,161	5.4
1985	399	9,089	4.4

**Table 2.2 (continued)**

Year	HAE	ITESM Campus MTY	% HAE respect to ITESM-MTY
1986	347	9,117	3.8
1987	336	9,113	3.7
1988	340	9,370	3.6
1989	367	10,211	3.6
1990	394	11,170	3.5
1991	404	11,845	3.4
1992	371	12,321	3.0
1993	373	12,742	2.9
1994	403	13,142	3.1
1995	426	13,396	3.2
1996	459	13,089	3.5
1997	451	12,726	3.5
1998	446	12,835	3.5
1999	458	13,348	3.4
2000	486	14,232	3.4
2001	522	15,332	3.4

*Source:* ITESM Academic Statistics Department (unpublished).

The philosophy of ITESM is inspired by humanism, and the university opens its doors to all students regardless of their ethnic background, religion, ideology or socio-economic position. As a result, the student population at ITESM is very diverse and constitutes a mosaic of young people from all over Mexico and other countries. This trend has grown so rapidly that the

student body is equally diverse at the 28 different locations (campuses) in Mexico that make up the ITESM System. It is worth noting that prior to 1980, the majority of ITESM students came from rural areas. However, as the country became more widely urbanized over the next two decades, this proportion declined significantly. Similarly, the background of HAE students now increasingly tends to be urban. Today, 50 per cent of the total student population of the School of Agriculture comes from the Monterrey metropolitan area, and only 1 per cent originate from rural areas.



## Chapter 3

# Transformation process of higher agricultural education (HAE)

### 1. External and internal causes of the transformation process

The main external causes of the transformation process of higher agricultural education, as discussed above, were changes to Mexican policy such as: the opening of markets; reduced government intervention in the agricultural sector; the decreasing importance of agriculture in the national economy; and the growth of industry and services. As a result of these changes, the optimistic outlook that envisaged more professionals and technicians working in areas related to agriculture needed to be modified.

Another consequence was that enrolment in undergraduate programmes in agriculture decreased, as did overall interest in studying such programmes.

On the other hand, the internal causes of the transformation process of HAE were associated with the continuous improvement of the ITESM System brought about by policies implemented since 1985. These policies, which were implemented as a response to new social demands, graduate demands and worldwide tendencies, resulted in a series of strategies, programmes and actions involving HAE.

### 2. Proposed changes

- a. *New degree programmes (bachelor in agribusiness, bachelor in food industries engineering and certification for other degree programmes)*

As both an answer to a changing society and a means to substitute traditional 'paradigms' with new programmes that would correspond to the

new reality, ITESM renewed and reprogrammed its offer of courses in the area of agronomy and agricultural engineering. The resulting 'menu' was novel and different. In addition to the undergraduate programmes of agricultural engineering in production (IAP), and a renewed minor in phytotechnology, students now have the following options:

- bachelor in food industry engineering;
- bachelor in agribusiness;
- bachelor in administration and mechanical engineering, with a minor in agricultural engineering; and
- bachelor in electrical and mechanical engineering, with a minor in agricultural engineering.

Each of these programmes consists of nine academic terms (semesters). Additional remedial courses are available as a requirement for students coming from high schools outside the ITESM System. The remedial courses that must be covered before the first academic term are:

- introduction to computers;
- biology;
- English 1;
- English 2;
- English 3;
- English 4;
- English 5;
- mathematics;
- Spanish; and
- physics.

Graduate students in the food industry engineering programme are trained to work in national and international industries in the food processing sector. In addition, they can occupy administrative positions in a variety of areas, such as: food processing, beverage industries, the packing sector, production, engineering, design, research and development, consulting, etc.

Graduates from the bachelor in agribusiness programme possess language, multicultural communication and leadership abilities. Furthermore, they have

the necessary skills to evaluate political and economic risks in international markets, analyze different cultures in markets, and produce commercial and financial projections for international markets. They can also identify different sources of financial support for the import and export sectors.

The bachelor of administration and mechanical engineering with a minor in agricultural engineering, and the bachelor of electrical and mechanical engineering with a minor in agricultural engineering provide their graduates with abilities and expertise that are needed in the industrial and agricultural sectors. In addition, different public and private enterprises and institutions can offer promising opportunities for these professionals. They can also continue their careers in postgraduate programmes in research or consulting activities.

In addition to the bachelor degrees mentioned above, ITESM offers certification and diploma programmes consisting of a select number of courses in the areas of meat processing, fruit and vegetable processing, tropical agriculture, milk industries and agribusiness. These programmes provide practical training, meaning that real problems of industries, government sectors or individual enterprises must be solved within a given period of time.

### ***b. Innovations of the existing degree programmes***

The detail and sequence of the courses that make up the curricula are based on a modern philosophy that aims to educate students with a holistic approach. This approach means that technical and scientific training is complemented with an education in ethics and the humanities, including topics such as leadership, creativity and commitment. Other important aspects, such as working in groups and communication, are also part of the training.

Another important change in the curricula of the School of Agriculture was the ‘industry residency’ or internship in a particular enterprise requirement, which aims to provide students with the technical and personal experience that is acquired through participation in real-life projects. In these programmes, students spend either a summer or a full term outside ITESM (within Mexico) or outside Mexico (mainly in the United States of America). They gain experience through their participation in the production processes of farms,

packinghouses, food processing industries and marketing firms. As a whole, internships promote the development of various specific applied and practical skills that students need once they enter the productive sector.

### ***c. Staff improvement***

In the early days of the School of Agriculture (1948), lectures were the main component of the courses. At that time, the academic staff of the school was comprised mainly of full-time faculty members whose academic background was predominantly in agronomy and agricultural engineering. To a lesser extent, biologists and veterinarians were also part of the faculty. The academic level of the lectures was ensured by the experience and training of the faculty members. In order to improve their training, some of the staff members periodically took specialized courses. The formal and mandatory training programme for staff members organized by ITESM began in the 1970s and 1980s.

In 1992, an official ITESM document indicated that “in order to achieve levels of excellence and high quality, the ITESM System has adopted a philosophy of continuous improvement”. This philosophy is applied to activities related to teaching, consulting and research.

Teaching is defined as the activity by which teachers facilitate the permanent process of personal and professional achievement of students. This means that students need to acquire specific knowledge and abilities in a defined discipline. It requires an open mind towards discovering new knowledge and the fundamental aspects, discipline, a vision of the future, hard work and self-confidence.

In the spirit of this new philosophy, each faculty member of ITESM is now required to be trained in teaching techniques for higher education, particularly if the staff member has selected the first category, i.e. teaching, as a full-time career. The categories for staff members are:

- staff dedicated mainly to teaching activities;
- staff dedicated to consulting; and
- staff dedicated to research.

Traditionally, a large part of the activity of professors was dedicated to research. However, more recently, the proportion of time dedicated to developing and mastering teaching techniques, particularly with the introduction of information technology in the classroom, has become equal to the time spent on research. Most of the research is now concentrated in the graduate school and conducted in special groups of collaborators, called centres of research and development. The near totality of the entire research capabilities of the School of Agriculture are concentrated in the Biotechnology Centre and the Agribusiness Centre.

It is important to point out that regardless of the category to which faculty members belong, they are required to take courses on new education technology (especially those related to the re-engineering of the teaching process).

#### ***d. Entrepreneurship programmes***

In the 1980s, ITESM decided that it should offer an education that would provide its graduates with additional capabilities and specific skills, thus giving them a valuable advantage. One such skill is learning how to become an entrepreneur. Through special training, students can develop into professionals with an entrepreneurial vision. This much-needed skill gives students the capability to define new ways and come up with new ideas to produce value. The idea was that ITESM graduates would contribute to building a new society with more opportunities for creativity and employment. The intention was to make students the actors – and not passive spectators – of their own professional paths; professionals who can effect needed change.

To train entrepreneurs, the traditional teaching process was reinforced so that students could gain experience in the real world and learn how to be creative and develop ideas. The entrepreneurship programme was given a formal structure in September 1985 and implemented as one of the academic programmes of the ITESM System, including within the undergraduate programmes of the School of Agriculture.

The thrust of this programme is the acquisition of skills for creating, launching and developing an enterprise, through activities that foster an entrepreneurial spirit in students.

In the School of Agriculture, the application of the entrepreneurship programme has resulted in the development of research projects oriented towards the optimization of products and processes for the food industry. The results obtained from these projects are available to students who are interested in setting up an enterprise. Furthermore, an experimental agricultural camp has been used to evaluate productive systems and validate technologies that can be implemented in both new and established enterprises to produce an economic benefit.

Until now, the entrepreneurship programme has contributed to the implementation of more than 23,500 projects. As a result, more than 3,000 enterprises have been created, some of which are very successful. These enterprises provide a considerable number of jobs and project a modern and dynamic image of the agricultural sector.

The entrepreneurship programme has had a strong impact on the ITESM community. For example, 48 per cent of ITESM students create their own enterprises within ten years of graduating, which means that 4,000 enterprises and 20,000 jobs are created annually. By comparison, 34 per cent of the students who graduate from ITESM join existing enterprises or work as independent professionals.

#### ***e. Investment in infrastructure***

In addition to using traditional facilities that support teaching and research (experimental stations, dairy plants, entomology labs, plant sciences laboratories, greenhouses, etc.), the School of Agriculture has made a great effort to build new infrastructure, such as laboratories. These mainly serve the areas of biotechnology, cereals, meat processing, fruit and milk processing, nutrition, food microbiology and post-harvest physiology. An extraordinary effort was also made to provide telecommunication networks and computer facilities for staff and students. All this has facilitated the conception and

implementation of modern teaching techniques and procedures at ITESM's School of Agriculture.

***f. Re-engineering the teaching and learning process***

Another key reform in the School of Agriculture's transformation was the re-engineering of the teaching and learning process, which represents a significant modification of traditional teaching practice. This reform was inspired by many internal studies of job market trends and current professional needs.

The aim of educational re-engineering is to increase the students' ability to learn by themselves and efficiently use information and electronic technologies. In this new educational process, which focuses on 'learning to learn', the student plays a major role, guided by the teacher.

The use of techniques such as collaborative learning, problem-based learning and project-oriented learning represents new learning alternatives for students. By using these alternative techniques, students can analyze and evaluate different solutions for specific problems more efficiently, exploiting the data banks and information technology that are available to them.

One of the major purposes of this educational approach is to enable students to acquire abilities in addition to basic knowledge and expertise in a given subject. In a re-engineered course, students are exposed from the early stages to a learning environment that facilitates the development of abilities such as analysis, synthesis and evaluation of information, and critical thinking. Learning how to identify and solve a particular problem and work in collaborative and multidisciplinary groups are other advantages of the new teaching-learning process.

Another objective of re-engineering the teaching and learning process was to make the content and methods of learning in the classroom as standard as possible. This new model, which exploits the use of technological platforms such as 'learning space' and 'blackboards', offers several advantages. These include new ways of developing educational material, use of virtual discussion

rooms, and facilitated monitoring and evaluation of students' progress by teachers, among others.

***g. Internationalization programmes***

The internationalization of students is a strategy of the ITESM System. The School of Agriculture therefore encourages its students to spend between one and two terms (maximum one year) abroad, mainly in universities in Canada, USA and Europe. An international exchange programme was created for this purpose in the early 1990s. Furthermore, in order to acquire international experience, students can select a residency or internship in an international enterprise. In this way, students can expand their abilities and be prepared for job markets outside of Mexico.

The strategy of internationalization also has an impact on the continuing training of staff members. Lectures and courses given by visiting professors are a common occurrence at the school and campus. Recently, it has become mandatory that at least two courses of the curricula be taught in English, which means that proficiency in English has become a requirement for both students and staff.

***h. Holistic education (values and attitudes) of the student in addition to training***

The new mission of the ITESM System for 2005, defined in 1995, promotes important processes with the aim of changing the academic and extra-academic education of its students. The main change has been the move from a mission aimed at training professionals and graduates with levels of excellence in their areas of expertise, to a mission oriented towards training people with a strong commitment to the development of their communities. ITESM graduates are expected to have an impact on the social, economic and political sectors at home, and to be competitive in their areas of expertise at an international level.

In order to achieve this mission, it became clear that the teaching and learning process and extra-academic activities would have to instil certain

abilities, values and attitudes in the students, to distinguish them and infuse in them a strong commitment to the community.

The abilities that needed to be reinforced include the capacity to learn by oneself; analysis, synthesis and evaluation skills; critical thinking; creativity; the capacity to identify and solve problems; the ability to work in groups; the efficient use of information technology; proficiency in English; and effective oral and written communication. The values and attitudes that the ITESM mission promotes include honesty, responsibility, leadership, entrepreneurship, innovation and a spirit of continuous improvement, among others.

ITESM defined 11 'seal' courses that have been incorporated into every academic programme. Seal courses are courses on a group of subjects that provide a specific ITESM academic identity. The idea was to offer a complete set of courses that would promote the abilities, values and attitudes mentioned above.

The 11 seal courses are: information analysis; English; culture of quality; advanced writing *or* drafting *or* written composition; leadership; ecology and sustainable development; oral communication; entrepreneurship; socio-cultural values of the world; social-cultural values of Mexico and Latin America; and values for professionals.

Over time, the evolution of these courses has resulted in five programmes that support ITESM's aim to provide a holistic education for its students: the 'Entrepreneurship Programme', the 'Leadership Programme', the 'Quality Culture Programme', the 'Export Programme' and the 'Support to the Community Programme'. These programmes are integrated into whichever area of study students choose. In addition, activities such as conferences, visits to enterprises, industrial and community projects also help to promote the abilities, values and attitudes named above.

#### ***i. Improvements in academic indicators***

In order to achieve the educational goals it has set, ITESM has improved its academic indicator system. These indicators support continuous

improvement of the teaching-learning process. In general terms, they help to evaluate staff performance, academic programmes and course content within the teaching-learning process. Students can evaluate several aspects, including:

- the subject of the course;
- teachers' respect for students;
- the self-learning process;
- student participation and research;
- appropriate use of technology;
- the difficulty of course content;
- the development of abilities, values and attitudes; and
- the assessment scheme.

The evaluation of these aspects is carried out each academic term using the School of Agriculture's or ITESM's electronic facilities, and the progress of the learning-teaching process is monitored using this evaluation method.

### **3. Acceptance and rejection of proposed changes**

In the School of Agriculture, some changes provoked interesting discussions, particularly with regard to the following issues:

- the number of seal courses;
- the elimination of the thesis from the agricultural curricula. The research programme that once served both the bachelor and graduate level was now limited to the graduate programme;
- change of the teacher's role in the classroom, with teachers moving from being the centre of the teaching-learning process to playing the role of a facilitator;
- as a consequence of the new education model, staff dedicated less time to research. So much time was invested in preparing the redesigned courses and training for the new model that the time spent on research was reduced by several years. A major concern today is the restoration of the research programme to its original capacity. The administrative reason for reducing research was that it is very expensive, both for students and for the institution.

The proposed changes were accepted gradually, and in particular by new staff members.

#### **4. Implementation of accepted changes**

Implementation of the accepted changes occurred gradually in several consecutive phases. The first phase involved the evaluation of the subjects of each course and the definition of the seal courses. This phase has already been completed. The second phase is closely related to re-engineering and redesigning of the teaching-learning process. It is anticipated that this phase will be fully functional by 2005.

The implementation of the second phase of the accepted changes required the use of advanced electronic and information systems and laptop computers. This has called for continuous staff training and the investment of considerable economic resources.

As a result of the implementation of these changes, modifications to the administrative structure of the university were also required. The administrative and academic bodies of ITESM increased by almost 50 per cent in size and duties. In addition, departments dedicated to the internationalization process were created.

In ITESM's infrastructure sector, electronic and communication technologies were put in place throughout the whole campus. Simultaneously, a great effort was made to provide training programmes for staff members so as to facilitate their understanding and assimilation of the new education systems.



## Chapter 4

# Profile of ITESM after the change

### 1. Institutional mission

In order to serve the country and society in a more up-to-date and adequate manner, the ITESM System reviews its mission every ten years.

The current ITESM mission is the result of an exhaustive process planned by the ITESM System for the year 2005. In addition to university presidents, vice-presidents, administrators, professors, alumni and students of the ITESM System, this process involved the participation of EISAC and other funding civil-society associations located in different cities throughout the country.

This consultation process identified a number of challenges that the country must address, as well as areas in which ITESM could play a helpful role:

- job creation;
- international competitiveness;
- democratization; and
- improvement of education.

#### *Mission*

The ITESM is a university system with the mission to fully educate and train people to be committed to the development and improvement of their communities – socially, economically or politically. In addition, these people should be internationally competitive in their areas of expertise. The mission also includes carrying out research and extension activities that are important for the sustainable development of the country.

The new mission statement declares that rather than acquiring only rigorous professional training – the objective of the last mission statement – ITESM graduates should now acquire a holistic education that includes community development. A great concern of ITESM is to develop an awareness in its graduates of their duty to serve the interest of the communities in which they live. Many strategies have been designed to increase the participation of ITESM students in the welfare of the community. ITESM students must perform a total of 500 hours of special community service through programmes such as nutrition for children, adult education, micro-enterprise development, technical service consulting, sustainable production systems, etc.

## **2. Strategies and actions to reach mission goals**

The strategies drawn up by ITESM to fulfil its mission are as follows:

- Strategy 1: redesign the teaching-learning process;
- Strategy 2: refocus research and extension activities;
- Strategy 3: develop the Virtual University;
- Strategy 4: internationalize the Institute; and
- Strategy 5: carry on the process of continuous improvement.

## **3. Support of ITESM stakeholders (private sector, alumni relations, etc.)**

The ITESM System establishes its strategies of development and growth with the experience and support of industry advisors (stakeholders). The 2005 mission statement defines the profile of stakeholders and the type of support that can be expected from them as follows:

- they should be leaders who – acting without self-interest and in a spirit of collaboration – share ITESM’s commitment to promoting the development of the country through education;
- advisors should share the values and the education philosophy on which the ITESM System bases its academic activity;
- stakeholders are expected to participate in planning the ITESM System and the development of the campus that they support. In conjunction

with the academic community, they define the strategies that ITESM and its campuses must follow;

- advisors should promote the presence and good image of ITESM in their community and in the country;
- advisors should represent their region's aspirations in educational matters;
- stakeholders should be enthusiastic collaborators in the financial campaigns of ITESM to seek support for its operations and efforts to stay ahead in the field of education.

#### **4. Staff profiles**

Professors are the basis for work of ITESM. In particular, they should:

- be committed to the principles and the mission of ITESM and act accordingly, training students in the values, attitudes and abilities established by ITESM's mission;
- set an example of these values, attitudes and abilities for students;
- have an academic degree superior to the level at which they teach;
- stay up-to-date with current knowledge in their professional field.

Through the professor-development programmes that have been established at ITESM, professors can strengthen the following:

- their professional and educational experience;
- their ability to develop and use a variety of didactic methods and resources to promote the acquisition of knowledge, values, attitudes and abilities by students;
- their capacity to carry out relevant research, consultancy and extension activities.

#### **5. Funding sources**

The current fundraising strategies are explained in *Chapter 2*.

## **6. Trends in student enrolment**

As a result of the reforms implemented through the transformation process, the enrolment trend of HAE shows two distinctive growth periods (*Figure 1.1*). The first (1988 to 1992) corresponds to enrolment in the academic programme ‘food industries engineering’ (IIA), which was new at the time. The second growth period started in 1993 with the bachelor of agribusiness programme.

It is clear that the enrolment trend for the School of Agriculture is increasing, and it is currently comparable to the 1984 level, with almost 530 students.

## **7. ITESM graduates in the labour market**

Most job opportunities are related to management and administrative positions in private enterprises. Professional activities include production and postharvest management, food processing, and marketing of food and feeding products. In the early 1990s, ITESM’s centre for market analysis and graduate surveys concluded that within five to ten years after graduation, a significant proportion of ITESM alumni are operating their own businesses. This is an indication of the strong emphasis that ITESM places on developing the managerial abilities and skills of its students so as to prepare them for entrepreneurship, as described above.

## **8. Partnership arrangements**

Another area of strategic development in the School of Agriculture since the change has been the strengthening of its links with the production sector and related government agencies, as well as with agribusiness and enterprises in the whole agrifood chain. At present, the School has increased its contribution to the production sector and expanded its partnership arrangements with many public and private entities through its Agribusiness Centre, Applied Agriculture Centre, Biotechnology Centre and Centre for Food and Agricultural Research.

Most ITESM projects, programmes and other activities are aimed at developing competitiveness at international level in the agrifood sector. This applies not only to research and extension activities, but also to continuous education offered through workshops and special training programmes, and to consulting services. In order to establish a significant and solid presence, the School of Agriculture has entered into many working agreements and contracts with organizations and individuals, but the nature of these relationships is always one of client-supplier for specific products and services. The fees for the extension of consulting services are charged to the client according to the terms previously set down in the contract.



## Chapter 5

# Outcomes of the transformation process

### **1. Response of the people involved in the transformation process**

The re-engineering of the teaching-learning process is one of the major elements in the transformation process at ITESM. This is also where most of the efforts to train and adapt human resources (professors and instructors) have been concentrated.

The relatively sudden change that saw student self-learning take centre stage in the classroom, in contrast to the traditional teaching method in which the professor was the leading figure, took many years to develop. Indeed, it involved not only an initial effort to convince the professors and train them, but also the renewal and adaptation of major academic subjects.

The younger generation of professors did not show major difficulties in adapting to the new paradigm. They rapidly adopted the model, probably motivated by the heavy inclusion of information technology in the process. Undoubtedly they perceived the change as a good and advantageous option.

‘Traditional’ and older professors, however, saw the new system as a good but short-term experiment, and approached it with dissatisfaction and distrust. Fortunately, they gradually modified their perspective each time new re-engineered courses were offered and more experience was gained. At the present time, older professors are adopting the changes satisfactorily and (in some cases) enthusiastically.

With regard to students, there was a marked difference between students coming from preparatory schools (high schools) that are part of the ITESM system, and those coming from other institutions and a different academic environment. For the latter, it took longer to accept the changes.

When implementing a new teaching system, first-year students (freshmen) are always the primary concern. They require support and far more attention than seniors. A main consideration for professors and the administration at ITESM is therefore to improve the infrastructure and make the adaptation processes easier.

## **2. Results and implications of the transformation process**

The transformation process at ITESM is continuing. It is still being implemented and has been through several modifications. In fact, currently it is not mandatory to enrol in all the seal courses. The final evaluation of the re-engineering of the teaching-learning process must be completed by 2005. To date, results have been satisfactory.

Thanks to the new bachelor of science programmes, such as food industry engineering and agribusiness-international trade, enrolment in the School of Agriculture increased by 18 per cent between 1995 and 2001. Likewise, minors offered in agricultural engineering within the mechanical-electrical engineering and mechanical business BSc programmes have also increased enrolment in the School of Agriculture.

Another result of the new curriculum is the more integrated and effective academic training that students acquire because they must fulfil the internship requirement. The new graduates have received an education that is more holistic and general, rather than specialized, which provides them with new options for the job market.

With the new curriculum, students can develop a more open and global approach to today's complex realities and problems. They are thus in a better position to successfully face the challenges of their professional fields and careers.

An additional result of the change process at ITESM has been that other universities with agricultural schools are showing an interest in re-engineering their own teaching-learning processes. For example, the ITESM

Entrepreneurship Programme has today become a teaching model that is being adopted by other educational institutions.

The implementation of this innovative transformation process entailed a strong institutional investment to build the technology infrastructure (desktop computers, laptops, software, servers, networks) and prepare both teachers and students. This included providing every single ITESM instructor with a laptop computer. It should also be pointed out that laptop computers have now become the basic personal learning tool for students.

All the reforms mentioned above have involved restructuring the organization of the ITESM. At the School of Agriculture level, this has meant a reorganization leading to the fusion of several departments and the incorporation of the School of Agriculture into a new upgraded administrative entity (Division of Engineering and Architecture).

### **3. Relationship of the transformation process of HAE at ITESM with trends in higher education reform in Mexico and at international level**

The tendencies and philosophy of higher education in Mexico have been dictated by the National Association of Universities and Institutions of Higher Education (ANUIES). This organization has proposed the following objectives and vision for 2020:

- education with quality and innovation;
- harmonization of academic areas;
- pertinence to the country's needs;
- equality;
- humanism;
- support for the development of a better society;
- responsible autonomy; and
- exemplary administrative structure and operation.

These objectives, which indicate the new concepts, perspectives and expectations for Mexican higher education in the near future, coincide with

several of the most important goals of the new ITESM mission for 2005, particularly those related to quality and innovative education, pertinence to the country's needs, humanism, support for the development of a better society and exemplary administrative structure and operation.

With regard to educational challenges, a UNESCO publication, *Learning: the treasure within* (1996), uses a beautiful metaphor to explain that education in the twenty-first century will have to meet a double challenge: "To provide maps of a complex world in constant turmoil and the compass that will enable people to find their way in it."

To meet this challenge, educational philosophy today "must be organized around four fundamental types of learning which, throughout a person's life, will be the foundations of knowledge: 'learning to know', that is, acquiring the instruments of understanding; 'learning to do', so as to be able to act creatively in one's environment; 'learning to live together', so as to participate and co-operate with other people in all human activities; and 'learning to be', an essential progression which proceeds from the previous three. Of course, these four paths of knowledge all form a whole, because there are many points of contact, intersection and exchange among them". (UNESCO, 1996: chapter 4.)

When ITESM's vision is compared with the UNESCO statement above, it is clear that they share several objectives, particularly in the following areas: self-learning ('learning to know'); acquisition of practical skills through internship and residence ('learning to do'); development of a sense of belonging to a community, not only academically but also socially ('learning to live together'); and, finally, offering a holistic education that includes moral values and attitudes such as honesty and respect for human dignity and nature, among others ('learning to be').

The re-engineering of the teaching-learning process discussed above has laid the groundwork for the self-learning process ('learning to know'), which is the main strategy for achieving ITESM's 2005 mission. With regard to the acquisition of practical skills ('learning to do'), the institution applies continuous improvement processes – for example to its academic programmes

– to ensure the competitiveness of the services it offers and the quality of its students.

In relation to the third pillar ('learning to live together'), ITESM has developed the 'Community Support Programme', which includes several sub-programmes and activities that aim to make students aware of problems in their communities. As for the fourth pillar ('learning to be'), ITESM's new mission aims to transform the educational process so that knowledge acquisition is coupled with the development of values, personal attitudes, capacity for professional growth, and preparation for working collaboratively, responsibly and in the interest of society as a whole.

The student exchange programme also fosters personal improvement, as the students live and interact with foreign peers. This interaction contributes to their development as human beings, in addition to broadening their cosmopolitan viewpoint.

In summary, ITESM's mission for 2005 is in line with the new modern and global education philosophy demanded by today's world. Mission 2005 states that the fundamental aim of ITESM is to educate and train people to become involved in community development – i.e economic, political and social improvement – and be equipped with internationally competitive professional skills.



## Chapter 6

# Lessons learned and their potential contribution to the reform process in Mexico and in other countries

Technological innovation in the teaching-learning process at ITESM has provided several lessons. These are summarized below:

- Both teachers and students have realized that, under the current conditions, an educational model focused on learning and the student offers more advantages than the past model that focused on lecturing by the professor.
- The implementation of revolutionary educational models requires that both staff and students be made aware of the coming changes at an early stage.
- Computers and information networks are very valuable material resources and should be used as tools in modern education. They have become necessary both for learning to learn and for learning to teach.
- Scientific and technical training alone is not enough for educating new student generations in the area of agriculture. This is because there are not enough employment opportunities in agriculture immediately following graduation. Current and future curricula should thus also include training in entrepreneurship. In addition, an international experience broadens the range of opportunities available to students by giving them more flexibility in professional performance and helping them to develop an attitude of self-improvement.
- The contents of the agronomy curricula must be balanced and offer a wide range of basic, formative and specialty courses. When designing new curricula, the needs of the country, in addition to the global environment, should be taken into consideration.

- Learning is (and will always be) an endless activity for higher education professors.
- Team work, tutorials and permanent feedback are imperatives of the new education technology methodology.
- The constant evaluation and innovation of academic programmes must have a higher and more direct positive effect on the community.

Every person at ITESM – including the students, professors, managers and employees – has learnt much through the implementation and operation of the transformation process. It has clearly been an exciting and fruitful project. Indeed, it is the most important academic project in all of the institution's history.

The originality and efficacy of the educational model that is currently being used, improved and developed at ITESM can make a worthy contribution to other agricultural schools in Mexico and other countries.

The contribution that the transformation process at ITESM's School of Agriculture can make in Mexico and other countries with a similar economic structure and profile consists of the following:

- redesigning the teaching-learning process is an experience that can be useful for other institutions of higher education in agriculture, as it supports efforts to promote student self-learning;
- the new teaching-learning model makes it possible to take advantage of the great potential that information technologies offer to improve higher education in agriculture;
- in contrast with the traditional educational model, a holistic educational model based on a good balance of knowledge, abilities, values and attitudes allows students to develop a more open outlook and greater range of capacities to deal with today's changing environment.

An additional advantage of the holistic educational model is that it requires innovation in academic programmes and curriculum design to make these more responsive to the conditions and needs of the national and global environment.

In addition, the staff is convinced that the change at the School of Agriculture can make a significant contribution to the entire agricultural sector, and this is mostly because of the generation of professionals who are now being educated to deal with the present situation and are developing skills to deal with any changes or challenges that might arise in the labour market in the future.

The main competitive advantages of getting a degree from ITESM are, on the one hand, that its graduates are technically competent and have enough managerial abilities to successfully face the challenges and opportunities that the new economic environment is bringing to the food industry. In our opinion, they are the type of ‘horizontal’ professionals that the agricultural sector in developing countries needs. On the other hand, ITESM professionals have many other crucial qualities, giving them added value and making them unique and well-differentiated from the graduates of most other agricultural schools. These qualities, which are much appreciated by the ITESM staff and administration, as well as by society at large, include: a capacity for self-learning, entrepreneurial skills, technological communication abilities, international experience, the ability to work in a group, and a set of cultural values – such as environmental sustainability, ethical responsibility, and community development – that were acquired through the ITESM experience. All this corresponds to the international strategic vision of the future that is presented by agribusiness organizations and emphasizes the following: economics, environment and ethics.



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