



AGROCERES - PIC CASE STUDY

A STUDY IN INTERNATIONAL TECHNOLOGY

TRANSFER IN THE FIELD OF PIG GENETICS

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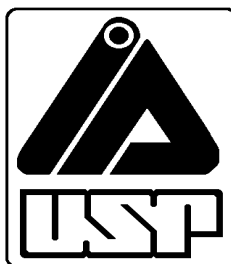
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The Royal Agricultural
College



PENSA
Programa de Estudos dos Negócios
do Sistema Agroindustrial

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The Origins of PIC Agroceres

During the welcoming ceremony to the businessmen who took part in the Agribusiness seminar of Harvard University in 1976, Ney Bittencourt Araujo, President of Agroceres, was introduced to Ken Woolley, who was the Pig Improvement Company (PIC) Management Director at the time.

Agroceres had been operating in the field of plant genetics in Brazil since 1945, having its main business in the field of hybrid corn seeds.

PIC had been operating in the animal genetics field since 1963, having England as its operational centre, holding the premier market position in the production of crossbred pigs.

A little time before their meeting, Ney Bittencourt had published a report where he expressed the strategic concern of Agroceres about their dependence on just one unique product. Corn seeds represented 80% of total sales and the Board of Directors had decided to research diversification to other markets which had synergy with its main product - corn seed - and also where they could apply the technological expertise of the company, concentrated in the field of genetics. This was mirrored from the English side where there was concern about being positioned in emerging markets with developing potential and amongst which were China, South Korea and Brazil. Nevertheless, PIC's international experience indicated that the key to entering international markets depended on the identification of a reliable

and skilful partner with the technological knowledge in genetics, essential for the commercial success of the business.

By the end of the seminar, a new joint venture was born. Agroceres-PIC started operating commercially at the beginning of 1978.

By 1994, PIC was under the control of a large multinational company - Dalgety. International PIC had by this time set up 25 subsidiary companies in over 30 countries producing 1.1 million crossbred gilts and generating sales of US\$ 30 million per annum.

In the same year, 35% of the pig meat produced in Brazil under federal supervision originated from Agroceres-PIC genetic material, representing sales of US\$ 18.9 million, under the control of Roberto Butteri, Vice-President of Agroceres in charge of the Animal Division.

By analysing the formation of Agroceres-PIC, it is possible to put the Agroceres diversification strategy into context. Dr Antonio Secundino de Sao Jose, founder of Agroceres and father of the present President, developed an interest in animal genetics in the 1970s. Agroceres even created a pig production centre in Patos de Minas, where Dr. Secundino replicated in pigs, the success obtained by the company in plant genetics with hybrid corn. Dr Secundino, however, considered that the technological gap in animal genetics was already too big to prevent the use of the strategy applied for seeds. So, in order to gain access to international genetics, it was necessary to set up a partnership with a company that had the

available technology - a world lead in pig genetics. The need, however, for the genetic basis to be modified for local needs, that is 'tropicalisation' was not considered as important as it had been in the corn case.

Many possibilities were considered. Dekalb group was contacted in the USA and NPD in Europe. Everything indicated, however, that the meeting between the two corporate presidents at the Agribusiness Seminar in Harvard had been the defining moment in setting this strategy in motion.

In 1977, Sementes Agroceres SA, Swift-Armour, Natron and PIC set a partnership of equal shares establishing the operation in Brazil. In December, 1977, despite the problems facing the industry with African pig fever, an air freight Boeing flew from England and landed secretly in Brasilia airport with the first lot of animals. After the first steps were completed, Swift and Natron sold their shareholder participation to Agroceres and in 1982, there was a capital call which was not followed by PIC. So the partnership shares became 87.7% Agroceres and 12.3% PIC, which it has remained to this day.

Great changes have since taken place in the international pig business that must influence the strategy of companies which operate in the genetic field or those which are pig meat processors. Consumers are now more demanding and concerned about health and pig breeders are requiring much higher standards in terms of management and the competition can only be expected to increase in the near future. Despite the success of the venture, concerns are focused on the next 20 years. The company has

been quite successful in its first two decades. The problem now will be to consolidate and keep a lead over their competitors.

THE INTERNATIONAL CONTEXT

Production and Consumption Patterns

The world pig herd was estimated in 1992 at 956 million pigs producing approximately 72 million tons of meat. The global demand has been increasing considerably due to population and income increases in the main consuming countries, a fall in the pig meat price, convenience food processing, a reduction in fat content, improved attractiveness of taste and texture and consistent marketing programmes.

Meat consumption 'in natura' is concentrated in the countries with mild climates whereas in the tropical countries it is the consumption of processed food that has developed most.

The world consumption per capita/per annum is around 13 kg, ranging from 22 kg in North America, 10 kg in Asia, 41 kg in Europe and 19 kg in the countries of Eastern Europe. The consumption per capita has grown by 8% between 1985 and 1992, according to a study made by Gaasbeek, Borgstein and Vlieger, in Rabobank (1993). By analysing the changes in the consumption composition, it should be noted that

Asia presents the greatest growth with 32% a year, whereas the consumption trend in Europe, is decreasing (Table 1).

International trade is limited and is concentrated on the countries next to big consumption centres. This explains why Denmark exports: 50% of its production, whereas China exports only 2%. The markets considered most promising for future growth are China, Japan, Thailand, Taiwan and Brazil. About 70% of the world trade takes place within the European Union. Germany, Italy and Japan are the biggest importers while Denmark, Holland and Belgium/Luxembourg are the biggest exporters.

The international supply of pig meat has been affected by the increase in consumption and, as a result of productivity improvements due to the dissemination of better genetics and handling technologies. The largest producing countries are China, USA, Germany and the Eastern European countries (Tables 1 and 2).

International competition:

The producer countries which specialise in intensive production such as Holland, are subject to growing environmental limitations. The factors which are considered essential for competitiveness in the pig sector are:

Geography - especially related to the proximity of the markets.

Climate: which determines whether the meat consumption is 'in natura' or as processed meat.

Raw material available: which limits production in areas where the cost of the feed ration is high.

Labour: because modern production requires specialized labour with the right skills to get high herd productivity.

Capital: where the necessary facilities to start production require a high level of investment and the minimum production scale excludes the small producer.

Infra-structure: where facilities to ship both the parent livestock and frozen semen are important.

Chain-coordination: the dynamic activity in competition that requires the developing of communication channels between all the factors of production.

Animal health: which relates to handling and results from factors such as coordination of input availability and producer's technical abilities.

Table 4 indicates the perceived level of international competitiveness for selected countries.

The outstanding conditions are those which affect production costs, access to resources, sources of capital for investment, capacity to adapt technologies, capacity to coordinate the system, knowledge and infrastructure. So the question is how would Brazil rate on these criteria?

THE EVOLUTION OF INTERNATIONAL PIC AND THE DEVELOPMENT OF INNOVATIVE METHODS OF GENETIC IMPROVEMENTS

A revolution in pig breeding techniques

Prior to the 1950s, the pig breeder's aim was concentrated on obtaining phenotypes; pigs based on a good appearance which could be enhanced by management. Naturally, this approach pleased them as agriculturalists. English farmers had a particularly strong tradition in the genetic improvement of animals, including pigs, but the cost of the parent stock was excessive relative to their potential for production.

At the end of the 1950s, some producers noticed that the new genetic improvement techniques used in plant and chicken breeding could be used in pigs. Actually, they noticed that the focus of breeding could be redirected from the phenotype approach to genotype; based on objective criteria of production for characteristics such as food conversion, weight gain and carcass quality with the view to passing these on genetically.

The producers organised a conference with important geneticists such as Dr. Sid Fox of Reading and Dr. John King from Edinburgh. During the conference it was emphasised that by concentrating breeding programmes on the animals performance there was enormous potential to be explored. There were further potential gains from improved animal health associated with suitable handling which would also be vital to get the desired performance. It was also vital for a breeding programme to eliminate the influence of disease as a factor affecting performance.

With this new concept, a group of producers created the Pig Improvement Company (PIC), whose aim would be to explore the benefits of a high health status breeding environment and genetic improvement achieved by breeding on a scientific basis. They bought a property in Oxfordshire and selected females of Large White (LW) and Landrace (LR) under the direction of the Pig Improvement Development Association PIDA. To make sure that the progeny were free of pathogens, the hysterectomy technique was used. The womb was surgically removed just prior to giving birth naturally, avoiding the contamination of the offspring. They produced 80 disease-free piglets, by this method, to start the breeding programme. As a result of this process most performance reducing diseases were eliminated. Equally important is that performance from superior genetic stock was not compromised by disease, allowing a more accurate and rapid selection process to take place. Currently, all the new genetic material to be introduced goes through the same process.

More recent studies, in the USA, have shown that the piglets seem to maintain their immunity level up to the 14th day; this immunity being obtained from the mother's colostrum. Such immunity decreases between the 14th and the 20th day of life. This means that the breeding pigs can be kept free from diseases if they are taken to completely isolated environments (such as the ISOWEAN system). This process reduces gilt production costs by up to 10% but it requires that pigs born in the same week are kept isolated in separate units and isolated from other pigs. Ideally, this means being kept in units at least 1 kilometre apart.

The mating of LW females with LR males resulted in a 10% increase in the pigs size, feed conversion and liveweight gain as a result of the effect known as 'hybrid vigour'. It was necessary to include animals with good fertility characteristics because litter size is only 10% heritable whereas feed conversion and live weight gain can be up to 30% inherited. The first females which resulted from the mating were called 'Camborough' (developed at Cambridge and Edinburgh) and were initially mated with LW males to produce the commercial pigs. The programme results were transmitted through a 'breeding pyramid' in which any advance could be rapidly transferred via the multipliers to the producer of slaughter pigs. The system stimulates the repeat purchase of further breeding stock every two or three years if the producer wants to keep his herd with the best possible performance. About 100 great-grandparents are needed to supply replacements for 1200 grandparents. These, in turn, provide replacements for herds of 18,000 sows. These would have an annual production of over 360,000 slaughter pigs. So, superior genetic merit from 100 pigs can be transmitted 3,600 times. Even a small commercial gain, therefore, in the

slaughtered pigs can pay for breeding royalties multiplying up to high values for the ideal grandparent stock.

Competition in the United Kingdom

At first, the traditional English producers and improvers did not believe in the use of hybrids and the Camborough female. The producers who concentrated on the male pig improvement ridiculed the new concept when it was introduced in England, and the same happened in other countries. PIC's approach, however, was successful commercially. It was reluctantly accepted by the breeders and the number of clients grew. PIC was closely followed by Cotswold Pigs, a company subsequently taken over by Nickersons, a seeds producer. As advanced plant breeders, they understood the potential gains from genetics and how to exploit them. Later on, the commercial improvers adopted the technology and formed groups such as United Pig Breeders (UPB), nowadays part of Porcofram. JSR Healthbred is a more recent imitator. It has been producing pigs for ten years and has made great progress in that time. JSR took over the Artificial Insemination Centre of the Meat and Livestock Commission (MLC) in 1995. NPD in the Netherlands, the greatest competitor in Europe, has now been taken over by PIC, so there has been a major consolidation of companies in the UK and Europe.

Development of the PIC system

The internationalisation strategy for PIC developed in the 1970s. It necessitated the development of a range of selection standards directed at specific countries with

their own particular production systems and distinct market requirements. As a result of this, races, such as the Pietrain, were introduced which had desirable production traits despite being susceptible to Pale Soft Exudative (PSE) muscle. This characteristic makes it difficult to sell the meat 'in natura' due to its unappealing appearance. This is of less importance when consumption is primarily of processed meat. The Duroc has proved to be particularly promising, when introduced in systems that require robustness in a harsher environment and improved meat quality.

The improvement system adopted by PIC has always been based on 'population genetics' which searches for material from a wide population with the aim of continuously improving the desired characteristics in the potential parent stock. In fact, under the system each great-grandfather sire has only 25 matings and each female only two litters, regardless of how promising the animal is. This technique guarantees sustained gains in all the herd instead of great surges achieved only when an exemplary animal appears. The population genetics system used is known as BLUP (Best Linear Unbiased Prediction).

The Use of Joint Ventures

A limitation found by PIC at the international level is the difficulty in maintaining high health status in the production phase to obtain the best results from the genetic improvement process. All the advantage can be lost if the material produced does not find appropriate conditions to reach its performance potential. International PIC believes that the main role of the associated companies is to guarantee that the clients adopt the standards considered necessary for business success.

Another important factor is to be aware of the local partner's objectives. Many international companies turn to PIC in order to use high potential females so that they can improve their own breeding production structure. These companies are not necessarily aiming to reach producers in general and may just target producer groups. These partners can then end up limiting the market development for hybrid pigs which is the base for PIC business expansion.

PIC's market leadership has resulted from a number of different factors but, essentially, it has been a belief in their own approach to genetics which made it possible for the company to operate in a sector of the market virtually on its own for some years. The results have been so good that competitors have now adopted the PIC approach although they find it difficult to penetrate the market now dominated by a proven system.

International PIC believes that expansion depends crucially on the formation of suitable contracts with their international partners. The company now has experience of a large number of contracts in a great diversity of countries where the traditions and institutions are quite different, which represents a considerable challenge in adaptability. One concern, for example, is how to cope with the fact that most of the countries where PIC operates do not have intellectual property protection laws for living beings, creating a potential problem for protecting the rights of breeders.

The most important factor in keeping the loyalty of international partner's is the high rate of technological advances which have resulted from investments in research and development by PIC. This is now concentrated in the USA although the research is multi-centred and international. The trend towards market segmentation, however, can lead to the need for greater strengthening of the breeding programmes at the local level. This results in a certain division of work in which a greater use is made of bio-technology in the USA and multiplication is developed by more conventional means in other countries adapted to suit local conditions. PIC has become very skilled in developing a dozen or so breeding lines allowing pigs to be offered that are ideal for local production and market conditions. Even so, non-participation in specific markets can create opportunities for smaller companies to operate with success. PIC's aim is therefore not that of total market domination, but to appeal to mainstream, large-scale markets.

THE BRAZILIAN MARKET

Demand

The consumption of pig meat in Brazil per capita is less than 10 kg/person/year. Recent estimates are 7.2 kg/person/year in 1993 and 7.5 kg in 1994 (Talamini, 1994). These numbers are low if compared to the consumption in other countries and to the consumption of other meat substitutes (Table 5 and 6).

The variables traditionally used for determining demand can be used to explain the reasons for the low level of consumption. Firstly, low incomes are a consumption

limiting factor for animal protein in general. This, however, is particularly significant in the case of pig meat which has higher prices than both beef and chicken meat. This is the main factor impeding the increase in consumption in pig meat. According to Talamini (1994) pig meat is about 40% more expensive than chicken meat (Table 7).

Over the period between 1970 and 1993, there was a 5.55% increase in the PIB a year and 2.32% of the Brazilian population. Over the same period, the real price of chicken meat decreased 3.97% a year while pig meat decreased by 1.65% a year. As a result, the chicken meat consumption increased 10.76% a year whereas, pig meat consumption increased by only 2.57% a year - little more than the rate of population growth.

The consumer relates pig meat to high cholesterol intake. This leads to consumption being only on an occasional basis representing an obstacle for consumption growth particularly as the modern consumer is tending to be more and more concerned with health and diet.

Despite these factors, however, it may be that actual consumption is higher than the figures suggest. This is due to the high incidence of illegal slaughter. The official figure for total consumption is about 1,300 tons of meat, but it could actually be as much as 2,600 tons (including the illegal slaughter), thus increasing considerably the consumption per capita.

Production

Production conditions vary considerably in different parts of the country. The national herd is estimated at 32 million with very low slaughter rates estimated at 39.8% per annum in 1992. About 33% of production is located in the south. The Northeast has 29% and the Southeast 18%. The slaughter rates, however, are quite different reaching 159% in Santa Catarina in the south. This is comparable to the slaughter rates observed in countries where pig breeding is well developed and way above the national average of 39.8% (Tables 8 and 9). The official figures for the total number of pigs slaughtered in Brazil in 1993, was 13.6 million animals. Data from the producers indicate a breeding herd size of 2.7 to 2.8 million sows of which 1.2 million are good meat producers - from improved races or hybrid stock. Out of these it is estimated that 400,000 are of a high genetic standard and 800,000 of average or below average standard.

Production factors:

Besides the characteristics of the breeding herd, one of the main production limiting factors is the raw material available to produce pig rations. The southern region of the country still has the largest and the best pig herds but production would be better located in the central region near the main grain producing areas and this is where the high technology, and most efficient production is migrating. According to PIC, the demand for its product has been increasing in the states of Minas Gerais (where 37.2% of the sales were concentrated in 1995), Goiás, Mato Grosso and Rio Grande

do Sul, and it has been decreasing in the states of Sao Paulo, Paraná and Santa Catarina (Table 10).

Veterinary support services are equivalent to those found in developed countries and this factor does not represent an obstacle to growth. Pig housing and sanitary control, however, still represent an obstacle for the improvement of performance and represent a limiting factor in the access to international markets which are often protected by non tariff barriers (such as sanitary and phyto-sanitary measures).

Competition:

Many of the compares which compete in the breeding market are of a high or at least, medium standard. The traditional compares which develop their own breed types, created by improvement of the traditional breeds operate at a local level in the regions and without providing technical support. The changes in superior genetic technology with the introduction of hybrid pigs represents a great threat to these breeders as has been seen in other countries.

In the more advanced technology sector, it is worth mentioning that some Brazilian agro-industrial compares have developed their own breeding programme such as Sadia, Frigorífico and Aurora, as backward links in a vertical integration strategy. Rezende Grange has been trying to introduce genetic material derived from international material. Seghers from Belgium and Dalland from Holland have started operating in the Brazilian market and Dekalb (the second largest supplier in the world market) has a strategy to expand in the international market.

The high profits which are apparent in PIC's financial analysis have attracted new international compares willing to participate in a market with great growth potential (Tables 11-14). PIC makes a net revenue of US\$ 7 million which is high considering the capital invested of US\$ 18.9 million. So the other compares mentioned have started operating in Brazil and, of course, other compares will follow.

PIC's strategy was to start operating in the market with Agroceres. The success of the joint venture represents an additional barrier for new compares which are willing to start operating on a national scale. Nevertheless, with the expected development in the sector, marketing segmentation can bring local opportunities for these compares

Agro-industrial System Coordination (SAG)

SAG is considered to be more and more important as a competitive factor but nevertheless the SAG coordination of pig meat production in Brazil has still not produced the desired results. Information exchange is deficient and there are many conflicts between the industry and the pig producers. One of the most contentious aspects of advanced technology pig breeding has to do with the payment for quality which is difficult to implement, especially when it is not coordinated by groups or cooperatives.

The existence of illegal slaughter further complicates the coordination process because producers operating within the sanitary regulations and paying breeding

royalties, (and thus operating with higher costs), are treated as equal to producers operating outside the system.

Possibilities do exist for smaller producers to operate in a more sophisticated production and marketing environment when producers are just involved in one step of the production process. Such organisation of production, however, requires structures for coordination which are very specialised. This can be provided by cooperatives.

Prospects for the Pig Industry in Competition with Chicken

The contrast between the efficiency of animal protein production from pigs and chickens is clear from the technical measures of food conversion; that is around 2.8:1 for pigs compared to 1.9:1 for chickens. The potential for pigs, however, could be as low as 2.35, with appropriate management and genetic material which represents a marked improvement although still well over the average for chicken (Table 15). This performance gap originates from long term genetic selection as well as easier handling techniques and the animals inherent biological capacity. In spite of chicken meat having these production efficiency advantages, pig meat is the animal protein source more commonly consumed in the world (Table 16). Agroceres decided to form a joint venture with Ross Poultry breeders, a UK based international company who, like PIC, are market leaders. They thus have a stake in both forms of intensive meat production.

The Implications of Recent Technological Evolution in Pig Breeding for Agroceres

Improvements of pigs at international level has been constant but new technology provides a powerful tool in accelerating the process. PIC has patented an identification method for isolating the ESR gene whose occurrence is associated with an increase in reproductive capacity. This has now developed further and PIC-sponsored researchers have identified an association of the RYR gene to high quantity non-fat meat and also high susceptibility to stress; the RN gene with acid meat, the K88 gene with resistance to E.Coli and the MHC gene with offspring size, bacon thickness and piglet mortality.

Improvement programmes can now be accelerated and targeted more accurately by 'gene tagging'. PIC has decided to keep this work centralised in the United States with contacts and coordination methods being developed to connect this to the developing programmes in associated companies where they will make use of the work. Associated companies have the option to participate fully in advanced biotechnological programmes, reaping a share of the rewards, or merely to benefit by the acquisition of stock which themselves have been a product of the work.

Participation in the programme implies a share in the cost of resources in a research fund. The participant companies will have special treatment in the early use of the best results reached. Agroceres has preferred not to participate in the fund and this means that it will have to get into an agreement with international PIC in order to benefit from any advances which result from the programme.

The Compatibility of Breeding Objectives

PIC recognises that there is a worldwide need to introduce a pig breeding programme based on meat quality, although operationally, this is focused on Germany, Denmark and Netherlands. In the other countries, production is still a priority, with the emphasis still on the capacity of the crossbred female pig to generate large numbers of strong piglets per farrowing. PIC has an objective to reach a technical index of performance of 30 weaners per sow per year. The advance in the improvement directed towards low fat meat, unfortunately, seems incompatible with breeding for such high reproduction rates. In other words, the improving programmes have limited possibilities to advance simultaneously in two or more directions.

The most important factors defined by the breeders must relate back to the producer's economic performance which, in turn, reflects on consumer's requirements.

All the effort that goes into the improvement can be wasted without suitable management of the herd with appropriate facilities run by skilled personnel using good quality inputs. When visiting PIC clients, it is clear that there is quite a wide diversity of producers in terms of management capability and resources. Consequently, the results are quite different in terms of productivity.

Special techniques concerning the management of boars has led some units to introduce artificial insemination, eliminating natural mating. This technique allows

the dissemination of positive characteristics in the herd much more easily, given that a male can mate with 200 instead of only 20 females (because the semen from one natural mating could serve ten pigs by AI). On the other hand, the pig semen is not as easily stored as cattle semen and the handling is more specialised.

Implications at the Farm Level

All the innovations in pig breeding have led to an increase in the optimal scale of production. Units with 20,000 sows exist in Brazil but the 150 sow unit is common. The traditional producer with 5 to 8 sows is far too small to compete on the technical performance criteria expected in industry. This fact has prompted changes in unit structure with a tendency to specialise into units for nucleus herds, multipliers, weaner production and fattening.

In Brazil, these units are called complete cycle, weaner granges, production and finishing units (as explained in the PENSA Perdigao case study). As a result, it is necessary to transform the cooperatives which were typically characterised as inefficient in terms of scale by the creation of the 'condominium system' where investment is divided up and centralised, making it possible to achieve the business continuity without losing the scale advantages and keeping the co-ordinating role of the cooperative.

The PIC business structure was developed so that it would be possible to have a fast diffusion of the technological advances obtained in the genetic improving programme. Their success is due to the maintenance of innovation by PIC and the

organisation and coordination of the productive systems where the company operates with its partners.

The Introduction of the Pig-Champ Recording Programme

Agroceres-PIC introduced the PIG-CHAMP programme for its customers. This is a system of integrated and computerised recording involving 152 units by 1995 with a total of around 93,000 sows. The system was not offered to all customers and was intended for monitoring the biggest units. These can then compare their performance indices with the other participants in the programme. By inference, it also gives Agroceres and PIC a database of performance regarding the commercial performance of their pigs and how successful their clients are in managing them.

The smaller customers do not take part in this programme although it is these units that have the greatest need to monitor and improve their management. For Agroceres-PIC, however, it would cost a great deal of money to expand the programme to include all producers and the capital costs of such investments for producers are prohibitive. Again, it is up to cooperatives to open the door to scale economies for the small producers.

CHALLENGES TO AGROCERES-PIC:

The international competition analysis of van Gaasbeel, Borgstein and Vlieger (1993) indicates that the European markets are saturated and have limited possibilities for growth. Production costs are high, due to high ration costs, and the increasing environmental restrictions imposed on producers.

In such market conditions, the only possible thing to do is to look for efficiency in costs, associated with organisational efficiency, and to aim for quality. Another possibility is to differentiate the products by adding value and targeting consumers with higher incomes.

The challenge is to attack the main competitor, chicken meat, and this implies the gradual development of distinct strategies. In the USA, the theme of the programme is the 'second white meat' with promotional emphasis on the appearance of white meat with brands designed to point out the differentiation with publicity from campaign stunts. It is expected that products made for a specific group will demand new finishing and slaughter facilities which will require coordination between the industry and the producers.

The Latin-American market, however, offers greater expansion potential as consumers incomes grow.

Dr. Butteri asks himself how the Brazilian and Mercosul market will grow? Currently PIC is putting its product in the other Latin-America countries. Table 4

can be used as a support to the discussion on the competitiveness of Brazilian pig breeding and help to formulate a suitable strategy for PIC in Brazil.

Some aspects deserve special attention to guide the future actions of Agroceres-PIC:

1. PIC's fast growth has led the company to work with quite different kinds of customers in terms of technological know-how and herd management. The customer's performance is not the same, which has led to criticisms from the smaller producers who need more training support. The PIG CHAMP programme just supports larger customers. In order to benefit fully from international PIC's philosophy, should Agroceres-PIC invest more in pig management training programmes or even expand the PIG CHAMP programme in order to give support to the less well qualified producers?
2. How will the partnership between PIC and Agroceres develop in the long term? PIC will be able to adopt strategies to limit the action of its partners at a regional level. It is not clear what the PIC strategy is in Mercosul. Specifically, will Agroceres have a privileged regional position or will other joint ventures be formed? Should Agroceres take more aggressive action in Mercosul markets? Should they develop these markets themselves or look for partners instead of allowing PIC to intervene?
3. The producers who use PIC material have higher overhead costs than the traditional producers. In a country where illegal slaughter is high and where

the payment for meat quality has not yet developed, the producers add value but they are not paid for it. Publicity campaigns prompting pig meat as a second white meat and PIC pig meat as a differentiated product can motivate the final consumer to pay for quality, establishing a scale of prices that would increase the value of Agroceres-PIC genetics even more. Should Agroceres-PIC invest in publicity campaigns aimed at the final consumer? Would it be possible to operate these in collaboration with the industry?

4. Competitor companies are coming to Brazil with the arrival of several multinational companies from the sector. In a concentrated market, such as that for gilts, should Agroceres react or is its leadership position still so solid that it is not necessary to take protective action?

Table 1 - Pig Meat Consumption per continent 1985-1992

Year	Consumption (million of tons)	Asia %	North and central America %	South America %	Africa %	Europe %	Oceania %	Ex- USSR %
1985	58,1	37	14	3	1	34	1	10
1989	67,9	40	14	3	1	31	1	10
1990	69,8	42	13	3	1	31	1	10
1991	70,9	44	13	3	1	29	1	9
1992*	71,8	45,5	14	3	0,9	28	0,6	8

Note (*) Preliminary data

Source: Competitiveness in pig industry. Rabobank, 1993

Table 2 - Overall production of pig meat per continent - 1985-1992

Years	Production (Million of tons) %	Asia %	North and Central America %	South America %	Africa %	Europe %	Oceania %	Ex-USSR %
1979/81	53,9	34	16	3	1	35	1	10
1985	58,1	37	14	3	1	34	1	10
1989	67,9	40	13	3	1	32	1	10
1990	69,9	42	13	3	1	31	1	9
1991	70,9	44	13	3	1	30	1	8
1992*	71,8	45	14	3	1	29	0	8

Note: (*) Preliminary data

Source: Competitiveness in pig industry. Rabobank, 1993

Table 3 - Pig numbers per continent - 1979-1991

Years	Production (Million of tons)	Asia %	North and Central America %	South America %	Africa %	Europe %	Oceania %	Ex-USSR %
1979/81	776,2	47	13	7	1	22	1	9
1985	791,5	48	12	6	1	23	1	9
1989	847,0	50	11	6	2	21	1	9
1990	855,9	51	10	6	2	21	1	9
1991	857,1	51	10	6	2	21	1	9

Source: Competitiveness in pig industry. Rabobank, 1993

Table 4. Factors for International competitiveness individual country comparisons

	Holland	Germany	China	Brazil
Geography	****	***	***	
Climate	***	***	**	
Raw Material	***	***	**	
Labour	**	**	****	
Capital	****	***	*	
Infrastructure	****	***	**	
Knowledge	****	***	*	
Internal market	**	****	**	
Network	****	***	**	
Economic structure	**	****	*	
Animal Health	***	**	**	
Environment	**	**	****	

- * poor / expensive and very rare
 ** moderate
 *** good
 **** very good / cheap and widely available

Source: Competitiveness in Pig Industry. Rabobank, 1993.

Table 5 - Regional analysis of the Brazilian Pig herd

Regions	Size (Million of heads)	Production (tons)	Exports (tons)	Consumption (Kg per capital/year)
North	3,7	6.000	-	4,0
North East	9,4	55.000	-	4,5
West center	3,5	40.000	-	5,0
South East	6,0	299.000	500	7,8
South	10,4	750.000	16.223	7,8
TOTAL	33,0	1.150.000	16.723	7,5

Source: Frigorífico Aurora: os caminhos para a construção da marca. Case study PENSA, 1994

Table 6 - Consumption of meat per capita, Brazil 1989-1994 (*)

Type	1989	1990	1991	1992	1993	1994
Beef	27,9	23,6	22,8	22,9	23,7	24,6
Chicken	12,5	13,5	14,8	15,8	17,1	18,4
Pigmeat	6,7	6,8	7,0	7,0	7,2	7,5

Note: (*) Em Kg per capita

Source: Wedekin, V.S.P. e Mello, N. *Cadeia produtiva da suinocultura no Brasil*. Agricultura em São Paulo, 1995

Table 7 - Relative meat price to the producer, in São Paulo

product (*)	1970/72	1991/93
Chicken / Beef	1,49	0,80
Chicken / Beef	1,14	0,67
Pig / Beef	1,30	1,20

Note: (*) Living net

Source: Anais Suinocultura 2000, Agrocere-PIC, 1994

Table 8 - Ratio of slaughtering relative to the size of the Pig herd Santa Catarina, 1990-1994

Year	Percentage %
1990	135,9
1991	149,3
1992	158,8
1993	156,7
1994	159,0

Source: ACCS - Associação Catarinense de Criadores de Suínos, 1995

Table 9 - Pig numbers and total slaughtering in the main producing regions / countries of the world 1993* (in thousands)

Country	Herd		Animals Slaughtered	Ratio % (**)
	Initial	Final		
China	384.210	398.210	375.000	101,4
CE (12)	110.002	110.009	175.800	162,9
Ex-USSR (12)	60.667	55.530	61.716	88,1
USA	59.016	58.537	92.475	158,9
Brazil	31.050	30.450	13.600	39,8
Poland	21.078	18.000	21.700	104,6
Japan	10.783	10.560	18.940	173,9

Note: (*) Preliminary data

(*) Ratio = slaughter + variation in herd size during the year.

Source: Wedekin, V.S.P. e Mello, N. *Cadeia produtiva da suinocultura no Brazil*. Agricultura em São Paulo, 1995

Table 10 - Agroceres-Pig; geographical distribution of sales

Estate	Heads	1995 %	1994 %	1993 %	1992 %
Minas Gerais	12.528	37,2	36,2	31,1	27,0
São Paulo	4.021	12,0	11,2	15,5	10,4
Paraná	1.828	5,4	11,6	11,2	7,1
Santa Catarina	3.234	9,6	9,6	14,1	29,0
Rio Grande do Sul	3.688	11,0	7,3	5,0	9,2
Espírito Santo	725	2,2	3,4	1,7	1,9
Rio de Janeiro	722	2,1	2,8	2,3	1,6
Goiás	1.468	4,4	5,2	3,5	2,8
Mato Grosso do Sul	1.410	4,2	4,4	9,0	-
Mato Grosso	1.805	5,4	-	-	-
Bahia	552	1,6	1,7	1,7	-
Others	1.681	4,9	6,6	4,9	11,0
TOTAL	33.662	100,0	100,0	100,0	100,0

Source: Agroceres - PIC

Table 11 - Agroceres-Pig; balance sheet ('000 \$US)					
ASSETS	1990	1991	1992	1993	1994
Short term:	195	108	18	24	87
Cash and banks	1,389	1,740	1,938	11	-
Financial application	684	623	569	983	1,812
Promissory notes to be received	(46)	(19)	(17)	(15)	(27)
(-) Doubtful debtors	159	357	295	399	193
Other sums to be received	2,437	2,387	2,037	2,137	2,255
Stocks	-	-	-	1	-
Anticipated expenses	4,818	5,196	4,840	3,540	4,320
Longer term	1,525	1,074	113	3,978	9,431
Allied operations	38	34	41	40	678
Other sums to be receiver	1,563	1,108	154	4,018	10,109
Fixed	34	34	34	34	34
Investments	7,929	8,216	8,303	8,534	8,934
Immobilized	(3,186)	(3,605)	(4,033)	(4,344)	(4,556)
(-)Accumulated depreciation	4,743	4,611	4,270	4,190	4,378
	210	145	80	54	65
Sub-total	4,897	4,790	4,384	4,278	4,477
TOTAL OF ASSETS	11,368	11,094	9,378	11,836	18,906

Table 12 - Agroceres Pic; balance sheet of ('000 \$US)					
LIABILITES	1990	1991	1992	1993	1994
Short term					
Suppliers	325	276	169	216	519
Importation's	-	-	-	-	-
Clients advantage payment	-	-	-	-	-
Loans and financing	104	336	182	-	185
Provision of interests	-	4	1	-	9
Social taxes / other taxes	210	368	229	55	83
Income tax	705	346	4	140	215
Social contribution	267	112	-	51	92
Dividends to be paid	-	1	-	2,181	2,944
Other bills to be paid	304	278	275	231	446
	1,915	1,721	860	2,874	4,493
Longer term					
Allied operations	128	296	43	64	805
Loans and financing	161	64	-	-	104
Provision for income tax	1	131	-	-	-
	290	491	43	64	909
Equity					
Social funds	2,898	2,898	6,343	6,361	9,400
Funds store	-	-	18	114	310
Accumulated profits	5,047	5,729	2,255	(83)	(3,254)
Year result	1,218	255	(141)	2,506	7,048
	9,163	8,882	8,475	8,898	13,054
TOTAL OF LIABILITES	11,368	11,094	9,378	11,836	18,906

Table 13 - Agroceres PIC; profit and loss account ('000 \$US)

RESULT	1990	1991	1992	1993	1994
Net sales	18,383	17,937	14,987	19,254	24,864
Sales cost	(11,684)	(12,378)	(11,292)	(12,171)	(13,879)
Gross profit	6,699	5,559	3,695	7,083	10,985
Expenses and operational receipts					
Sales expense	(2,349)	(1,683)	(1,890)	(1,693)	(1,765)
Overall expenses and administrative	(1,784)	(2,767)	(3,039)	(2,783)	(3,871)
Revenue/financial expenses	4,221	4,409	1,049	1,942	(1,482)
Doubtful debtors provision	(494)	(355)	(31)	(42)	(41)
Other operational revenue	-	-	-	-	-
Total	(370)	(396)	(3,911)	(2,576)	(7,105)
Operational result	6,329	5,163	(216)	4,507	3,880
Non operational results	69	16	(19)	569	164
Earnings/loss in the conversion	(3,706)	(4,587)	191	(1,564)	4,431
Results before income tax	2,692	592	(44)	()	8,475
Income tax provision/social contract	(1,474)	(337)	(97)	(1,006)	(1,427)
NET RESULTS	1,218	255	(141)	2,506	7,048

Table 14 - Agroceres-PIC; financial performance indicators of agroceres

Indexes/Years	1990	1991	1992	1993	1994
Current ratio (floating assets/floating liabilities)	2.52	3.02	5.63	1.23	0.96
Liquidity ratio (floating assets-stock/floating liabilities)	1.24	1.63	3.26	0.49	0.46
Production costs participation (sold products cost/Net sales)	64%	69%	75%	63%	56%
Overall returns indicator (Net produce/Net Sales)	7%	1%	-1%	13%	28%
Capital Returns indicator (Net Produce/Net Patrimony)	13%	3%	-2%	28%	52%
Return on investments (Profit before Income Tax/ Total Assets)	24%	5%	0%	30%	45%

Source: Agroceres-PIC

Table 15 - Indexes of food conversion of chicken and Pigs			
Food conversion	Very good	Medium	Bad
Pigs (*)	2,35	2,8	3,6
Chicken (**)	1,7	1,9	2,1

Note: (*) For growing pigs between 145 to 180 days and slaughter average weight of 100 kg.

(**) For slaughtered chicken between 42 to 45 days, with slaughter average weight of 2.2 kg.

Source: Agroceres - PIC

Table 16 - World consumption of animal protein				
Meat	1981 a 1983		1991 a 1993	
	Average	%	Average	%
Pigs	36.359	40,3	67.213	47,5
Beef	39.109	43,4	47.067	33,2
Chicken	14.615	16,3	27221	19,3
Total	90.083	100,0	141.501	100,0

Source: *Anais Suinocultura 2000*, Agroceres-PIC, 1994.

LITERATURE

AGROCERES PIC (1995). **Relatórios Experimentais e de Vendas**. Rio Claro, SP.

ASSOCIAÇÃO CATARINENSE DE CRIADORES DE SUÍNOS (1995). **Relatório de Desempenho**. Concórdia, SC.

PINAZZA, L.A, CHADDAD, F.R. (1994). **Frigorífico Aurora: Os Caminhos para a Construção da Marca**. IV Seminário PENSA, Águas de São Pedro, SP.

RABOBANK, (1993). **Competitiveness in Pig Industry**. The Netherlands.

SUINOCULTURA 2000 (1994). Anais Suinocultura 2000. Rio de Janeiro, RJ.

TALAMINI, D.J.D. (1994). **Fatores Limitantes e Perspectivas para o Consumo de Carne Suína no Brasil**. Anais do Seminário Suinocultura 2000. Rio de Janeiro, RJ.

WEDEKIN, V.S.P; DE MELLO, N. (1995). **Cadeia Produtiva da Suinocultura no Brasil**. Agricultura em São Paulo, Instituto de Economia Agrícola, Secretaria de Agricultura e Abastecimento do Estado de São Paulo, V. 42, T.1, pp.1-12, São Paulo.