The University of Queensland

Getting the priorities right: stakeholder involvement for a holistic view of research and extension priorities in the Australian and Brazilian dairy industries

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Statements

The work presented in the thesis, to the best of my knowledge, is the original work of the author. It has not been submitted for a degree at this or any other university.

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Papers co-authored with the advisors were prepared using the thesis data and arguments while the work was in progress. In each case, the candidate wrote the first draft and provided data. All three authors discussed appropriate structure and content, and resolved difficulties in the presentation of data and clarification of arguments.

Sérgio Rustichelli Teixeira                                          Helen Ross
Dedication

I dedicate this thesis to many people. First to my family for coming with me to Australia and supporting me at all times, even with their own sacrifices. I dedicate it to my parents for the encouragement and example of a solid family, giving me the basis for my future. I dedicate it to my Brazilian and Portuguese friends in Australia; they became my Australian family, and I dedicate it to my friends in Brazil for their support before and during the course, particularly in solving our problems in Rio de Janeiro and Juiz de Fora.
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- Invited speaker for the Expointer (Agricultural exposition in Rio Grande do Sul, Brazil) in late August 2004. The event and speech have the objective of put in practice the findings of this study.
Award

During the course I received an award. Alan Lawson, Dean of Post graduate Studies at the University of Queensland, and Don Cameron, coordinator of post graduation of the School of Natural and Rural Systems Management, nominated me for participation in the American Association for the Advancement of Science / Program for Excellence in Science. This program rewards deserving graduate students.
Abstract

Globalisation causes continual change in the dairy industry, creating new opportunities and risks in countries, states, and regions. To survive and benefit from these changes, stakeholders from across each country’s dairy industry need to co-operate to develop alternatives for their regions. The Australian and Brazilian dairy Research, Development and Extension (R,D&E) organisations recognise this need in their mission statements. They also have some initiatives for more effective interaction with the stakeholders in their dairy industries. In the 1990s Australia created Regional Dairy Programs, including a Subtropical Dairy Program (SDP) for tropical and subtropical areas of east Australia, to gather demands from the production regions in order to design R,D&E. To promote interaction between R,D&E efforts and agricultural industries the Australian government matches expenditure on R,D&E dollar for dollar. The Brazilian Agricultural Research Corporation for Dairy (Embrapa Dairy) developed the Platform Project, with the objective of identifying constraints on dairy development in Brazil’s main dairy production regions. Embrapa Dairy has also moved researchers to those regions to establish a link between stakeholders and the head research station in the design of R&D. There remains room for improvement in both countries’ methods. In Australia’s SDP, priorities for R,D&E are identified by regional teams consisting mostly of farmers and R,D&E people, but an evaluation has recommended involving a broader range of stakeholders to increase the diversity of ideas. In Brazil, dairy R&D priorities are identified mostly through quantitative surveys with farmers or panels of experts who consider large regions (of more than three states), without deeper involvement of farmers. Models and approaches in extension and systems thinking offer ideas for more effective and comprehensive approaches.

The objectives of this study were to:

1. Develop a strategy to:

   - Involve a broad set of stakeholders in a dairy community to obtain a holistic view of their priorities for R,D&E, and
• Help R,D&E people to understand the dairy farms and the production realities of small regions.

2. Document and compare the R,D&E priorities of dairy stakeholders in one Australian and two Brazilian regions, including the views of different groups of stakeholders within each region.

Regional studies were conducted in three dairy regions, one region in the north coast of New South Wales, Australia, and two regions in Rio Grande do Sul state, Brazil. The research method within each region studied combined three approaches, each involving a variety of stakeholders from across the production communities. These were familiarisation through staying on a farm and building trust; individual interviews with a diversity of stakeholders from farmers to off-farm enterprises and R,D&E staff, and focus group interviews with participants selected from those already interviewed individually. The focus groups verified and enlarged upon the findings of the individual interviews, and enabled convergence among the participants’ views.

The three approaches produced complementary results. The strategy for eliciting R,D&E priorities worked equally well in all three case studies. Across the three cases, the individual interviews pointed out previously unrecognised R,D&E priorities, going beyond production technologies into issues such as communication, farm management, labour and finance. Pasture issues also remained important. The results from the focus group interviews corroborated communication, farm management and finance as important priorities for R,D&E, while adding marketing, industry policy and organisation of farmers, issues which had not stood out originally in the individual interviews in any of the three regions studied.

This suggests a number of things. In terms of strategy for developing R,D&E priorities, both individual interviews and group processes are valuable, and may provide somewhat different outcomes. Further, the primary information needs for the industry lie beyond the farm and production technologies. The results also show that stakeholders would like R,D&E people to work as their partners in improving the dairy industry. The involvement of a broader range of
stakeholders brought a more holistic and integrated view of each region’s dairy development needs. It was particularly useful to engage people from throughout the dairy community with R,D&E practitioners in identifying priorities, since this broadened the picture of needs and showed the relative importance of production technologies alongside other, previously unrecognised needs. The results also suggest that research organisations should include staff capable of taking a more systemic view of dairy production systems, on- and off-farm, and potentially other industries. The academic significance of this study lies in the combination of systems thinking, stakeholder analysis and participation with extension science, towards a practical need.
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<tr>
<td>ABCAR</td>
<td>Brazilian Credit and Rural Assistance Association</td>
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<tr>
<td>ABS</td>
<td>Australian Bureau of Statistics</td>
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<tr>
<td>AC</td>
<td>Acre, a state of Northeast Brazil</td>
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<td>ACAR</td>
<td>Credit and Rural Assistance Association, Brazil</td>
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<td>ACAR-MG</td>
<td>Credit and Rural Assistance Association of Minas Gerais, Brazil</td>
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<tr>
<td>ADC</td>
<td>Australian Dairy Corporation</td>
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<td>AFFA</td>
<td>Agriculture, Fisheries, Forestry - Australia (Federal government department)</td>
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<td>AFSC</td>
<td>Australian Farming Systems Conference</td>
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<tr>
<td>AI</td>
<td>Artificial insemination</td>
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<td>AKIS</td>
<td>Agricultural Knowledge and Information Systems</td>
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<tr>
<td>AL</td>
<td>Alagoas, a state of Northeast Brazil</td>
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<td>AM</td>
<td>Amazonas, a state of North Brazil</td>
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<tr>
<td>AP</td>
<td>Amapá, a state of North Brazil</td>
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<tr>
<td>APEN</td>
<td>Australasia Pacific Extension Network</td>
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<td>ATDI</td>
<td>Australian Tropical Dairy Institute later Tropical Dairy Research Centre</td>
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<tr>
<td>ATER</td>
<td>Rural Extension and Technical Advice, Brazil,</td>
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<tr>
<td>AUD$</td>
<td>Australian dollar</td>
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<tr>
<td>BA</td>
<td>Bahia, a state of Northeast Brazil</td>
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<td>CAPES</td>
<td>Coordination for Enhancement of Graduated Professionals Foundation, Brazil</td>
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<td>CCPR</td>
<td>Central Co-operative of Rural Producers, Brazil</td>
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<td>CE</td>
<td>Ceará, a state of Northeast Brazil</td>
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<tr>
<td>CIA</td>
<td>Central Intelligence Agency, USA</td>
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<td>CNA</td>
<td>National Brazilian Agricultural Confederation</td>
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<tr>
<td>CRC</td>
<td>Co-operative Research Centre In Australia – Any of a number of research centres based on an Australian Government program from the Department of Education Science and Training. The program emphasises the importance of collaborative arrangements to maximise the benefits of research through an enhanced process of utilisation, commercialisation and technology transfer. It also has a strong education component with a focus on producing graduates with skills relevant to industry needs. The program involves R&amp;D partnerships between industry, government agencies, and research providers designed to produce collaborative research meeting industry needs. Government sponsorship under a competitive scheme supports the program.</td>
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<td>Abbreviation</td>
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<td>CSIRO</td>
<td>Commonwealth Scientific and Industrial Research Organisation of Australia — Develop research for the different sectors of the Australian economy, from primary industry to the whole branch of industries. CSIRO is Australia’s largest scientific research organisation, undertaking research in a variety of disciplines in order to provide benefit for all Australians. CSIRO’s funding is provided predominantly by the Australian Government, however industries work closely with the organisation in order to commercialise the research outcomes generated by CSIRO for those industries. More information about the organisation is available on the Internet at <a href="http://www.csiro.au">www.csiro.au</a>.</td>
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<td>DART</td>
<td>Dairy Action Research Team, Australia</td>
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<td>DRDC</td>
<td>Dairy Research and Development Corporation, Australia</td>
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<tr>
<td>EMBRAPA</td>
<td>Brazilian National Agricultural Research and Development Corporation</td>
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<td>EMBRATER</td>
<td>Technical Assistance and Rural Extension Brazilian Corporation, Brazil</td>
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<td>ES</td>
<td>Espírito Santo, a state of East Brazil</td>
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<td>ESALQ</td>
<td>Agricultural High School Luiz de Queiroz, Brazil</td>
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<td>ESAL</td>
<td>Agricultural High School of Lavras, Brazil</td>
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<tr>
<td>ESAVE</td>
<td>Agricultural High School of Viçosa, Brazil</td>
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<tr>
<td>ETA</td>
<td>Agricultural Technical Office, Brazil</td>
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<td>FAO</td>
<td>Food and Agriculture Organisation of United Nations</td>
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<td>FASER</td>
<td>Federation of Associations and Syndicates of Rural Extension Workers, Brazil</td>
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<td>FGM</td>
<td>Focus Group Meeting</td>
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<td>FSR/E</td>
<td>Farming Systems Research and Extension</td>
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<td>GDP</td>
<td>Gross Domestic Product</td>
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<td>GO</td>
<td>Goiás — a state of West Brazil</td>
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<tr>
<td>Ha</td>
<td>Hectare — 10,000 square metres</td>
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<td>IAC</td>
<td>Agronomic Institute of Campinas, Brazil</td>
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<tr>
<td>IAPAR</td>
<td>Paraná Agronomic Institute Foundation, Brazil</td>
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<tr>
<td>IBGE</td>
<td>Brazilian Institute of Geography and Statistics, Brazil</td>
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<tr>
<td>IPEA</td>
<td>Agricultural Research Institute - Brazil</td>
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<tr>
<td>IPEAC</td>
<td>Agricultural Research Institutes, Brazil</td>
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<td>MA</td>
<td>Maranhão, a state of North Brazil</td>
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<tr>
<td>MAARA</td>
<td>Ministry of Agriculture Provision and Agrarian Reform, Brazil</td>
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<td>MIDDA</td>
<td>Model of Innovation Development Diffusion and Adoption</td>
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<td>MS</td>
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<td>MT</td>
<td>Mato Grosso, a state of West Brazil</td>
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<tr>
<td>MG</td>
<td>Minas Gerais - State in Brazil</td>
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<tr>
<td>Norco</td>
<td>North Coast Co-operative Company, Australia</td>
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<tr>
<td>NSW</td>
<td>New South Wales, Australia</td>
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<td>NZDB</td>
<td>New Zealand Dairy Board</td>
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<td>PA</td>
<td>Pará, a state of North Brazil</td>
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<td>PAM</td>
<td>Participative Action Management</td>
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<td>PB</td>
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<td>PE</td>
<td>Pernambuco, a state of Northeast Brazil</td>
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<td>Acronym</td>
<td>Description</td>
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<td>PI</td>
<td>Piauí, a state of North Brazil</td>
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<tr>
<td>PR</td>
<td>Paraná, a state of South Brazil</td>
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<tr>
<td>PRA</td>
<td>Participatory Rural Appraisal</td>
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<td>QDO</td>
<td>Queensland Dairyfarmers Organization, Australia</td>
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<td>QDPI</td>
<td>The Queensland (state) Department of Primary Industries is concerned with science, innovation and the commercial uptake of new technology; food integrity; smart, market-driven food and fibre production; ecological, sustainable use of natural resources; and capable rural communities achieving prosperity and self-reliance through successful rural businesses.</td>
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<tr>
<td>Qld</td>
<td>Queensland, Australian State</td>
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<td>R$</td>
<td>Real – Brazilian currency</td>
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<td>R&amp;D</td>
<td>Research and Development</td>
</tr>
<tr>
<td>R,D&amp;E</td>
<td>Research, Development and Extension</td>
</tr>
<tr>
<td>RDP</td>
<td>Regional Dairy Programs, Australia</td>
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<tr>
<td>REE</td>
<td>Research Education Extension</td>
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<tr>
<td>RJ</td>
<td>Rio de Janeiro, a state of East Brazil</td>
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<td>RN</td>
<td>Rio Grande do Norte, a state of Northeast Brazil</td>
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<tr>
<td>RO</td>
<td>Rondônia, a state of Northwest Brazil</td>
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<tr>
<td>RP</td>
<td>Regional Programs, Australia</td>
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<tr>
<td>RR</td>
<td>Roraima, a state of North Brazil</td>
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<tr>
<td>RS</td>
<td>Rio Grande do Sul, a state of South Brazil</td>
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<tr>
<td>RRA</td>
<td>Rapid Rural Appraisal</td>
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<td>SC</td>
<td>Santa Catarina, a state of South Brazil</td>
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<td>SDP</td>
<td>Subtropical Dairy Program, Australia</td>
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<td>SE</td>
<td>Sergipe, a state of Northeast Brazil</td>
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<tr>
<td>SNPA</td>
<td>Brazilian National Agricultural Research System</td>
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<td>SP</td>
<td>São Paulo, a state of East Brazil</td>
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<td>SRT</td>
<td>Sub Regional Team, part of SDP</td>
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<td>TO</td>
<td>Tocantins, a State in the North of Brazil</td>
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<tr>
<td>TOT</td>
<td>Transfer-of-technology</td>
</tr>
<tr>
<td>TTIC</td>
<td>Technology Transfer Information Centre, USA</td>
</tr>
<tr>
<td>US$</td>
<td>United States dollar</td>
</tr>
<tr>
<td>UFV</td>
<td>Federal University of Viçosa, Brazil</td>
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<tr>
<td>UQ</td>
<td>University of Queensland, Australia</td>
</tr>
<tr>
<td>USA</td>
<td>United States of America</td>
</tr>
<tr>
<td>USDA</td>
<td>United States Department of Agriculture</td>
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<td>WTO</td>
<td>World Trade Organisation</td>
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The advisory team

Principal advisor: Professor Helen Ross, School of Natural and Rural Systems Management
Graduated with First Class Honours in Psychology at the University of Tasmania in 1972, MSc. Social Psychology, London School of Economics in 1979 and PhD Psychology and Anthropology; London School of Economics 2003. Helen was awarded the Fulbright Senior Award in 1996. Her research interests are rural community development and contributing social dimensions to sustainable development.

Associate advisor: Professor Tom Cowan, School of Animal Studies
Graduated in Agricultural Science at the University of Queensland, Brisbane, Australia, 1970. Has Diploma in Science in Agriculture at the University of New England, Armidale, Australia, 1972, M.Sc. in Agriculture at the University of New England, Armidale, Australia, 1976, and Ph.D. at the University of Aberdeen, Scotland, 1980. He is Director of the Tropical Dairy Research Centre, School of Animal Studies, University of Queensland, Gatton, and Dairy Science Adviser to the Queensland Department of Primary Industries and Fisheries. His special research fields are: pasture management, cow nutrition, dairy farming systems and farm business analysis.

Associate advisor: Dr. Shankariah Chamala, School of Natural Rural Systems Management
He has been with the University of Queensland since 1972 and taught group dynamics, research methods, extension education, management and community development. Based on his experiments in teaching, research and consultancy, he has developed the Participative Action Management (PAM) model, which provides a framework for stakeholders’ participation in innovation development and use. He has supervised more than 100 postgraduate scholars. Since 2001 he is working as Honorary Reader in School of Natural and Rural Systems Management.
The student

As a 10 year old child I constantly exchanged a weekend playing in a pool or playing soccer to stay on a farm. That may be the origin of my interest in studying Animal Science at the Federal Rural University of Rio de Janeiro, 1974 - 1977.

After I graduated, I worked for a short time in different parts of Brazil and worked for six months in Rio de Janeiro Extension organisation with dairy. However, I needed something more real and challenging. From 1979 till 1985 I became a manager of a dairy farm planned to produce 20 000 litres a day. I thought I could change technical issues but actually I also learnt about finance, people, and environment.

In 1985 I started in Embrapa Dairy (Brazilian National Agricultural Research Corporation for Dairy) managing field experiments. It was easier to manage experiments after managing a farm. The experience of management of a farm drew me to work with farm costs and management in Embrapa.

To get expertise in such a subject I took accountancy and rural administration courses. In 1991 I started my master’s course in Production Engineering at the Federal University of Santa Catarina. The thesis on Payment of milk on quality is about offering a better payment for farmers whenever they improve milk quality; in balance with the profits of the processor. Returning to Embrapa I wrote articles about the cost-benefits of technologies.

Something was missing. I could see that publications and attending congresses was good for Embrapa, as well as for me because that is the way they evaluate researchers. But I could not see clearly farmers taking advantage of what I was doing. Together with another researcher, I developed posters for farm barns, to facilitate the access to information instead of having it on a shelf. But I could still see room for improvement in terms of R&D working closer to stakeholders to deliver better services. Participating in rural events has been the turning point. A cooperative asked us to show the best technologies that we had. We rejected the usual approach and asked to have an insight into the production system by discussing with farmers about their realities and then organising them to show what they really needed. It produced improvement in the region, but our tools were still very quantitative. I asked to develop the Ph.D. to improve the knowledge of qualitative issues with a focus on having stakeholders share the design of R,D&E activities.
Chapter 1 – The need to improve stakeholder involvement in Research, Development and Extension design

Worldwide, the dairy industry is becoming more important and demanding more from Research, Development and Extension (R,D&E) organisations. The Food and Agriculture Organization of the United Nations, FAO, estimates that world milk production will reach 654 million tons in the year 2010 (Milkpoint 2001); in 2003 it was 507 million tons. For Oceania, an increase of 11 million litres, mainly for export, is expected. For Latin America, an increase of 38%, particularly from Brazil, is forecast. Although only 5% to 10% of the world production goes to the international market (Milkpoint 2003; Staal 2001), the dairy industry plays an important role economically and socially in many countries. The Australian production of 10.3 billion litres of milk in 2002/2003 means an A$ 2.8 billion farm-gate industry exporting about A$ 2.5 billion in dairy products. The Brazilian production of 22.6 billion litres in 2003 means support for economic growth through cheap food, support for other agricultural industries as a regular monthly provider of income, and potential for export (A$ 62 million in 2002, 61% higher than in 2001). The world dairy environment movements in this market, such as subsidies, disputes and export incentives, have a large impact on some countries, states, and regions. However owing to the labour-intensive nature of family farms and the traditionally weak links between production and marketing (Carvalho 2001), these changes sometimes are not noticed in the microenvironment of the dairy farm where this knowledge is needed to help farmers in their planning and decision making. This lack of information exchange among the segments of the industry chain reduces the interaction with and appropriate responses to the dairy world-macro environment of the people in the production system, as well as their understanding of the possible effects of dairy trends in production regions.

Dairy R,D&E organisations have a partial responsibility for updating dairy macro-environment information flows to production communities. However,
considering their mission and the on- and off-farm issues, they also have responsibility for providing solutions for the sustainability of the Australian and Brazilian dairy industries. Agricultural scientific communities in a research station work to control many variables affecting a particular technology being developed; but without a vision shared with stakeholders of how it can be applied in the production systems, which have a greater number of variables, they are unlikely to have that technology adopted successfully (Teixeira and Novaes 2000). Cornwall et al. (1994) concluded that while conventional research and extension can contribute substantially to agricultural development, even the most well-intentioned scientists and extension workers, using the best conventional methods available, may still produce and pass on totally inappropriate recommendations, that result from considering agriculture as a technical activity rather than as social praxis. Researchers initiatives are often more comfortable in providing advice on what ought to be done and why, rather than practical advice on how it might be achieved. Chambers et al. (1989) reported that in India, 70% of the results of research to deal with dry land in the 1960s and 1970s were confined to research stations and their annual reports, not tested in the field or disseminated further. However, according to Hamilton (Hamilton 1995), R,D&E often does not have a major influence on farmers’ decisions; its information must therefore be placed into context with other information relevant to a production community. There is a general feeling that technology generation and transfer systems have not been sufficiently effective because users have not been involved in the technology generation and transfer process (Collion and Rondot 1998).

According to Ison et al. (1997), there is general dissatisfaction with the success rate of 50 years of R&D in natural resources. The poor success rate in R&D arises from the failure of the ‘problem’ or project formulation process so that the results fail to address the problems experienced by clients (Mascaretti 1994). Chamala et al. (1991) noted that cattlemen in Australia consider that communication about R&D findings has been relatively ineffective, and that R&D priorities have been determined by researchers without effective liaison with production communities. There is, therefore, a challenge for R&D to achieve integration of stakeholders into R&D activities by developing
approaches that permit data, intrinsic and extrinsic knowledge from stakeholders, and scientific findings and judgements of data to be made easily available and usable (Walker, Cowell and Johnson 2001). According to Macedo (1998), to deliver desirable outcomes, R&D should involve the study of the interaction of science findings and production systems, including agricultural products and their markets.

Agricultural extension, mixing knowledge about agricultural production technologies with social science has this function; extension agents should play the role of information managers. In Australia, Dairy Australia has increased the number of social science and agricultural extension projects in its portfolio (DairyAustralia 2003b; DRDC 2001), permitting a better understanding of the relations of people with their food production and social environments. The Brazilian National Agricultural Research Corporation (Embrapa), recognising the need for better communication between research and production communities, has intensified the training of researchers in extension science from the 1990s (Cezar 1999). Given the advice of the authors cited above and that the mission of most agricultural R,D&E organisations is to serve the information needs of the various industries, the stakeholders’ points of view about R,D&E services are very important.

1.1 Dairy stakeholders’ perceptions of R,D&E services

To present this topic clearly, it is necessary first to define who are considered as the dairy stakeholders for this study. They are the people who belong to the communication network of a production region, mainly those in the input market, farmers, R,D&E people, processors, and credit providers. Figure 1.1 illustrates the dairy supply chain, formed by the various groups who exchange money for milk, dairy products or inputs, and are affected by the dairy industry environment. Other players such as governments, people whom the production system consults, and R,D&E organisations are not represented currently in most people’s concepts of an industry, but are members of the industry communication network and exert influence on the industry results. They are also considered stakeholders in this study.
In both Brazil and Australia stakeholders perceive a need to improve R,D&E services through more effective stakeholder input. According to Carvalho (2000; 2004), there is no doubt that Brazilian R&D organisations have the knowledge to improve the dairy industry. However, they need to deliver scientific information in a language that is easier to understand and improve the interaction of R&D with extension and people in the production systems (Silveira 2004). In 2000 the electronic newspaper Milkpoint ran a survey with dairy stakeholders who access the electronic newspaper with the question ‘What is limiting dairy productivity in Brazil?’ The results (Table 1.1) show that extension is second only to milk price as an important limiting issue among the dairy industry stakeholders who participated in the survey (Milkpoint 2000).

**Table 1.1 – What is limiting milk productivity in Brazil?**

<table>
<thead>
<tr>
<th>Items</th>
<th>Number of participants</th>
<th>Rate - %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied research</td>
<td>3</td>
<td>3.37</td>
</tr>
<tr>
<td>Rural extension</td>
<td>26</td>
<td>29.21</td>
</tr>
<tr>
<td>Rural credit</td>
<td>9</td>
<td>10.11</td>
</tr>
<tr>
<td>Milk price</td>
<td>47</td>
<td>52.81</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>4.49</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>89</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Source: Milkpoint (2000)

In Australia also, some authors have commented on the need for higher interaction between R&D people with the production community (Carberry 2001; Ison and Russell 1999). In Australia, there has been a reduction of public funds...
to finance R,D&E organisations, and increased support from private funds in dairy research and extension through farmers’ levies. These policies are pushing R&D in Australia to develop initiatives to merge R&D with extension, in the same organisation. To promote integration between R,D&E and agricultural industries, the Australian government matches industry expenditure on R&D dollar-for-dollar (AFFA 2002).

However, R,D&E people, particularly those in R&D, have different points of view to production community people about R&D needs. Researchers and academics mostly concentrate on technologies that can return publications. They should not be blamed for this because this is the way their work is evaluated by most R&D organizations (Eponou 1993). The different points of view could be as illustrated by the eyes in Figure 1.2.

![Figure 1.2 – R,D&E and production communities’ perceptions of the priorities of technology](image)

Prepared by: Sergio Teixeira, Tom Cowan and Helen Ross

However, there are initiatives to improve the R,D&E understanding of the production community’s angle of vision.

### 1.2 Initiatives to improve stakeholder inputs in R&D projects

The constant demand for higher competitiveness of industries suggests that client demand, involving different parts of agribusiness chains, is the most
appropriate way to select priorities to design future activities (Silveira, Martins and Bressan 2002). The Australian and Brazilian dairy R&D organisations developed some initiatives in the 1990s to improve the participation of dairy stakeholders in the design of their R&D activities.

1.2.1 Australia

The Dairy Research and Development Corporation (DRDC), (called Dairy Australia after 2003), developed Regional Development Programs (RDP) in each Australian state in the mid to late 1990s to improve the linkage between research and the farming community in the planning of R&D activities. The Subtropical Dairy Program (SDP) is the RDP program organized in 1995 for tropical and subtropical regions of Queensland and the north coast of New South Wales, Australia (SDP 1999). Staff of the SDP discuss with Sub Regional Teams (SRTs), which consist mostly of farmers and R,D&E people, the regional dairy industry needs, particularly technological issues, and inform Dairy Australia about the types of research that are relevant to the region (SDP 1998). Other Australian agricultural organisations, such as the state departments concerned with agriculture (e.g., Queensland Department of Primary Industries, QDPI, and NSW Department of Agriculture), universities, the Commonwealth Scientific and Industrial Research Organisation (CSIRO), and Co-operative Research Centres (CRCs)\(^1\) are developing services for production communities, as well as developing programs of their own.

1.2.2 Brazil

In 1974, the Brazilian National Agricultural Research Corporation (Embrapa) was created as a federal government research organisation to lead applied agricultural research in Brazil. A model of integration involving agricultural research and extension organisations was created to simplify the flow of information to and from the production system (Olinger 1996). Unfortunately, the integration has not happened as expected and most R&D communication

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\(^1\) CRCs (Co-operative Research Centres) are R&D partnerships between industry, government agencies and research providers designed to produce collaborative research meeting industry needs. Government sponsorship under a competitive scheme supports the program.
with stakeholders arises from direct personal relationships. In the 1990s, Embrapa Dairy began to establish activities and contracts with private and government organisations in an attempt to increase integration. In the same period, milk production grew in the west, northeast and south of the country. Embrapa Dairy has moved one researcher to each of these three new milk frontiers. These researchers form a link between the central research station and the regions, helping researchers to align projects with different realities (Vilela 1999). Also, in the 1990s, Embrapa Dairy developed the ‘Platform Project’ to identify the limiting factors for the dairy industry development in macro regions of Brazil (Vilela and Bressan 2002). More details on the organisation of the Australian and Brazilian dairy industries and R,D&E for dairy are provided in Chapter 3.

1.3 Research problem

R&D agencies in Australia and Brazil were started after the production systems of these countries reached a stage of development that demanded scientific findings be connected to the demands of the agricultural industries (ABAG 2002; ADIC 1996; AFFA 2002; Embrapa 2003). There is no doubt about the benefits of research activities. Since Embrapa’s creation in 1974, it has helped increase Brazilian crop productivity by 70% (up to 2001); Brazil was able to reduce its soybean nitrogen fertilizer imports by A$ 1.9 billion in the 2003/2004 production year because of advances in nitrogen-fixing through research. Milk production increased from 7.9 billion litres a year in 1980 to 21 billion in 2001 (Castro 2001; Oliveira 2004). However, today the role of R,D&E has gone beyond developing technologies, to ensuring higher involvement of stakeholders in research and extension planning. On the other hand, higher involvement of R,D&E people with the production community is also demanded to enable them to see the production system from another perspective (Ison and Russell 1999). In other words, two-way involvement is required to improve R,D&E services. Ison and Russell advocate the use of systemic action research; they believe that the way the researcher perceives the situation is critical to the understanding of the system being studied. Ison and Russell
advocate that the researcher should have the role of ‘participant-conceptualiser’ in order to view the events in their contexts.

The challenge of agricultural R,D&E is to deliver good services for sustainable technological, economic and environmental development of agricultural industries (Carberry 2001; DairyAustralia 2003a; Embrapa 2003). The recent Australian and Brazilian initiatives are improvements on the previous relations between R,D&E and dairy communities. Nevertheless, farmers are not used to listing research priorities and in 2000 an evaluation of the Australian DRDC/SDP concluded that SRT members have to develop a system for collection and recording of ideas from a diversity of stakeholders of the dairy community (Roberts 2000). This evaluation considers that SRTs are not gathering the full range of ideas that circulate in the dairy community directly or indirectly in different dairy stakeholders’ minds. In addition, the attendance records and minutes of SRT meetings demonstrated minimal participation by stakeholders other than farmers and R,D&E people. In Brazil, Embrapa’s initiatives are based on large regions using expert panels (Vilela, Calegar and Bressan 1999) or quantitative surveys, mainly with farmers (EmaterRio 1998; Embrapa 1998). Thus, in both countries, it is necessary to improve the way of collecting the ideas of various stakeholders to contribute to the development of more effective R,D&E.

My thesis
I argue that it is necessary for dairy R,D&E organisations to improve the design of R,D&E programs so that they meet industry needs comprehensively by involving a broad range of stakeholders in order to increase their understanding of regional production systems holistically.

However, for stakeholders to participate effectively, they need to understand the micro- and macro-environment in which their dairy industry operates. Therefore, in this study, I created a process to improve R,D&E people’s understandings of dairy farmer, region and industry issues, and also to challenge stakeholders of a regional dairy community to see the whole picture of the dairy industry. This
created a realistic basis for discussion and identification of regional R,D&E priorities and activities.

1.3.1 Objectives of the research

The objectives of this study are to:

1. Develop a strategy to:
   
   • Involve a broad range of stakeholders in a dairy community to obtain a holistic view of their priorities for R,D&E, and
   
   • Help R,D&E people to understand the dairy farms and the production realities of small regions (consisting of three to five local government areas).

2. Document and compare the R,D&E priorities of dairy stakeholders in one Australian and two Brazilian regions (namely, the north Coast of New South Wales, Santa Rosa and Alto Jacuí), including the views of different groups of stakeholders within each region.

1.3.2 Research questions

The study was guided by the following research questions.

1. How can one involve the range of dairy stakeholders who influence the industry, and exchange information and ideas within a dairy community, to identify a comprehensive and relevant set of priorities for the design of R,D&E activities?

2. What are the priorities of each dairy region from the perspective of a broad range of stakeholders?

3. Do different groups of participants (input market, farmers, R,D&E people, processors, credit providers, others) have different views of the dairy region’s priorities?

4. What are the differences and similarities between the regions studied?

For clear communication in this thesis some key terms, such as ‘dairy environment’, are defined in Appendix 8.
1.4 Outline of the thesis

Chapters 2 to 8 present the different stages of my study: a comprehensive review of the evolution of extension and related theories, description of the regions studied, the strategy built for identification of priorities for R,D&E, presentation of results, discussion of results, key findings and their implications and suggestions for further research. The following presents a brief description of each of the chapters.

Chapter 2: Models and theories in research and extension
The first part of this chapter presents the evolution of the field of extension and the approaches to production systems, from ‘top-down’ approaches to seeking the involvement of stakeholders in the R,D&E process. The review of key bodies of theory related to extension stresses theories that give support to this study, such as systems theory, communication theories and studies related to adoption of technologies, community and behaviour. The chapter finishes with a conceptual model of how to involve a broad range of stakeholders and improve R,D&E understanding of regional dairy systems, based on the theory reviewed.

Chapter 3: The dairy industries and R,D&E services in Australia and Brazil
The dairy industries in Australia and Brazil, and Australian and Brazilian R&D organisations’ initiatives to identify priorities for R,D&E activities are described in this chapter.

Chapter 4: Methodology for a holistic view of dairy regions
This chapter begins with a description of how my networking contributed before and during the study. The choice of methods and the design of the qualitative research, including the criteria to select countries, regions and participants are explained. The strategy developed is presented in stages. This involved building trust, followed by individual interviews with a description of interviewees and sampled farms and then focus groups interviews. The chapter concludes with a description of the data analysis and the ethical issues.
Chapter 5: Individual perceptions of regional priorities
This chapter presents the results from individual interviews for the main issues: (i) Why farmers selected the dairy industry and what their goals are; (ii) What were the positive and negative experiences of interviewees in dairy farm business and in the whole dairy industry in their regions, as well as their views on potential initiatives for the future; (iii) What are the farms’ sub-systems (e.g. pasture, finance, genetics) of highest preoccupation; (iv) What interviewees would do if they were managers of R,D&E organisations; (v) How interviewees would introduce technologies in their regions and (vi) suggestions of any nature. The main issues focused on suggested the priorities for the regions studied.

Chapter 6: Group perceptions of regional priorities
This chapter presents the group results for the main issues, from focus group meetings: (i) What the strengths and weaknesses of each region are, including discussion of the priorities obtained in the individual interviews, and (ii) Where the focus group meeting participants would invest an imaginary $ 100,000.

Chapter 7: Discussion of the relevance of the study
In this chapter the achievements of this study are discussed. The opinions of individuals and groups of stakeholders are compared, and then the current activities in the Australian and Brazilian dairy industries and R,D&E organisations are compared with the priorities identified in this study. Ways in which the results can improve R,D&E organisations’ interactions with people in the production systems are considered, in order to identify a more comprehensive set of dairy industry R,D&E priorities. The last part of the chapter contains general observations made during the whole study.

Chapter 8: General conclusions
In this chapter, the rationale for the objectives of the study is described briefly and the main findings and implications are summarised. The weaknesses and limitations of the strategy are described as well as limitations and suggestions for future studies are made.
The chapters are followed by the list of references, and the appendices. The appendices are grouped under the headings of the chapters to which they are relevant. Thus, Appendices starting with 5.x contains material relating primarily to Chapter 5. Appendix 8 is the glossary.
Chapter 2 – Models and theories in research and extension

2.1 Introduction

The means of identification of priorities for R,D&E is a subject that has already been studied occasionally during the last four decades of development of extension models. As a result the participation of stakeholders in R,D&E activities is improving. To provide theoretical background for the objective of this study to improve the present methods of stakeholder involvement in the identification of priorities for R,D&E, this chapter starts with a definition of extension and its role, a description of extension paradigms and a brief history of extension. The evolution of extension models and approaches is summarised, then key bodies of theory associated with extension, such as those concerned with the adoption process, communication and systems analysis, are presented. These bodies of theory are important to show how to improve the present methods of identifying priorities. Systems principles are used to analyse what is missing in the previous and present approaches before introducing the conceptual model used in this thesis.

2.1.1 What is Agricultural Extension?

According to Farquhar (1962), ‘Agricultural extension is a service or system which assists farm people through education procedures in improving farming methods and techniques, increasing production efficiency and farm income, bettering farmers’ levels of living, and lifting the social and educational standards of rural life’. Agricultural extension may be seen as a form of adult education; the term ‘extension’ is a shortened form of ‘university extension’ or ‘extension education’, terms originating at Oxford and Cambridge Universities in the nineteenth century, and describing efforts to take the benefits of university education to ordinary people. Ban and Hawkins (1996) present words used in other countries with the same meaning, voorlichting in Dutch with the meaning of lighting the pathway, beratung used by the Germans with the meaning of an expert giving advice on the best way to reach your goal, förderung used in
Austria with the meaning of going in a desirable direction, vulgarisation used in France meaning the need to simplify the message, and capacitation, used in Spain indicating the intention to improve people’s skills.

Most definitions of extension are related to improving farm production, productivity and profitability and farmers’ living standards. This can be observed through definitions of extension. Ban and Hawkins (1996) define extension as ‘a form of conscious social influence’ to help people form sound opinions and make good decisions. ABCAR (Brazilian Association for credit and rural assistance) defined extension in the 1970s as an ‘educational process to provide technical, economic and social assistance to rural families with the objective of helping them to enrich their life pattern’.

According to Freire (1992), in his book Extension or Communication?, the expression ‘extension’ is not appropriate to the job of the technicians who work with farming communities, aiming to improve the profitability and sustainability of their rural activities. Freire considers that an expression involving communication would be more appropriate. On the other hand, the word ‘extension’ is well known and accepted by people who work in extension services all over the world.

2.1.2 What is the role of Agricultural Extension?

The role of extension is shifting from one-way transmission of information to farmers, to a two-way communication to and from farming communities. In 1989 Watts (1989) argued that ‘extension has basically an educational function. Its job may vary considerably from country to country, but without exception it is expected to inform, advice, and educate in a practical manner…’ Olival (2002) describes the main role of agricultural extension as being that of improving the productivity of farms and as a consequence enhancing the socio-economic standards of the rural population. Fontes (2002), an extension agent and manager, wrote that in the past the extension agent provided technical advice to farmers, but today extension is also concerned with farmers’ families, future generations and environmental care.
Today extension agents are being pushed to improve their understanding of rural communities. In the past, attention to social issues was already part of the extension role in Brazil; however, maybe because of the predominance of extension agents with backgrounds in agricultural science, production technologies were stressed much more than the social approach. The focus of extension has shifted from single enterprises of production and productivity issues (e.g. pig production) to a holistic farming view (Scott-Orr and Howard 2000).

Coutts (1994) classifies four paradigms of extension:

1. **Technology Transfer** – Extension is a means of pro-actively changing voluntary behaviour in the form of the adoption of new technology or management practices, by providing information, opportunity, and persuasion.

2. **Problem Solving** – Extension is a reactive expert (advisory/consultancy) function which is a means of assisting individuals to find solutions to technological or management problems, which are inhibiting their desired unit performance. The adoption of new technology or management practices is an indirect, though ‘inevitable’, consequence of this process.

3. **Educational** – Extension is a means of pro-active informal education which seeks to assist individuals to better understand their situation, and so enable them to make choices and take action to improve their situation.

4. **Human development** – Extension is a means to facilitate and stimulate individuals and communities to take the initiative in problem definition and seeking solutions to individual and societal concerns/opportunities.

Agricultural extension is changing from *handmaiden of research* to a discipline itself; it is also being redefined, the term *extension* now having a meaning going beyond technology transfer (Coutts 2000). As a practical result, the behaviour of R, D&E is changing from ‘push’ technology to interaction with the production system. According to Freire (1992), extension work is related to the interaction between the extension agent, farmers and community. That means that the
extension agent should have an attitude of being both teacher and student at the same time.

The product of agricultural science cannot be considered finished before its insertion into the production system (Macedo 1997). From this statement extension is seen as an effective instrument when it stimulates participation and combines efforts with other segments of the agricultural industries chain, mainly research. However, tax payers and other investors are putting the investment in extension under enquiry. Extension professionals have partial responsibility for this by pointing out the partial failure of the extension role (Paine and Nettle 2003). Participatory approaches and involvement of stakeholders have been stressed recently to improve the relations between research and agricultural industries in order to improve the performance of the extension role (AFFA 2002; DairyAustralia 2003; USDA 2003; Vilela and Bressan 2002).

In this study extension is treated as a ‘bridge’ to help the insertion of agricultural research findings into production systems and as a feedback instrument to drive new research directions and activities.

2.2 Paradigms influencing extension

The theory of extension has been influenced strongly by both the positivist and constructivist paradigms, with a shift from the former to the latter, though both now co-exist. In the 17th century, the Cartesian paradigm, usually termed rationalism or positivism, dominated scientific investigation (Pretty 1994). The positivist paradigm considers that nature follows immutable laws. A traditional approach from positivism is to reduce or break complex systems into smaller parts in order to investigate the nature of a property or phenomenon independent of the system and then return the results to the whole system (Petheram and Clark 1998). By the late 19th century, the modern scientific revolution realised that phenomena are transformed in the act of measurement and the observer is never really independent of the phenomena under

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1 Positivism is a system of philosophy that accepts only observable phenomena and positive facts as sources of knowledge (Edwards RL 2000, *Encyclopaedia of Social Work*, Washington).
investigation (Robinson et al. 2001). Researchers make sense of what they observe through the interaction between their own ‘interpretive framework’ and those of others (Levy 2003). Constructivist epistemology\(^2\) rests on the assumption that people construct meaning actively within the contexts of social interaction in which they are situated. Both positivist and constructivist researchers are shaping and being shaped by phenomena. They should therefore be engaged in merging their expertise (Cupchik 2001).

Guba and Lincoln (1989) explain how the constructivist paradigm and positivism differ under ontological, epistemological and methodological perspectives:

- **Ontologically (the nature of being / reality):** Constructivism denies the existence of objective reality; instead realities are recognised as social constructions of the mind; there are as many realities as there are individuals; however many constructions are shared. Positivism is usually linked to realism. That means that reality exists and can be discovered through experimental testing.

- **Epistemologically (how it is that individuals have knowledge of the external world):** Constructivism suggests that the findings of a study exist because there is an interaction between the observer and the observed, creating what emerges from the inquiry. Positivism in contrast views the researcher as being apart from what is researched, neither influencing nor interdependent with the other.

- **Methodologically (how a researcher performs research):** Constructivism rejects the manipulative approach and stresses a dialectic (the art of investigating or debating the truth of opinions) process and the observer/observed interaction to create a constructed reality that is as informed and as sophisticated as it can be made at a particular point in time. Positivism concentrates on the observer attitude rather than the interaction.

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\(^2\) Epistemology is the theory of knowledge, the critical study of its validity, methods, and scope.
2.3 A brief history of extension and evolution of approaches and models

2.3.1 Brief history of extension

From the early civilisation in Mesopotamia, 8000 years before Christ, human beings have developed knowledge that facilitates living. However, modern science began only in the Italian Renaissance (15th and 16th centuries). According to Swanson and Claar (1989) there was also in the Renaissance a movement related to the education of people to address their needs and to the application of science to practical affairs. That suggests that agricultural extension was born together with modern science, because of the need to make practical use of scientific findings. In 1723, Scotland started the first organization with agricultural extension objectives; it was known as The Society of Improvers in the Knowledge of Agriculture. With the progress of printing in France, a publication called the Encyclopaedia (1751-70) reported works on agriculture. More societies were created in the second half of the eighteenth century to acquaint their members with what was being done by science to improve agriculture, to establish local agricultural organizations, and to disseminate agricultural information through their publications, newspaper articles and lectures (Swanson and Claar 1989).

According to Jones (1982), ‘the first modern agricultural advisory and instructional service was established in Ireland during the great potato famine of the mid 19th century. This led to the institution of itinerant practical instructors, to work among small-scale peasant farmers in the areas worst affected by the famine, in the south and west of Ireland’. The modern term ‘extension’ originated in England in 1866 as university extension, which was taken up first by Cambridge and Oxford Universities, and later by other educational institutions in England and in other countries. According to Farquhar (1962), the term extension education was first used in 1873 by Cambridge University to describe this particular educational innovation. The objective of university extension was to take the educational advantages of universities to ordinary people. In the same period, the United States Department of Agriculture
(USDA), through the Office of Farm Management, was also selecting agents and sending them to districts to study farm management problems, the prevailing systems of farming, and to conduct on-farm trials of new crop varieties (True 1928). In 1887, each state of the United States received funds from the government to build a Research Centre. According to Olinger (1996), academics and researchers concluded at a certain stage of the 20th century that they had not enough time to conduct research and give orientation to farmers, since the latter required a constant presence in the farmers’ community. It was necessary to create a service that could extend their research findings to the target public.

The spread of agricultural extension-type activities in Europe, Australia, New Zealand, and Canada tended to parallel events in the United States, but their organisations developed somewhat differently. Several of the European extension systems included co-operative organisations that provided support at both the national and local levels. In most North American and European countries, local-level farmers participate in programming, planning, and even in the hiring and firing of staff (Swanson and Claar 1989).

The development of agricultural extension organisations in third world or developing countries occurred mainly after the Second World War. In Latin America and the Caribbean, the majority of national agricultural extension organisations were started in the mid-1950s, with a few established in the late 1940s and others initiated in the early 1960s. In African nations, the development of extension came later, with most extension organisations starting in the 1960s and 1970s (Swanson and Claar 1989).

The 1980s saw a division in the focus of extension between the more developed and the less developed countries. The more developed countries kept their extension attention on improving issues such as organisational learning, continuous improvement, action science and team building. The less developed countries began to focus on issues of power and equity, introducing the notion of social justice. In a social justice agenda, participation was seen not only as a way of developing better technologies but also as a right of individuals
and communities in shaping and determining their own destiny. The Brazilian Paulo Freire had a strong influence in this focus of extension through publications such as *Pedagogy of the oppressed* (Freire 1968). In the 1980s, extension agendas incorporated environmental issues and highlighted the important role of women in the world’s work, though they were still relatively powerless in decision making (King 2000).

In 1988/1989 FAO conducted a survey in 113 countries, which found that 81% of the 207 consulted organisations had the public sector providing the extension services. In the last two decades (1980s and 1990s), public sector extension services have gone through substantial renewal in many countries in an effort to make the sector more efficient and effective. This process has led to a reduction of the role of the public sector, increased private extension, and decentralisation of government extension organisations, which has increased the local extension services’ responsibilities. In Europe, the result has been the withdrawal of the European Union from sustaining the costs of extension services (Zezza 2002). Zezza stated that technical modernisation of agriculture on one side and changes in information technologies on the other side have increased the marketability of information as a commodity and increased the number of private extension agents, suppliers’ extension agents and consultants. She concluded that ‘new rules on structural funds for the future organisation of extension services are needed as the present organisation does not appear to be sustainable any more’.

There is an increasing role for commercial companies, which are merging knowledge and information with sales. It is quite common for such companies to employ more extension agents than the government. This shift in extension providers exerts influence on farmers’ choices by reducing the popularity of products that are not linked to advisory services (Alves 2000). Debowski *et al.* (1996) found a high positive correlation between farmers’ needs for marketing advice and their existing level of qualifications, land quality, farm size, or labour force. Despite the increasing influence of commercial extension on farmers’ decisions, government should invest in public extension in several situations, such as when the general public benefits more from extension than the
individual participants, for a type of extension which can be done better or more cheaply by the government than by others, when government agricultural development programs can be made more effective if they are combined with extension, and when necessary public benefits are not provided sufficiently by private enterprise (Ban 2000).

The failures of extension drove efforts to find out why farmers are not doing what is considered optimum by R,D&E. Through the last four decades, extension science has been moving from one-way extension of information to farmers, to two-way communication with farmers, farming communities and other stakeholders in agribusiness. R,D&E organisations are more likely to treat farmers as equals and are increasing interaction and engagement of stakeholders in the discussion of R,D&E activities.

2.3.2 The evolution of extension approaches

Agricultural extension has been changing since the 1960s. Scholars demand more participatory approaches because of the failures of the top-down, one-size-fits-all technology transfer model (Ison and Russell 1999). Major changes can be observed in the way extension people are conducting their studies and the way they are viewing people in production systems. Extension is shifting from a narrow view of these people as receptors of technology, to a broader view of them as partners in the process of identifying needs, exchanging intrinsic and extrinsic knowledge, planning research or extension activities, implementing the activities and in the evaluation of the results and in the planning of next steps. Figure 2.1 shows a summary of the evolution of extension approaches. Notice that the view of extension expanded from a Transfer of Technology approach with its focus on the individual farmer to include farming systems and then the community. From the 1990s, R,D&E improved participation and educational programs (Krasny and Doyle 2002) and in the 2000s has promoted engagement, which means that stakeholders should be involved in the action, no longer merely listening or giving opinions. It is an important step in developing true two-way communication between R,D&E and production communities.
Figure 2.1 – Summary of the evolution of extension approaches

2.3.3 1960s: The Transfer of Technology approach

‘Traditional extension has been a top-down process: scientists developed products and methods which, following promulgation by extension agents, farmers were expected to adopt. Extension agents considered farmers who failed to adopt new techniques to be recalcitrant and irrational’ (Vanclay and Lawrence 2001). The premise of extension till the 1960s was that scientists know best, new technology is better than old, technology is needed, innovators will transfer information to laggards and many people are not information seekers (Chamala 1999); agricultural technology would diffuse from more progressive farmers to most other farmers in a rural community. It was also assumed that rural communities are relatively homogeneous (Swanson and Claar 1989). These assumptions gave rise to a ‘linear’ model of R,D&E. The focus of extension and the methods developed to transfer technologies was on the relationships between technical variables of the biological system; the farmers themselves were seldom involved, either in setting the agenda for research, or in testing and evaluating information and technologies (Fliert 2000).

The best known expression of the Linear Model of R,D&E is the Transfer of Technology (TOT) approach, which employs the unilateral, top-down, educational-paradigm presentation of technologies (Figure 2.2). Some of the major features of TOT were: positivist paradigm and reductionist approach, little feedback, a single-innovation focus and the purpose of helping to increase production (Chamala 1999).
TOT excludes the additional relationship that occurs when economic and social variables and their interactivities with choices of technology are considered (Hamilton 1995). According to Freire (1992), the simple assistance approach of extension, without interaction, generates an anaesthetised audience of farmers without critical reaction. As a result, in the 1960s the extension people had much optimism about extension, but few proven results (Russell et al. 1989). However, even then, a note of caution was sounded by Wilson in 1967 (Russell et al. 1989); Wilson noticed that the technological view of agricultural problems was not enough and suggested that the social aspects of production should be considered. According to King (2000), the linear approach proved successful only under certain conditions. The conditions are mainly to do with the offering of technologies that show very evident advantages, such as new, more productive plant varieties.

### 2.3.4 1970s: The Farming Systems approach

A significant and positive outcome of the late 1960s and 1970s for agricultural development and research was the expansion of production and of marketing research, which increased the involvement of farmers and farm communities. This involvement resulted in the emergence of Farming Systems Research (FSR), which evolved in the post ‘Green Revolution’ period (Chamala, Coutts and Pearson 1999). The 1970s was also the period of the Green Revolution in some developing countries and of economic growth for the more developed countries. To ensure the success of investments in agricultural development in the less-developed countries, the World Bank developed strategies such as the Training and Visit system (Benor and Baxter 1984; Coutts 1997) which,
although not strictly a farming systems approach, was another effort for better interaction with farmers for more effective transference of technology.

FSR is a more holistic approach than the prior reductionist research approaches; it recognised the importance of developing technologies within the context in which they were to be used (King 2000). FSR assumes that farmers possess a great depth of knowledge and understanding of their farming systems. Likewise it accepts that adoption decisions are made by farmers on the basis of rational consideration, using this knowledge, their own ability as experimenters, and appreciation of their goals and circumstances. FSR represented a fundamental change in orientation for agricultural researchers (Reid 1996). Advocates of the FSR model argued that research should be determined by explicitly-identified needs of farmers, rather than according to the preconceptions of researchers.

Farming Systems Research and Extension (FSR/E) emerged in the late 1970s in reaction to the prevailing TOT model in an effort to drive research according to farmers’ needs identified while seeing agriculture as a holistic system (Chamala, Coutts and Pearson 1999), the FSR/E model has developed in many different directions. Scoones and Thompson (1994) have made a generalisation of three key principles of FSR/E:

1. Joint efforts by researchers, extension agents and farmers to design, test and modify improved agricultural technologies appropriate for local conditions;
2. Agricultural industries are seen as holistic systems in which all important interactivities that affect performance should be considered in a multidisciplinary perspective for problem analysis, and
3. Activities include basic research, research station trials, on-farm trials and extension and production programs. Most work should be done in on-farm and multi-location trials, under farm conditions, to learn about farmers' constraints. The results are then communicated to experimental stations, usually by researchers or extension agents. FSR/E provides the means for making decisions about cost-effective on-farm and on-station measures.
Figure 2.3 shows a generic view of the FSR/E model. Farmers’ needs could be analysed using the method of Rapid Rural Appraisal (RRA). In RRA, a team of researchers from different disciplines analyse a cross section of the farms in an area to discover what the major problems/needs faced by farmers are and what are the reasons farmers farm in the way they do.

However, FSR/E is based on some assumptions derived from a TOT approach to agricultural systems and researchers continued to keep control over research agendas (King 2000). Considered in terms of social science, FSR/E remains insensitive to farmers’ knowledge, it is ‘top-down’ (Chamala, Coutts and Pearson 1999), as illustrated in Figure 2.3.

In response to the criticism that RRA was a ‘top-down’ approach, the Participatory Rural Appraisal (PRA) approach was generated. PRA is basically about facilitating and contributing to the empowerment of local people to take
control over their own appraisal of problems and opportunities, and to select appropriate action (Reid 1996).

2.3.5 1980s: Approaches to understand the production community better

The 1980s was a period of transition of extension science studies from one-way R,D&E informing farmers, where extension science stressed studies of the adoption process, to a two-way communication between R,D&E and farmers. During the 1970s and 1980s the unidirectional approach was still strong but authors like Bordenave and Pereira (1977) and Silva (1983) raised similar concerns about the importance of the interaction between general environment and technology. During the 1980s, authors proposed new methodologies such as the Problem-Census technique (Crouch 1983), Farmer Researcher (Silva 1984) and Agricultural Knowledge and Information Systems – AKIS (Röling 1988). Two models for R,D&E based on a better understanding of the production community are detailed below.

2.3.5.1 The Farmer First model

At the end of the 1980s Chambers et al. (1989) presented the ‘Farmer First’ model, based on the concept that most R,D&E problems arose from attempting to transfer technologies that did not relate well to farmers’ own capacities and priorities. This philosophy has generated much interest and caused a revolution in agricultural extension science. The Farmer First model promotes the view that farming communities are complex, diverse, and risk-prone environments, which share common goals and access to resources, and that local knowledge is unitary, systematised and available for assimilation and incorporation with scientific knowledge. It emphasises finding consensus solutions to problems identified through managed research and/or development activities. Compared to the TOT model, this model has a larger view of the community, focused on farmers’ identified needs; it is ‘bottom up’, and led by local demands, rather than external plans for local solutions (‘top-down’). Chambers describes the extension agent as an outsider. Chambers considers the recommendations in
the following list as important procedures to be considered when dealing with community production systems:

- Aiding farmers’ analyses and learning their agendas;
- Getting started with families and communities;
- Finding out about agricultural research;
- Finding and supporting farmers’ experiments;
- Convening and assisting groups;
- Convening and managing innovator workshops;
- Searching, and supplying farmers with what they want and need;
- Designing and managing incentives for scientists; and
- Communicating: farm family and outsider meet face-to-face.

The second recommendation (getting started with families and communities) and the last, (communicating with the farm family face-to-face) are particularly important to obtain a broader view of dairy communities before starting R,D&E activities. However, they should not be undertaken with the focus on production technologies only, nor using a ‘bottom up’ approach alone, which is still unidirectional.

2.3.5.2 The MIDDA model

Chamala (1987) developed the Model of Innovation Development Diffusion and Adoption (MIDDA), which was designed to give an understanding of R,D&E and community interactivities and processes. The model identifies the different stakeholders in the research sub-system, diffusion sub-system and the client sub-system. This model showed systematic linkages between the research sub-system and the technology diffusion sub-system, which in turn influenced the farming sub-system’s adoption of technologies for production and conservation of natural resources. However, it has not addressed the question of how different stakeholders of the three sub-systems could work together in the whole process of technology development, diffusion and adoption. Also it does not show aspects of involvement of stakeholders, mainly farmers, in the process nor draw a holistic picture of the production communities for the research people before they plan R&D activities.
2.3.6 1990s: Participatory approaches

2.3.6.1 What is a participatory approach?

According to Morris (2003), participatory models emerged in part as a reaction to the underlying assumptions of the uni-directional diffusion of knowledge, although participatory projects also necessarily involve some element of information transfer. The participatory model holds that development communication is not a vertical process of information transmission from the knowledgeable to the less knowledgeable, but rather a horizontal process of information exchange: an interaction. Proponents of this approach stress the model of dialogue, as a catalyst for individual and community empowerment, adopted from the work of Paulo Freire (1970). The participatory approach in essence lies in working with citizens to determine their needs and to design and implement programs to address these needs, rather than imposing an intervention on a community. That means that people are regarded as agents rather than objects. Community participation can extend from the formative research phase till the evaluation of the program (Morris 2003).

According to Pretty et al. (1995), the term participatory approach came to group a variety of terms, and the author cites 31 different terms included in this group. Participatory approaches are also a wise way to transform intrinsic knowledge into explicit knowledge and technology. Lundvall (1995) suggests that the day-by-day experiences of workers, production engineers, and supplier representatives play an important role in the innovation process, providing their intrinsic knowledge that is transformed into explicit knowledge. On the other hand, Pretty et al. (1995) mentions criticisms of some participatory methods, they are considered 'undisciplined' and careless.

Pretty et al. (1995) describes participatory approaches as having evolved from several sources and traditions. Activist participatory research, inspired by Paulo Freire (1968), is one source with high relevance to the present study. This approach uses dialogue to enhance people’s awareness and confidence and to empower them to take action. The key contribution lies in its recognition that
poor people are creative and capable and should be empowered, while outsiders have a role as catalysts and facilitators.

2.3.6.2 Why did participatory approaches grow?

A key feature of participatory processes is that they provide an extremely powerful means of responding to stakeholder priorities. By the 1990s, there was an accelerating process of change towards interacting and mainly learning together with farmers about their production systems. Extension people and academics redefined the meaning of the term ‘extension’ as going beyond TOT (Coutts 1994). The origins of participatory approaches can be traced to the evolution of action research approaches in the development of community. McTaggart (1992) credits Lewin (1946, 1952) as the first advocate of ‘action research’ in the English language. According to Johnson and Walter (2000) participatory approaches can:

- act as a statement of stakeholder and R&D provider philosophy;
- stimulate the sharing of knowledge;
- provide a learning experience;
- provide a sense of ownership for users and thereby increase the usefulness of research products;
- foster improved client/stakeholder relations; and
- foster the development of change skills for both R&D providers and clients/stakeholders.

Improvements in extension led to incorporating communication theory principles into the approaches, involving the stakeholders, mainly farmers, more in R,D&E. This made the 1990s a fruitful period in rethinking the role of extension. Participatory approaches helped substantially in this process and made the 1990s a very active period of extension model development (Frank 1998), (Hamilton 1995), (Lawrence 1999), (Pretty 1994). The earlier efforts of Röling and Chambers and other authors who specifically pioneered the concepts of participation in R,D&E became well known (King 2000). The qualitative participatory ‘bottom up’ approaches of the 1980s supported constructivist interpersonal approaches of the following years.
2.3.6.3 Participatory approaches to identify priorities

Science policy will be as useful as the degree to which it succeeds in representing the solution of basic needs or priorities of entrepreneurs. However, according to Stubbs (1978), most of the science-based organisations do not have problems in finding creative people to employ, but the organisations are not completely successful in employing this creativity in generating practical applications of science. This is not because the organisation is not able, but because the findings are not always fully usable. The scientist is not inclined to ask himself or herself the question: *What is the problem?* According to Scoones and Thompson (1994), citing *Farmer First*, much of the problem with conventional agricultural research and extension has been in the process of generating and transferring technology, and much of the solution lies in farmers’ own capacities and priorities.

According to Mortiss (1993), traditional methods to identify priorities emphasise quantitative data and expert opinion while the participative approach relies more on qualitative data and client sources. In most countries, government, universities and other bodies collect and record relevant information on rural areas and conduct special surveys on particular topics. However, these organisations, mainly when using data from quantitative surveys collected in an office, provide written records that do not put into words the motivations and feelings of people. In addition, each community is unique in the diversity of problems and concerns that it faces, and the priorities and solutions of each community have to be addressed individually (Thomson 2000). Conducting meetings with the purpose of revealing individual and community priorities can be an effective method as it stimulates thinking and mobilises energy. It can also be risky if the intentions of the communication are not clarified and there is no follow up (Mortiss 1993). It can also be risky if the needs assessment makes stakeholders focus on community gaps and deficiencies, and if they start to believe that outsiders will solve all their problems. It is necessary to enhance the initiative of producers (Nieto, Schaffner and Henderson 1997). In addition, the reduction of public funds to finance R,D&E organisations is pushing R&D in Australia and New Zealand to develop initiatives to merge research with...
extension. With the increase of stakeholders’ support to R,D&E, through levies paid by farmers, the identification of priorities of R&D to production systems, with active participation of people in the production systems, mainly farmers, assumes higher importance in those countries. The next section describes some of the models developed in the 1990s.

2.3.6.4 Strategic Extension Campaign

Strategic Extension Campaign (SEC) is a methodology developed by FAO and introduced in several continents including Africa, Latin America and Asia. It emphasises people’s participation in strategic planning, management and field implementation of agricultural programmes. It is based on the results of a participatory problem identification process on the reasons for non-adoption, or inappropriate adoption of recommended technology. SEC uses surveys to identify the problems with target beneficiaries, mostly farmers (Adhikarya 1996). SEC is strongly focused on technology adoption, however it has not mentioned the need to understand the reasoning of a production community, or how to involve the stakeholders, or identify their community network in the stages of the method.

2.3.6.5 Rapid and Interactive Model

According to Gastal et al. (1997), this model consists of interaction with the production community for a rapid and dialogued identification of the problem, analysis of the problem, and dynamic interpretation of the way that the rural area can become very successful in the agro-ecological and socio-economic environments. Basically, the objectives of the model are:

- Initial understanding of the community according to ecological, technical, economic and social points of view. The aim is to identify the communities’ potentialities, limits and problems that the producers are facing,
- Identification, by the producers, of their problems so that they look for their own solutions. Their active participation increases the commitment towards future tasks,
Design of an activity plan for the community, where the priorities of action and general goals for the community development are shown. The action plan should be precise and simple, and

Drawing a picture of the community, this facilitates the further evaluation of the project’s impact.

This method was based on a practical project developed in Silvânia, a county in the Goiás state, Brazil. First developed in 1986, the model was upgraded in 2002 with the name *Participative method of support for sustainable development and land sharing*.

### 2.3.6.6 The DART model

The Australian ‘Dairy Action Research Team’ – DART project was developed and implemented in Southeast Queensland in May 1993 after a dairy workshop (McIntosh 1997). The project provided experience in adult learning. The DART process follows nine steps, in which the last four points form a continuous learning cycle:

- Initiating the group,
- Identifying the issues,
- Expanding the issues,
- Categorising and prioritising the issues,
- Identifying other stakeholders,
- Planning action,
- Implementing action,
- Observing results, and
- Reflecting on ways to improve (McIntosh 1997).

Even with such a comprehensive cycle of identifying issues, planning action, observing results and feedback to reflect on how to improve, the DART process no longer exists. An explanation from some stakeholders I consulted is the lack of support from farmers’ organisations. The natural substitute has been the Regional Development Programs (RDP) developed by the Dairy Research
Development Corporation (DRDC). The RDP was introduced in Chapter 1 and details of SDP are presented in Chapter 3, Item 3.6.1.

2.3.6.7 Clark: Six Steps for Better Practice

Clark and Timms (1999) describe the Six Steps for Better Practices process as parts of a flexible and dynamic process of continuous improvement. The purpose of the Better Practices Process is to focus on action to improve performance and innovation. In the process, it is important to identify the appropriate participants in any particular process of change and innovation. The author mentions that individuals will often, at any time, and repeatedly, draw from their experiences, observations, reflections and action-plans. This is natural and should be supported since it elicits the best knowledge from each person. The six steps for better practice are:

Step 1 – Situation analysis – what problems and opportunities can I see?
Step 2 – Impact analysis – what makes a real difference?
Step 3 – Action planning – what problems and opportunities are there?
Step 4 – Taking action – exactly what aspects of present practice am I going to change?
Step 5 – Observing – if you cannot measure it, you cannot manage it.
Step 6 – Learning and Creating – Improvement – ‘how can I/we do better?’ Be open-minded.

The model stresses the change of stakeholders’ attitudes, specifically adoption of innovation. It assumes that people are motivated by the problems they identify, and are involved in resolving them. However, the Six Steps for Better Practice does not mention how to identify the stakeholders or how to involve a broad range of stakeholders in the process in order to bring different experiences to the discussion, thus enlarging the view of an agricultural industry’s main priorities.
2.3.6.8 The PAM model

The Participative Action Management (PAM) Model starts with a systemic approach involving stakeholders. Empowerment is the cornerstone of the PAM model by building empowering structures, networking with agencies, encouraging learning among groups, building group management capacities and sharing the credit of project success (Chamala, Coutts and Pearson 1999). The model moves beyond the FSR/E model of contracting or consulting with farmers; it combines the FSR/E model with the MIDDA model, improving stakeholders’ participation. The model is an organisational system, a convergent action model, which enables stakeholders to come together in the planning, implementation and monitoring of any development project. PAM suggests that stakeholders of industry, government and the community be organised into converging and energising group(s), team(s) or council(s). Figure 2.4 presents the six participatory planning steps involving R,D&E people and community; however, there could be more steps in certain projects.

![Diagram of the six planning steps of the PAM model]

Figure 2.4 – The six planning steps of the PAM model
Source: Chamala, Coutts and Pearson (1999)
In the PAM model, the participative action team (team involved in the implementation of planned activities):

- Is representative of all agencies, groups and individuals who have a legitimate interest in the primary industry;
- Has a philosophy and structure that enables it to draw on opinions, aspirations, plans, information and resources from all sections of the community and then develop, implement and evaluate the results of the team action plan; in other words, it is a convergent action model.

A strength of the PAM model is the involvement of on-farm and off-farm resources in a participative way. The stakeholder groups are encouraged to make decisions at every stage. According to Chamala (1999), ‘the model is not just a research or extension educational or communication model, but an organisational system’. Another strength of the PAM model is that it starts from a systemic approach, empowerment and network building, and encourages group management. On the other hand, the PAM model does not show how to obtain individual contributions from stakeholders. Although it is a time consuming activity, it is more likely that a person will present their real thoughts in an individual interview than in a group meeting. In addition, the model does not explain how the community actors to participate are identified.

2.3.7 2000s: Engagement approaches

Extension in the 2000s is in the process of generating more models, approaches and strategies to improve the participation of agricultural industries in research and extension activities. Some approaches are going beyond simple participation because there is pressure for greater stakeholder involvement and engagement in decision-making processes. Franz et al. (2002) wrote that engagement for extension is to mesh or network university resources and research with community or client needs. That was the idea when agricultural extension was separated from research, that field people should facilitate this interaction. Why did it not work? Perhaps the lack of resources for R,D&E will create a new demand for this interaction in future.
2.3.7.1 Participation as business

In the United States, participation means business in the ‘The Technology Transfer Information Center’ (TTIC). This section of the United States Department of Agriculture (USDA) has a new process to transfer technology for the industry (USDA 2003). It is divided into six stages:

1. Work with an industry association to identify and prioritise research needs;
2. Hire technology agents;
3. Write and distribute thorough problem statements;
4. Canvass the Federal laboratories, universities, and private research systems to identify potential technologies to meet an industry’s top priority needs;
5. Evaluate the technologies and document the findings in State-of-the-Art reports; and
6. Disseminate reports to appropriate businesses.

This process establishes the R&D in a very professional and technological relationship with agricultural industries, centred on each industry’s needs. However, it seems that it does not stress close interaction between other stakeholders and R,D&E people, and does not explain how the research organisation or the researcher identifies the needs in a participative way or obtains a proper understanding of how the technological need interacts with the social, environmental, and economical issues.

2.3.7.2 Singh Five ‘P’ model

Singh (2000) describes a model called Farmers’ Led Participatory Extension Education – Five ‘P’ model. The model stresses that it is of no use to improve the knowledge base for a particular activity without examining the specific work situation and the degree of freedom available to act on that information. Figure 2.5 shows steps of the 5 'P' Model. The model considers information from significant social groups and communities, their structural relations, economic, social and cultural activities and events constituting their normal life patterns, to
plan activities. However, the model does not explain how to converge the different sources of opinions or compare individual to group opinions.

**Figure 2.5 – Five ‘P’ Model**

*Source: Singh (2000) adapted by Sergio Teixeira*

### 2.3.7.3 Participation with engagement

At the Australasia Pacific Extension Network (Apen) forum in 2003 it seemed that one word pervaded the meeting and the goals of extension agents: engagement. Morris (2003) commented how the end of the Cold War removed much of the ideological debate and generated disillusioned and under-empowered people. However, a new focus on communities provides an opportunity for a much richer, more participative democracy than ever before. Morris gave the *Tasmania together* approach as an example of community engagement seeking the involvement of key stakeholder groups. This is a long-term strategic plan for Tasmania based on the hopes of many thousands of people who live in this Australian state. The intention is to have people believing that they can influence the direction of their community. According to Morris, the same approach is being studied in other Australian states. Some other Apen presentations stressed the desirability of engagement. A New Zealand study, involving social researchers, extension people and farmers to analyse the learning contexts and information needs of farmers, concluded about the successful mix of these three groups of people engaged in finding solutions for bull management problems: ‘It is not a matter of whether social science, farm practice or biophysical science is the most important, it’s a matter of how to successfully combine the three’ (Bramley, Botha and Tarbottom 2003). Day
(2003) presented his experience. He described his activities as constituting a community engagement approach. One part of this approach is to provide information to the community, but other important elements are to actively seek stakeholders’ opinion and involve them in decision-making and activities. Tijs (2003) reported an extension program for community engagement. The program applies principles of business management, marketing, community engagement, extension and communication to improve engagement. The expected results of this initiative are an integrated and cost effective approach (‘more crop per drop’) and community ownership of the project.

2.3.8 Extension trends

According to Paine and Nettle (2003) extension agents are in a crisis because we fail to adequately represent to others what we do as a professional practice. That requires more effective inter-disciplinary projects. Tom Cowan (see the advisory team page xxvi), in a personal communication, also mentioned the need for research teams that should have a more holistic view of production communities in order to deliver results that best fit their realities. The present reality in agriculture requires a broader view than that of just the farm, a view that looks also to the farmer’s family and beyond, to the future generations. It must consider the technical, labour and sustainability aspects of the business, and environmental care as well. This expanded view impels the extension agent to acknowledge and understand rural communities as systems with uncountable branches (Fontes 2002). The role of the extension agent is also changing from that of key informant to facilitator in order to access local knowledge and communities. For researchers to engage in successful research collaborations with extension agents, the privileged position of researchers within the research/extension partnership must be challenged to higher mutual involvement in a way all parties find comfortable (Nieto, Schaffner and Henderson 1997). The trends in agricultural extension over the past 50 years are shown in Figure 2.6, where the triple bottom line is the desired combined outcome for the 2000s and beyond.
Figure 2.6 – Evolution and trends of agricultural extension

Source: Chamala (1999) adapted by Sergio Teixeira

Notice that, like Figure 2.1, Figure 2.6 reflects the increasing complexity of farming systems and rural environments. Before the growing importance of the environmental issues, the social and economical issues were already preoccupying farmers. In the process of improving knowledge to understand better the complexity of farms and rural environments, extension thinkers have to involve more knowledge from other branches of science, including, and particularly for the context of this study, social science.

Public and private extension

In many countries of the developing world, the Ministry of Agriculture or State Government establishes the extension offices, contracts the staff and then the services become increasingly involved in carrying out all types of governmental activities at the local level (Swanson and Claar 1989). In this way the effectiveness of government extension organisations can often be decreased by the influence of politicians on the selection of staff members, target groups and
messages to be delivered. An extension agent may encounter difficulties if he or she refuses to spread information for the party of a local member (Ban 2000). As a result, the extension services now have different objectives. Public extension is declining in terms of the number of organisations and of extension agents. In many countries it tends to serve mainly the farmers without enough resources to pay for technical advice. There is also a trend for group advice instead of one to one (Nettle, Weatherley & Paine 2003). Probably family participation is left out of group advice.

On the other hand, it is mostly public extension that devotes attention to extension science. Private extension, which includes co-operative extension services, works mostly with those who can afford to pay for it. But private extension is also participating in extension science discussion. According to Farrington (1995), to make extension more efficient for the future, governments will have to identify in what areas the provision of advice can be privatized, either directly or by linking it with the sale of inputs; how the media can be used more effectively; how group formation can best be supported; how to achieve better definition of goals; how to secure the commitment or engagement of people, and how to obtain an organised plan to avoid getting lost in philosophies without results.

2.4 Key bodies of theory in extension

From the spread around the world of extension models and methods stressing the transfer of technology paradigm, until the present, when research and extension seek the engagement of people in the production systems in the R,D&E design, extension science has increasingly used knowledge developed in other branches of science to deliver better results. This section presents key bodies of theory, on the adoption process, communication, behaviour, community and systems, which contribute to the discussion of how to make extension more useful.
2.4.1 Adoption of new technologies through Innovation and Diffusion

Because extension managers were worried about delays in farmers’ use of research findings, more than 3000 research reports have been published about innovation, diffusion and adoption (Ban and Hawkins 1996).

2.4.1.2 Innovation and Diffusion

Innovation in business is something that is new or an improvement made by an enterprise to create significantly added value either directly for the enterprise or indirectly for its customers (Chamala, Coutts and Pearson 1999). Diffusion is a special type of communication concerned with the spread of messages that are perceived as new ideas. Diffusion research studies the way in which innovations spread among the members of a social system. Getting a new idea adopted, accepted and used is often very difficult. A common problem for many R,D&E people and organisations is how to speed up the rate of diffusion and adoption of an innovation. The main elements in the diffusion of new ideas are: (1) an innovation, (2) which is communicated through certain channels, (3) over time, (4) among the members of a social system (Rogers 1995).

Communication, motivation, and having a systemic view are some issues that R,D&E people need to have in mind when dealing with the key part of the diffusion and adoption process, the farmer. Changes have to take place in the mind of the farmer before a behaviour change becomes evident in the farm (Crouch 1992). Analysing the theory of innovation, Crouch (1970) listed four factors. Notice that excluding biological ability, it is possible to recognise cultural and motivational elements in item (b), an indication of systems theory in item (c), and again motivation in item (d):

(a) – biological ability,
(b) – personal value orientations,
(c) – elements of the situation, and
(d) – personal prestige.
2.4.1.3 Adoption process

Adoption refers to the stage in which a technology is selected for use by an individual or an organisation (Carr 2000). The adoption process is all the stages leading to adoption. The adoption process was studied intensively to understand the reasons for non adoption. Adoption can be defined as the changes that take place within individuals with regard to an innovation from first seeing or learning about it to adopting, to the final decision to use it or not. Research has demonstrated the delay that occurs between the time farmers first hear about favourable innovations and the time they adopt them. Studies show that it took four years on average for the majority of mid-Western United States farmers to adopt recommended practices (Ban and Hawkins 1996). Research workers have been keen to find out what happens during this time. The adoption process does not always follow a pre-established sequence in practice, such as a farmer pilot test. For some technologies, such as milking machines or buildings, it is not possible to have a trial in the farm before adoption. For others, like new seed varieties, the adoption process happens faster. Decisions in practice often may be made in a much less rational and systematic manner; trust in the introducer of the innovation may have a stronger influence than publications.

Adoption of innovations is highly dependent on some factors beyond the control of individuals, such as soil type, weather conditions and landscape. It is also subject to resource allocation and labour inputs. Production structures such as economic and social improvements, the social and cultural values of farmers, varying levels of education, and customary consumption patterns add complexity to the adoption by a large number of farmers of the same technology. Provision of credit, marketing and extension services and compatibility of the technology with management practices and local environmental conditions are all integral to the adoption process. It is hard for R,D&E people, without field experience, to understand why a farmer does not adopt an innovation that has been scientifically proved and published. Their incomprehension comes from a lack of understanding of the many issues involved in the farming system. Successful adoption, therefore, depends on a
multiplicity of factors, which impinge on the decision-making process at the farm level (Shaw 1987). According to Ban and Hawkins (Ban & Hawkins 1996), we have an image of reality in our mind of the physical and social environment in which we live. Adoption is a decision-making process regarding the approval or rejection of an innovation. It is highly influenced by the communication we need for forming an image of the consequences we can expect from this innovation.

Guerin (1999) details numerous reasons why land users do not always adopt innovations even though all evidence may suggest that they should:

**Personal attributes** – Include values and fears that affect attitudes. To understand the learning style is fundamental to selecting the best approach to explain and increase the motivation towards new ideas.

**Attitudes towards risk** – Groups of people will resist a risk if they do not understand the nature and limits of the risk involved with an innovation.

**Years of experience** – Guerin found different associations between farmer age and adoption. Some researchers believe that young farmers are more likely to adopt technologies while others have found that old farmers are more likely to favour adoption. The type of technology influences the adoption by young or old farmers.

**Opinion Leaders** – These are key persons in the adoption process. It is important for extension agents to locate opinion leaders and gain their approval and confidence by providing them with information.

**Visibility of technology** – It is relatively easy for a land user to see and appreciate a practice that affects productivity; however it is more difficult for the land user to see how preventing pollution of land and water would benefit productivity.

**Complexity of innovation** – The simple innovations, the ones that are easily understood, like changing crop cultivars, are more likely to be adopted.

**Communication constraints** – It is necessary to recognise the level of community knowledge, to prepare an appropriate way to communicate clearly with the people.

**Credibility of extension agents** – Developing credibility with farmers is one of the most important influences on the success of the adoption process. The extension agent is a mediator in communicating innovations; he/she must be
able to interpret the complexities of scientific jargon in terms which are familiar to farmers. The following attributes have to be considered if the extension agent is to have credibility:

- Maintain a practical approach to problem solving,
- Make recommendations that are feasible,
- Make recommendations that are visible,
- Be well informed or have access to the source for latest developments,
- Have an overall knowledge of environmental management,
- Be accessible to farmers,
- Be unbiased, honest, trustworthy and reliable,
- Maintain confidentiality, and
- Understand and work within the social norms of the community.

**Harmony with lifestyle** – Farmers avoid adopting an innovation if it somehow puts at risk their lifestyle; they tend to preserve their environment to satisfy lifestyle needs.

**Holistic needs** – Land users have to make many decisions and they select, from the range of practices developed, those that are consistent with their needs, socio-economic status and attitudes toward different practices (Chamala 1987). The reasons for some of their choices are not necessarily clear to an external observer.

According to Frank (1998), farmers react to innovation and adopt new behaviour in harmony with the environment, respecting the social and economic influences. Their angle of vision is wide and they see things that have not been considered by an outsider. The multidimensional nature of the agricultural innovation / adoption process and its interrelationship with other sectors of the economy is highly complex. In Australia, the establishment of Cooperative Research Centres (CRCs) was a turning point for involving stakeholders in research projects (Chamala 1999). Notice from the review above that even in the 1990s the adoption of technologies was still being studied. However, the adoption process, as described in the literature, suggests a one-way direction of information from R,D&E to production communities; it suggests ‘top-down’ research where the farmer is the object or client of research rather than a partner. The 1990s publications on innovation, diffusion and the adoption
process reviewed for this study indicate changes to involve other branches of science related to extension.

2.4.2 Communication Theory

Before extension science began using communication theory, the theoretical basis for improving the exchange of information between people was already in evolution in social science through the development of communication theory. When working as an extension agent, because of my positivist, animal-science background, I confused ‘inform’ and ‘communicate’. Many times I considered that I was communicating when I was only informing. The differences between informing and communicating can be clearly understood from definitions below. Notice that communication involves sending and receiving messages.

**Information** – *Gives facts or information to* (Soanes 2001).

**Communication** – *Shares or exchanges information* (Soanes 2001).

*It is the process of sending and receiving messages through channels, which establishes a common meaning between a source and a receiver* (Ban & Hawkins 1996).

Other authors sum up how to improve interaction of R,D&E with people in production systems.

*‘Tell me and I forget, show me and I may remember, involve me and I will understand.’* (McClelland & Eyres 2001)

Interaction between people, with different roles, requires at times the proper persons, organisation, skills, and ‘tools’ to connect information and action to make communication happen. To Freire (1992), communication happens at the same time as comprehension. Communication theory developed faster after Shannon and Weaver’s (1949) studies with telephone cable and radio waves during the Second World War. Their linear model of communication does not represent properly the sharing of information and meaning and attracts many
critics. But it does convey the idea of communication as consisting of both transmission and reception.

Communication theory exists not as a single entity but as a series of interrelated areas of study (Nelsen 1980). According to Elder (1994), all of the theory states that good communication occurs when one person has an idea, expresses that idea to another person or group of people through a communication channel, either by verbal or nonverbal means, and the other person/people understand exactly what the first person has communicated. There is a popular humorous expression in Portuguese that reflects the importance of communication in terms of making the receiver understand the meaning of the message, even between animals and humans:

‘The chicken that does not cackle after delivering an egg will be cooked.’

This saying means that, by cackling, the chicken is communicating the message, ‘I am a productive chicken, do not kill me’.

2.4.2.1 Communication in extension

Agricultural R,D&E uses various approaches to transfer technologies or interact with production systems. In general, the approaches can be divided into Mass Media, Group and Individual approaches. These three approaches have the following main characteristics:

- **Mass Media** has the objective of reaching large numbers of people simultaneously. Use of mass media is important to raise issues through newspapers, radio, and television, making people aware that the particular information and technology exists (Chamala 1999).

- **Group methods** give the opportunity for interaction and feedback. Some examples are field days, lectures, units of observation (field trials), e-mails, and group discussion,

- **Individual methods** consist mainly of dialogue. The best example is visiting individual stakeholders to communicate or exchange ideas and/or information.
Berlo (1960) combined group and individual methods and developed an Interpersonal communication model; it is based on Shannon and Weaver’s theory of communication, excluding the noise in communication. Table 2.1 shows some characteristics and differences comparing interpersonal and mass media channels.

### Table 2.1 – Differences between interpersonal and mass media channels

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Interpersonal channels</th>
<th>Mass media channels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message flow</td>
<td>Tends to be two-way</td>
<td>Tends to be one-way</td>
</tr>
<tr>
<td>Communication context</td>
<td>Face-to-face</td>
<td>Interposed</td>
</tr>
<tr>
<td>Amount of feedback readily available</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Ability to select process (selective exposure)</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Speed to reach large audiences</td>
<td>Relatively slow</td>
<td>Relatively rapid</td>
</tr>
<tr>
<td>Possibility of adjusting message to audience</td>
<td>Large</td>
<td>Small</td>
</tr>
<tr>
<td>Cost per person reached</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Possibility for audience to ignore</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Possible effect</td>
<td>Attitude formation and change</td>
<td>Knowledge change</td>
</tr>
</tbody>
</table>

Source: Ban & Hawkins (1996)

The interaction between transmitter and receiver is the important factor when analysing the communication process. In theory, the science of communication is about a process of sharing knowledge more widely through social, political and economic networks to serve the individual and collective good (Day 1975). In practice, communication is not just about packaging information in easy-to-understand language and putting it into popular communication channels; it is not a linear process whereby a message is sent and received. It is also about understanding the social, professional, and institutional contexts in which the communication occurs, the social environment. This way of viewing communication does not exclude mass communication when it is identified as the more efficient way.

### 2.4.2.2 Opinion leaders

Opinion leadership refers to the degree to which an individual is able to influence other individuals' attitudes in a desired way with relative frequency. This leadership is not a function of the individual’s formal position or status in
the system (Rogers 1995). Opinion leaders constitute a group of people who are very important in the process of communication with a community. They tend to be people who are capable, willing and in a position to help others solve important problems (Ban & Hawkins 1996). They play an important role because they can create noise in the communication process or bring valuable co-operation to it. They provide information, advice about different issues, and can indicate people who can make positive contributions. They are important both to transmit the first ideas about future action and to start a pilot test, working as a sounding board for R,D&E ideas.

2.4.2.3 Communication network

Cezar (1999), studying beef cattle farmer communities in Mato Grosso state, Brazil, wrote that as in any society, the farmers have a communication network in their community. For the individual, that starts at an early age, at home, and is developed during relations with the social, commercial and technological environment. Cezar also noted that the farmers he studied are not usually readers, although radio and television are a constant in their lives, and that the informal ways of communication, including through opinion leaders, can provide better results than disseminating the traditional published information. Vanclay and Lawrence (1999) wrote that farmers utilise a range of information sources, and different farmers use different information sources forming a net of communication relations. According to Keen and Stocklmayer (1999), the process of science communication is now being facilitated in rural industries by the development of communication strategies to involve production communities and their communication networks. In addition, it is important to consider that other stakeholders, not only farmers, have different access to information. Studying the most efficient and effective process of promoting more sustainable farming systems through new technology in Queensland, Australia, Hamilton (1995) concluded that ‘Information as a written product has only minor impact on the decision making process’. He found that the information and knowledge of the communities’ participants, the community knowledge,\(^3\) and

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\(^3\) This is the knowledge in a region with similar interests, opportunities, information and skills.
their judgements of expected outcomes put the scientist with his/her technical knowledge in the background.

Crouch (1992) commented that factual information itself will not promote any change in attitudes or modification in behaviour. It is what the farmer does with the information received that is pertinent, reflecting a willingness to assess and modify behaviour. Information technology, given the availability of basic resources, is proving to be a fast way to supply and exchange information and ideas on issues in the agricultural environment.

### 2.4.2.4 Information technology

Just one decade ago, scientific information was accessible to comparatively few persons. Only a few could consult libraries that receive journals from different branches of science. Information technology has brought a major change to the socio-economic paradigm: today the access to capital is not as important as access to technology (Rivas 2001). For researchers and students in cities the internet is fundamental. Even courses are provided in this way, almost without contact between the academic and the student. Government agencies involved in agricultural extension see information technology as a way to enhance the efficiency and effectiveness of their extension work. In Australia, it is a quite recent phenomenon that significant numbers of farmers have begun to own a personal computer (Martin et al. 1998).

Information technologies will facilitate some forms of education, training, learning and information exchange. On the other hand, according to Thomson (2000), each community is unique in the diversity of problems and concerns that it faces. Modern knowledge-based systems involving computers, and not always easy-to-deal-with software, permit customised solutions to complex issues, but there is currently no good method of representing traditional knowledge on the computer, in a way that helps the needs of communities to be addressed individually. When one is dealing with complex technologies or trying to understand the local production system, the personal approach of R,D&E cannot be replaced by a computer program. In addition, farmers have
telecommunications infrastructure constraints in some parts of Australia. In other parts of the world, these constraints are stronger, like the lack or unreliability of an electricity supply. While new technologies, such as information technology, and old technologies, such as reliable sources of electricity, are improving the communication between R,D&E and their clients, personal communication will always be essential. This is because it is difficult to build trust and to evaluate the behaviour of people through the internet; this requires a higher interaction between R,D&E people and people in the production systems.

2.4.3 Behaviour in extension

Humans are both rational and emotional beings and social science studies on human behaviour are helpful to achieve effective stakeholders’ participation. Trust, motivation and ownership of ideas are particularly important in the contact with people, and are discussed below in brief.

2.4.3.1 Trust

In my first contact with the manager of the Subtropical Dairy Program in Queensland, Australia, he asked me how I would get trust from stakeholders. According to Sixsmith et al. (2003), it is evident that more than describing a research project is necessary to gain the participants’ co-operation. It is not simply a matter of recruiting people into the research but, rather, a complex social process of gaining access into the community itself. Sixsmith wrote:

‘As outsiders to a community, researchers need to address the psychological distance between themselves and the researched to gain valuable insights into the everyday lives of community residents’.

Trust is a firm belief in the reliability, trustworthiness, ability, or strength of someone or something (Soanes 2001); it is an intuitive strategy that people use to adapt themselves to a complex environment where the future is not so easily
predictable. People take active orientations toward the future, in order to face the future actively and constructively. It is necessary to build trust to have people believing that they are listening to the right person to help them achieve their desired outcomes. Trust becomes the crucial strategy for dealing with a future full of alternatives brought by technological development and an uncontrollable future (Sztompka 1999). Sztompka defines it thus: ‘trust is a bet about the future initiatives of others’. According to Pretty and Ward (2001), trust lubricates co-operation, improves the confidence that people will act as is expected and creates a social obligation – trusting someone engenders reciprocal trust. The literature about extension treats trust with different names but always as an important issue. Mortiss (1993) suggests that credibility and trust can be gained by dealing with the farmer’s own data, testing alternatives with the farmer, and describing experiences of farmers in similar situations. Spies (1996), studying the most important attributes for consultants’ success, describes credibility, trust and honesty as some of the most important attributes. ‘You only need to be dishonest once in your career to destroy trust’. Johnson (1975) analysed the acceptance of a person, stressing that his/her personal attributes, or the kind of person he/she turns to be, is more important than what the researcher represents.

2.4.3.2 Motivation theory

Motivations are the reason behind people’s activities or behaviour. Toates (1986) notes that things do not simply happen spontaneously, they are caused to happen. According to Ford (1992), early theories of motivation portrayed humans as reactive organisms compelled to act by internal and/or external forces. It was assumed that if one could ‘push’ or ‘pull’ the right buttons, motivation would provide the desired results. Motivation theory has a relevant role in helping the integration of stakeholders of a production system in a study such as this since an effective contribution from them can be obtained after understanding how they deal with their business, society, family, and priorities. People commit themselves when they believe in the worthiness of the change goal and when they are fully involved and contributing according to their own
values (Clark & Timms 1999). Two important theories of motivation are presented below:

**Maslow**
Abraham Maslow (1908 – 1970) classified human needs into five categories. Maslow’s theory suggests that individuals will act to satisfy their lower needs before they attempt to achieve their higher level needs. In practice the different levels are not so clearly identified in each person. The understanding of these issues is a key step in motivating individual co-operative participation and may not be clearly evident in a group (Chamala 1999).

**Herzberg**
Herzberg in the 1950s published studies stressing two sets of factors popularly known as the *Maintenance* and *Motivating Factors*. *Maintenance Factors* correspond to minimal prerequisites of a satisfactory existence corresponding to the lower three levels of Maslow’s hierarchy. Herzberg found that only the level which corresponds to Maslow’s Esteem and Growth could actually serve as direct sources of motivation to work effectively. Table 2.2 presents Maslow’s five categories of human needs and how they correspond to Herzberg’s motivation and maintenance factors.

Freire (1992) suggests that, without proper knowledge of the socio-cultural aspects of a community, it will not be possible to motivate the community and challenge them to change. Projects have often failed because farmers’ involvement, needs and interests were neglected, while programs mostly focused on ‘what is happening’ rather than ‘why it is happening’ (Chamala 2000). There are several other theories of motivation besides those mentioned before such as the Theory of X and Y, Psychological success, Social needs (Clark & Timms 1999).
Table 2.2 – Maslow’s human needs categories and Herzberg’s maintenance and motivational factors

<table>
<thead>
<tr>
<th>Maslow Categories</th>
<th>Needs</th>
<th>Herzberg Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth</td>
<td>Accomplishment, Self-actualisation</td>
<td>Motivation factors</td>
</tr>
<tr>
<td>Esteem</td>
<td>Self-respect, Achievement, Status, Recognition</td>
<td></td>
</tr>
<tr>
<td>Social</td>
<td>Belonging, Acceptance, Social Life, Friendship, Love</td>
<td>Maintenance Factors</td>
</tr>
<tr>
<td>Safety</td>
<td>Security, Protection from danger</td>
<td></td>
</tr>
<tr>
<td>Physiological</td>
<td>Hunger, Thirst, Shelter, Sleep</td>
<td></td>
</tr>
</tbody>
</table>

2.4.3.3 Ownership of ideas

Ownership of ideas plays a strong part in influencing people’s motivation and attitudes towards improving their production, social and economical status. On this matter, Freire (1992) proposed an approach to challenge stakeholders to think about problems. Extension agents should stimulate people in such a way that they recognise themselves as able to transform their realities. Freire divides the approach into four stages that encourage the ownership of the activities, no matter which step of development the community actor is at:

1. Presentation of intentions, challenging each person to reflect about himself/herself and the problem,
2. Researcher looks at the reality/problem trying to view it from the point of view of an insider, still thinking and reflecting,
3. Exchange of stakeholders’ points of view, building the different parts of the reality and their relationships,
4. Critical observation of the reality, preparatory to action.

To Knowles (1973), the exchange of experience is more than telling what is happening. People identify with their experience, so, in any situation in which an adult’s experience is being ignored or neglected, the adult perceives this as not rejecting just his/her experience, but rejecting him/her as a person. Active participation and contribution of ideas should not be expected from someone who does not feel a sense of belonging and cannot feel that the ideas in discussion have recognised his/her contribution.
2.4.4 Community

So far, this review has stressed individual relations. However, individuals are part of communities, which integrate within the broader society and economy. The term community has a range of meanings carrying a strong ideological connotation (Kenny 1999). In this study it is used in the broad sense of a group of people in a geographical location with common interests in a particular industry. Extension is being pushed to face new challenges beyond the traditional, individual boundaries. To meet these demands, extension has taken its role as educator and facilitator to a new level – building community coalitions to engage in research for community problem solving (Nieto, Schaffner & Henderson 1997). Insight into community knowledge and power has great importance for the understanding of the reasons why people select certain priorities over others and for improving the possible outcomes of this study.

2.4.4.1 Community knowledge

The expression community knowledge has been used to express the knowledge that a community of people accumulates in experimentation with different strategies to achieve different goals. In this study community knowledge refers to the knowledge that exists among farmers and in their communication network involving the people that they share information with in their regional production systems. This study treats the terms local knowledge, collective knowledge, rural people’s knowledge as synonyms for community knowledge.

According to Carr (2002), local knowledge incorporates information about local conditions, local culture, intuitive concern and local places. Local knowledge is especially important for outsiders, e.g. external scientists, historians, artists, anthropologists, journalists and many others. The integration of local knowledge into R&D activities is a process that often receives insufficient attention (Ban & Hawkins 1996). Knowledge networks operate across space and time more effectively than hierarchical systems and a catchment can be thought of as sets of communications and interactivities between stakeholders involved in different
knowledge networks. According to McIntosh (1997), we are often unaware of the group process. A group may make successful decisions without realising or recognising its own decision process. A member may initiate an idea, and be supported by another member. A member can also contribute an idea that he/she brought from another group, strengthening the community network. Then the whole group discusses the idea before action. This group process may go unobserved if the communication network is not observed.

Eliseu Alves (Embrapa researcher) defined, in a personal communication, community knowledge for a production community as the combination of the knowledge of at least five agents: input market, farmers, services (including R,D&E), processors and credit system. He mentioned that if the local, county or regional community has appropriate knowledge of its input and output market, service providers, good analyses of government and market behaviour, it will be easier for the farmers to have good results in their businesses. Alves's opinions had an important influence at the first stages of this study.

Scoones and Thompson (1994) made an interesting comparison of how rural people's knowledge is seen. The comparison goes from primitive or unscientific procedures requiring a re-education by R,D&E people; to a valuable and under-utilized resource that needs to be studied; to the recognition that rural people's knowledge and western science cannot be regarded as single 'body' of knowledge. The modern view of community knowledge is a contrast with the considered superiority of 'rational science', which used to see farmers as either 'adopters' or 'rejectors' of technologies, not as originators of either technical knowledge or improved practice. Richards (1994) presents a concept of 'local knowledge' associating knowledge with lower risk. Richards points out that local knowledge, that could be original or adapted, embodies place-specific experiences that allow better assessments of risk factors in production decision making.

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4 Networks are also related to social capital, which will not be discussed in this review. For more information on social capital please read Putman (1995).
Walters et al. (1999) studied eight neighbouring villages in the Philippines to find out why some farmers participate more readily than others in discussions for community development. He found out that the level of local knowledge is one of the main issues to be analysed in order to achieve participation. Replacing present farmers’ technologies with more advanced ones, with the aim of community development, is not only a technical issue; it is also an anthropological, epistemological, and structural issue. It is important to analyse the level of local knowledge, in such a way as to avoid the cultural invasion (Freire 1992). In other words, it is important not to ignore the knowledge in use by a production community, since it could have significance beyond production.

2.4.4.2 Community development

According to Kenny (1999), community development has the objective of helping people in a community to identify their needs in order to obtain resources, as well as to increase the community’s organisation to give the people more power and control of their lives. Community development has become an objective of agricultural extension. According to Olival (2002) development has been associated with industrialization. Good development has been associated with economic growth. Nevertheless, development and community development should assume different shapes, depending on the society, in contrast with the unilateral picture of economic development. For Rogers (1992), development is associated with establishment of goals for the nation, region or person.

Chamala (2000) provides several definitions of community development. Two of them are: ‘A process during which people in the small community first thoroughly discuss and define their wants, and then plan and act together to satisfy them’ and ‘A social process by which human beings can become more competent to live with and gain some control over local aspects of a frustrating and changing world’. Both definitions have as a common point, the initiative of the people, even if it has to be stimulated by R,D&E organisations.
Another important point in community development is involving people who share a common identity. Despite the increasing exchange of cultural ideas through the media, which constantly transmit different values, the idea of community remains a powerful one (Kenny 1999). An Australian study about how people viewed their society, in terms of what is missing and what they would like to see in the future, revealed that presently the community felt they were losing their sense of community and identity (Ife 1999).

An example of a community development initiative related to dairying comes from the county of Juiz de Fora – Minas Gerais state in Brazil. Here the dairy farmers organised a project called ‘Proleite’, which means ‘pro milk’, to gain advantages in technical advice, milk sales and collective purchase of goods. The project was designed by the city hall working with the farmers (Martins 2003). Because of the farmers’ organisation of technical support, participating farmers earned an additional A$ 0.032 per litre of milk in 1999 and a sense of empowerment and community identity.

In relation to the objectives of this study, the concept of community development is related to the desired welfare of a population and is associated with setting goals and priorities. The idea of community development is also important for the stakeholders’ perception of the strength of thinking collectively and the view of the different parts of the dairy chain.

2.4.4.3 Power and empowerment

Power is the capacity to impose one’s will against the will or interests of others. A dominant person or group maintains power over other people or groups in a variety of ways (Kenny 1999). A simple definition of power is the ability of people to act or produce an effect. In community development, a central idea in the concept of power is the term empowerment or collective empowerment of a community. Scoones and Thompson (1994) observed that approaches involving groups of stakeholders in a production community, aiming to facilitate the process of generating and transferring knowledge and technologies, fail if they do not consider the impact of power on the relations between different groups.
within farming communities or between local people and outside change agents. It is not enough for community development workers to be committed to people in the community, it is necessary to empower them and transform their society (Kenny 1999).

Morriss (1987) noted that there is no one method of studying power which explains effectively how any individual or group can gain power. According to Long and Villareal (1994), power and knowledge cannot be precisely measured, and knowledge processes are embedded in social processes, that imply aspects of power, authority and legitimation. This may raise some conflict but also lead to the establishment of common perceptions and interests. Long suggests that power cannot be stored like a commodity. It is fluid, and specific stakeholders who feel capable of manoeuvring within a given context can develop strategies to improve their power and reach their goals. These citations suggest a dynamic dimension of power that allows improvements in the power of a person or group of people.

2.4.5 Systemic view of production communities

According to Röling (1988), the word ‘system’ is applied for a complex phenomenon, which could be a farm economic model to predict outcomes (soft system), or a system created to perform a specific function (e.g. heating system – a hard system). Systems have been studied for centuries, although the term ‘system’ itself was not emphasised until the middle of the 20th century when the ‘system’ emerged as a key concept in scientific research. From this period rises the tendency to study a system as an entity rather than as a conglomeration of parts (Bertalanffy 1973). Checkland (1981) defines a system as the interactivities, and lessons from managing the interactivities, between the relevant combination of parts (sub-systems) that make up the complex whole (the system). According to Checkland and Scholes (1990), managing anything in life involves coping with a flux of interacting events.

Dillon (1992) describes a system as an organised unitary whole. It is a set of interrelated elements, each of which is related directly or indirectly to every
other element, and no subject of which is unrelated to any other subject. Thus, anything that affects one part of the system has repercussions throughout. In addition, systems interact with other systems in a complex way. Therefore, while each system will generally be part of a larger system, it cannot be decomposed into independent subsystems. We are all familiar with many of them: solar system, economic system, transport system, soil-plant system and social systems. Before the advent of systems thinking, both social and physical scientists tended to derive their understanding of the functioning of the whole from the study of the individual parts considered in isolation. In consequence, despite the awareness in the scientific community of systems thinking, the physicist, the biologist, the psychologist and the social scientist tend to be encapsulated in their private universe generating information that does not fit into the big puzzle of reality.

2.4.5.1 Systems thinking

Systems thinking emerged in response to understanding that mechanistic or reductionist thinking did not account for the relationships between a set of interrelated elements, each of which related directly or indirectly to every other element of a system (Capra 1996). Ison et al. (1997) suggest that systems thinking views systems as: (i) constructs or devices that are articulated for the purposes of understanding and change; (ii) a shorthand for a system-sub-system-environment relationship and (iii) brought forth by an observer who has a unique experiential or cognitive history.

This study was designed according to a soft-systems approach. Soft systems are based on constructivism in which the system is constructed by the researcher or other actors. A comparison between the constructivist approach and the positivist approach to systems helps in the definition of soft systems. Under positivism, systems are taken as something that actually exists. Under constructivism, systems are constructs used to study real life situations (King 2000). Systems are constructs that are articulated for the purposes of understanding and change (King 2000). Soft systems thinking suggest that there is no single interpretation of phenomena and each stakeholder can have a
different contribution. According to a soft-systems view, people appreciate the same context in different ways, in line with their experiences, ‘world views’ and purposes, resulting in a number of different system models, which are relevant to the stakeholders’ concerns, but not to all stakeholders’ (King 2000). The combination of the different persons’ ways of seeing the world and the influence that each one can play in the real world generate the community initiatives and may influence the behaviour of the community as well. Checkland (1981) developed the Soft Systems Methodology. This takes a set of stakeholders through a process of shared problem appreciation, learning about the problem and taking collective action to improve it. Participatory approaches, particularly using focus group meetings, can stimulate the exchange of different points of view and also help convergence on the main points in a discussion.

Changes in an agricultural industry environment may challenge present production systems. A single group of stakeholders, such as farmers, may not notice all the implications of these changes. However, farmers belong to a social system, defined by Rogers (1983) as ‘a set of interrelated units that are engaged in joint problem solving to accomplish a common goal’. Those units include the family. Cowan et al. (2003) stresses the importance of considering family values in the systemic approach of a farm, to the collective of farms and other parts of the dairy chain. According to McCown (2001), in studies of production communities, there is a trend away from a ‘hard’ systems approach (systems approach that considers mostly the material resources) to design best practice and towards a ‘soft’ systems approach in which models aid dialogue about farmers’ felt problems and possibilities for improvements. Petheram and Clark (1998) consider multidisciplinary teams need to be set up, with a shared vision and purpose to obtain a holistic view of production communities, and these can be extended to different stakeholders as needed to improve the holistic view of production communities.

2.4.5.2 Farming systems

Internally each farm is a unique and purposeful subsystem related to (a) technology and resources, (b) formal organisation structure, (c) informal
relations, goals and values and (d) management. In other words, each farm has the interaction of four production factors: earth, work, capital and technology. External to the farm sub-system is its environment, which exerts both general and specific influence on any particular farm sub-system. Major influences in the environmental supra-system are cultural, technological, market, educational, political, legal, climatic, demographic, sociological, and economic factors. These environmental influences, along with intra-system determinants, help determine and constrain the goals of the farm sub-system.

Farmers use many different sources to obtain the knowledge and information they need to manage their farms, and new knowledge is developed not only by research institutes, but also by many different stakeholders. It is useful to improve the understanding of the farming systems to analyse how all these sources supplement and support each other in a systemic way. Few farmers can have direct contact with researchers, especially in less industrialised countries where the number of farmers is large compared with the number of agricultural researchers (Ban & Hawkins 1996). When one considers the different production technologies, and the different sources for obtaining knowledge, and how they are working and interacting together, it is easy to understand that a researcher or the research will only have a real impact on agricultural production if there are others, working synergistically, acting as effective communicators between researchers and farmers. Development of good solutions requires contributions from researchers who have a deep knowledge of certain aspects of the problem, from extension agents who should have a broad knowledge and understanding of the farming system, and from the stakeholders in the communities who transform resources into products. It is the interaction of these people and exchange of ideas among them that directs the actions that they undertake within the production community; that needs to be understood by R,D&E, before planning of their research projects and extension activities.

Figure 2.7 is an attempt to illustrate some of the several systems that farmers access or may access. The internal ‘clouds’ are representations of the closer and more immediate preoccupations of the farmer and the outer ones represent
the larger environment that he/she may or may not influence or be influenced by, or get information from. Depending on particular difficulties, the peripheral issues can take more central importance. For example, the fate of Parmalat, a multinational milk processing and distributing company in financial difficulties, for many farmers is currently a high preoccupation and would belong in the central ‘cloud’.

Figure 2.7 – Illustration of farm / farmer’s place in several systems
2.4.6 Additional issues related to this study

The focus of this review has been on theory informing approaches to extension in agricultural industries and underpinning the logic of this thesis. However, some other issues that influence the results of extension need to be addressed before presenting the conceptual model of this thesis. They are presented below.

2.4.6.1 R,D&E linkage

Watts (1989) gave a simple description of the roles of research, extension and the farming system (Figure 2.8). In brief, extension can be illustrated as the bridge between research and the production system. Extension could also be seen as information management in the interaction between production communities’ knowledge and demands and R&D services. Unfortunately the linkages of R&D with extension and with people in production communities are weak in many countries (Ban & Hawkins 1996).

While close linkages between extension and research are necessary, they are not easy to achieve (Benor & Baxter 1984). The problem of linkage between R&D and extension is found in different countries. Agbamu (2000), studying the linkage of research-extension in Indonesia, Japan, Mexico, Nigeria, South Korea, Tanzania, and Thailand, found no organized linkage system between agricultural research and extension organisations. An important point is that the linkage mechanisms work only if there is an effective exchange of information.
between research and extension, which requires the evaluation of an existing fruitful environment between R&D and E. For those reasons, Röling (1988) believes that the image of an effective information system as a system in which research produces the information, extension passes it on and farmers use it, is a false one.

On the other hand, Guerin (1999) suggests that research should include an extension component, which starts at the design stage of the research, by making sure that land users want to know the results in the first place. From the results of their project on learning, Paine and Kenny (2002) recommend active partnership through collaborative teams involving research and extension. According to Cowan (1995), Embrapa dairy in Brazil has a very strong program of research and has developed an excellent information base. However, Embrapa dairy could improve the R,D&E linkage by ensuring in its projects a higher consideration of extension issues.

In effective agricultural information systems, farmers are very active in developing and adapting information and in asking for the kind of information which they find useful. However, the weak linkages of R&D with the production community result in recurring ‘bottlenecks’ in agricultural technology, and can limit their contribution to development of the agricultural industry as well as the recognition of the importance of R&D (Crowder 2001). The weakness of the R,D&E linkage is part of the reason for new initiatives from stakeholders in research, such as the Cooperative Research Centres in Australia from 1994.

According to Crouch (Crouch 1987), R,D&E must be client-and-problem-oriented, and produce co-operative work for the same objective, which is agricultural development. Crouch also attributes the weak linkage between R&D and extension to the difference between R&D and extension agents in their use of communication media. This is despite the similarity of research and extension people on their graduation. The extension agent prefers to communicate through personal contact whereas the researcher informs through publications.
2.4.6.2 Environmental issues

Successful adoption of environmental management practices has been discussed more frequently in the 1990s and 2000s. These practices are not so readily adopted because they do not visibly increase productivity, as innovations such as new varieties of seed do. In addition, the costs are born by the individual farmer, while the benefits are social (Vanclay & Lawrence 2001). Communities tend to identify environmental management as an important issue that influences the farm system to the benefit of the whole community. In economic terms, good environmental practices involve farm investment to bring positive externalities to the whole community (Lele & Makki 1997). To convince the farmer to adopt good environment practices, the extension agent and the community have to show the bigger picture of the ecosystem, and the interrelation with the farm production system in the long term. Appropriate environmental management in agriculture requires major changes in land use, behaviour, and farm management. It is well established that add-on technologies are far more likely to be adopted than practices that require major land use change, even where significant economic advantages can be demonstrated (Donald 1982).

2.4.6.3 Increasing complexity of farm and government management

There has been growing complexity in farm management since the 1970s and it continues today, particularly in the dairy industry. In the 1970s, the main preoccupation of research, extension and farmers was to raise production. In the 1980s, the costs of production grew in importance in farm management. In the 1990s, quality issues were added to farmers’ preoccupations (Teixeira & Ribeiro 2000). From the 1990s, and more strongly in the 2000s, environmental issues have become an additional preoccupation in farm management.

There is also a growing complexity in government management of the dairy industry. From the 1970s, the Brazilian government started to reduce funds for public R,D&E, and it reduced its role as interventionist in the dairy industry from 1991. In Australia, the same attitudes were adopted in similar periods.
Meanwhile, in both countries government has kept and improved its role in helping to increase production, in improving milk quality and in environmental conservation. In addition, social issues such as the welfare of farmers, mainly small farmers, are growing in importance.

### 2.4.6.4 Complexity of community issues

The ‘top-down’ approach to farmers was easy for extension agents, who were preoccupied mainly with obtaining production information and passing it on to farmers. Chambers (1988) called the R,D&E people of that era ‘outsiders’ in the farm environment. Chambers suggests that for many outsiders there is scope for learning by physically working alongside farmers and others. This is not new to social anthropologists. Ross (1987) lived with Aboriginal people in Australia during her Ph.D. course; this enabled her to deeply understand the reasons for their decisions on housing. According to Chambers (1988) the same approach was taken by other researchers such as Paul Devitt, Paul Richards, John Hatch. Tattersall (2001) concluded that living with the farmers that he studied gave the full picture of farm complexity. The requirements to deliver better services are increasing the interest in closer involvement to understand social issues, and in taking an anthropological view (Freire 1992). Christiansen and Hunt (2000) report that R,D&E agents can in fact learn much from farmers about multi-disciplinary decision making. Farmers are constantly making decisions that take into account physical, environmental, technical, economic and social aspects. Do public R,D&E services have the time and the people for that?

### 2.5 Reasons for developing a new conceptual model for better involvement of stakeholders in Research, Development and Extension

This chapter has show how extension has evolved, to demand two-way communication between the generators and clients of R&D. The first activities related to extension are almost as old as science since they started with the Renaissance in the 15th and 16th century (Swanson & Claar 1989). The late 19th century evolution of science brought qualitative research but only in the last
three decades of the 20th century has it exerted real impacts in agricultural extension. Until the 1970s, research and extension organisations used predominantly the Transfer of Technology approach, resulting in failures in the adoption of technologies. The 1980s brought a shift in extension science attitudes, with efforts to understand the production communities instead of just delivering results. The studies in related areas such as innovation, diffusion, adoption, motivation, and community development, and publications such as Farmer First (Chambers 1989) contributed substantially to the evolution of extension at that stage. The 1990s and early 2000s enhanced the role of stakeholder as partner instead of merely the object of research, and expanded the use of social science theories and knowledge in agricultural extension. For instance, during the Australian Farming Systems Conference 2003, in Queensland, Australia (Bramley, Botha & Tarbottom 2003; Cowan et al. 2003; King 2003; Teixeira, Ross & Cowan 2003), and the Australasia Pacific Extension Network forum 2003, in Tasmania, Australia (Tijs 2003; Day 2003; McCown 2001), there were few papers on how to show production technologies in different ways; most presentations were related to human relationships in terms of engagement, integration, interaction, motivation, and other related issues. This suggests that stakeholders are becoming part of extension teams instead of merely clients. An additional explanation for research and extension interest in higher engagement with stakeholders is that the public funds for R,D&E are being reduced and private funding, mainly from agricultural industries, is very welcome and, in Australia, encouraged through government incentives.

2.5.1 The new paradigm

The tradition in agricultural research by which scientific intervention in farming practice is facilitated almost exclusively by the profession of agricultural extension, has meant in the past that scientists themselves were rarely expected to play the role of an interventionist (Davies 2000). The adoption of participatory approaches aiming at greater engagement of production communities requires ‘opening up’ of scientific practice to stakeholder involvement. This could place R&D in a negotiating rather than simply a
controlling role, even when R&D people consider themselves as the experts. In addition, engaging in dialogue with stakeholders and clients rather than simply communicating results challenges the basis by which scientific judgements are made (Stefanson & Fulton 1997). Walker et al. (2001) conclude that the challenge is to develop approaches by which data, knowledge and scientific judgements of the data, can all be made available for integration into a negotiation process that attempts to deal with inherent uncertainty. They suggest that a range of research challenges relating to participation will need to be addressed in the next 5-10 years in:

- Adopting methodologies with a participatory framework;
- Improved understanding of the appropriate balance between science push and client pull within a participatory framework;
- Facilitating interaction between different levels of organisations in agriculture where there are constraints to innovation and change, and
- Building improved relationships and linkages with internal and external clients of R&D.

2.6 Key points from the literature

Contemporary extension approaches present several improvements over the TOT approach in terms of stakeholder participation. As confirmed in this review of literature, farmers actually have access to and consult a diversity of people in their communities. Systems theory became an important part of the study since it describes how a designated set of parts has no meaning unless the parts are connected together to become one functional dynamic unit (Edwards 2000). However, while the models reviewed in this chapter satisfy parts of systems theory, they need improvements on the following points:

a) Thinking of each production system in holistic terms, involving farm issues from family to production, and the key people of the production community beyond the farm. That means thinking about the development of the whole dairy community, before defining the R,D&E contribution,

b) Consultation with the community network, which means a broad range of stakeholders who exchange information and ideas in their day-by-day relationships. These people can bring their experience and intrinsic
knowledge to a common issue. They should be identified by the people in the production community,
c) Two-way communication, with high involvement of the researcher with the community (two-way involvement), to improve the researcher’s understanding of the production system as a whole as well as the participants’ needs, linkages and motivations,
d) Higher engagement of stakeholders but also higher engagement of R,D&E people in the understanding of the diversity of production communities issues before defining R,D&E activities, and
e) The need for mutual trust between the sources of knowledge (i.e., between the community and the researcher), built through relationships with the dairy production community.

2.6.1 The model for this study

Figure 2.9 represents two strategies to develop research, both supported by literature, but with different approaches to research problem identification and experimentation. The figure represents a trend in R&D, due in part to the present decline of funds for public agricultural R,D&E (Putman 1995) with the increasing participation and financial support of agricultural industries in research and extension, that is pushing research and extension people to work in closer contact with and respond to the agricultural industries' demands. Particularly extension tends to occupy an information management role.
The higher involvement of agricultural industries in research pushes R,D&E organisations to widen their perceptions of the priorities of production communities in order to have a broader understanding of the R,D&E role and its usefulness in the development of the agricultural industries. That suggested to me that I should develop a study focused on higher engagement of researchers in the understanding of the diversity of production community issues, and on how R,D&E needs can be identified, involving stakeholders for a holistic view of their realities. In other words I stressed two-way engagement in the identification of production communities’ priorities.

Systems thinking was chosen as a theoretical basis for the study with the aim of seeing a regional farming system as a whole, while also considering its linkages to other systems.

Community theory helped to support the systems theory by enlarging my understanding of relationships among stakeholders and their communication networks within their communities when sharing knowledge and co-operating on other issues.

The review of the literature in extension was helpful to improve my understanding of the reasons for the evolution of extension. A key point here was the evolution from the linear, one-way model to inform about technologies, to the two-way communication of research between extension and agricultural industries.

For the field work, other bodies of theory were important. Theory of communication helped in the understanding of how to improve two-way communication.

From the beginning I recognized the need to have stakeholders’ trust in an outsider to involve them successfully in the identification of their priorities. Theories related to behaviour, such as trust and motivation, pointed out the need for trust-building to be included in the methodology (see Chapter 4).
Issues linked to ethics, and deeper involvement with some key farmers and their families, were considered as part of building participants’ trust.

Figure 2.10 presents the conceptual model for the study and illustrates the use of systems thinking as the basis for the study. Systems thinking helps the R,D&E community widen the view from production technology priorities to the whole farming systems priorities, from farm family to other stakeholders who exert influence in the industry. Other bodies of theory such as extension, approaches help to understand the basis of the evolution, of extension pointing to the growing understanding of the need for better interaction of R,D&E with people in production systems. Communication theory and behaviour theories, especially those on trust and motivation, help in the process of transmission and reception of ideas as well as in understanding behaviour and acceptance. Community theory is also helpful to improve the understanding of community linkages and knowledge transfers within a community.
How to identify the priorities of a regional dairy industry involving a diversity of stakeholders in order to have a holistic view of the region (Study focus)

**Figure 2.10 – Conceptual model for identifying priorities for R,D&E in a regional dairy industry**

The following chapter gives background information on the study areas, from the countries to the regions. The strengths and the points for improvement in the Australian and Brazilian dairy R,D&E initiatives are then presented, with the aim of improving participation by people in the production systems in the design of R,D&E activities.
Chapter 3: The dairy industries and Research, Development and Extension services in Australia and Brazil

3.1 Introduction

The aim in this chapter is to describe briefly the stage of development of the dairy industry in Australia and Brazil as well as important parts of the dairy industry history in both countries and in the regions studied. The dairy R&D services in Australia and Brazil are introduced and present methods to identify priorities for R&D actions in both countries are described. Details about the basis for selection of the regions studied as well as interviewees and farms are presented in Chapter 4.

In terms of kilometres, the distance between Australia and Brazil is huge, about 15,000 km. However, in terms of dairy industry production systems, the two countries are much closer when compared to those from the northern hemisphere. The Australian and Brazilian dairy industries have pasture-based production systems, and the regions studied are producing year-round milk at the same latitude (see Figure 3.1). In terms of Research, Development and Extension (R,D&E), the major difference between these countries is in agricultural extension. In Australia extension is treated as a science, with specific Ph.D. training available. In Brazil there is no Ph.D. course in extension. In Brazil the emphasis is on the one-way transfer of research information to the agricultural community.

These similarities and differences provide a useful background for the present study. In Australia there is interest in improving the present approaches to involve dairy communities in R,D&E; in Brazil Embrapa dairy wishes to improve the present methods of identification of priorities in R,D&E. Embrapa dairy is a major producer of technical information for the Brazilian industry, and has a
major project, The Platform Project (see Section 3.6), aimed at improving its communication with the major dairy regions of the country.

![Map of Australia and Brazil](image)

**Figure 3.1 – The regions of Australia and Brazil where the current research was conducted**

### 3.2 Dairy industry development stages in both countries

Agriculture does not have the same meaning or role in every country. The role of agriculture may differ, not only historically, but also in the same historical period for different agricultural industries. The stages of agricultural evolution can be divided into: a) agriculture for subsistence, b) commercial agriculture with a focus on internal consumption, and c) commercial agriculture with a focus on international markets. The last exploits the comparative advantages of the country to produce commodities with low production costs compared to competitors in the international market (Rivas 2001).

Australia and Brazil have large areas of grazing land, suited to low cost systems of milk production. The Australian dairy industry has an internal consumption and / or export focus, depending on the region of the country. In 2002/03, the country exported dairy products to the value of A$ 2.5 billion, mostly from the state of Victoria, which has a seasonal, low-cost, pasture-based production
system. In 2002/2003 Victoria produced 63% of Australia’s milk (Dairy Australia 2003). The dairy industry in tropical and subtropical Queensland and Northern New South Wales has higher costs of production than in Victoria and produces year-round, mostly for the internal market (ADC 2002a, 2002b). The Brazilian dairy industry has a segment which is subsistence, a large segment of commercial dairy with a focus on the internal market, and in the last five years an increasing participation in the international market. In 2002 Brazil exported A$ 62 million dollars worth of dairy products (Milkpoint 2003a). In general Brazil is similar to Queensland and northern New South Wales in terms of market focus and seasonality of production.

### Table 3.1 – Comparisons between Australia and Brazil

<table>
<thead>
<tr>
<th>Item</th>
<th>Australia</th>
<th>Brazil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size of the country</td>
<td>7.7 million square km</td>
<td>8.5 million square km</td>
</tr>
<tr>
<td>Population 2003</td>
<td>19.7 million people</td>
<td>182 million people</td>
</tr>
<tr>
<td>Climate</td>
<td>Generally arid to semiarid; temperate in south and southeast; tropical in north</td>
<td>Mostly tropical with high rainfall, temperate in south</td>
</tr>
<tr>
<td>GDP – Purchasing power (2002 estimate)</td>
<td>A$ 716 billion</td>
<td>A$ 1.875 trillion</td>
</tr>
<tr>
<td>GDP (World bank – 2001 estimate)</td>
<td>A$ 571 billion</td>
<td>A$ 778 billion</td>
</tr>
<tr>
<td>GDP (%) (2001 estimate)</td>
<td>Agriculture 3</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Industry 26</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>Services 77</td>
<td>56</td>
</tr>
<tr>
<td>Rank in the world</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>Production system</td>
<td>Pasture-based</td>
<td>Pasture-based</td>
</tr>
<tr>
<td>Number of dairy farmers</td>
<td>1997 13,753</td>
<td>2003 10,654</td>
</tr>
<tr>
<td></td>
<td>1,200,000 (estimated)</td>
<td>800,000 (estimated)</td>
</tr>
<tr>
<td>Year of milk market deregulation</td>
<td>2000</td>
<td>1991</td>
</tr>
<tr>
<td>Milk production litres/cow/year (2003)</td>
<td>4,800</td>
<td>1,177</td>
</tr>
<tr>
<td>Biggest processors</td>
<td>Co-operatives (&gt;70%), Murray Goulburn, Bonlac, Dairy Farmers.</td>
<td>Nestlé, Parmalat, Itambé (coop), Elegé (co-operatives provide the milk)</td>
</tr>
</tbody>
</table>

Sources: (Worldfactbook 2004; Embrapa leite 2004; Dairy Australia 2003; CIA 2003; Milkpoint 2003b).
Table 3.1 provides some background and dairy industry data from the two countries. Notice that there are differences in production per cow and number of farmers. However, the similarity in terms of production systems can be explored to exchange information for the benefit of dairy communities in both countries.

### 3.3 Dairy regions studied

The three regions chosen for the study were the North Coast of New South Wales in Australia and Santa Rosa and Alto Jacuí in Brazil. They are located on the same latitude, and have similar production pasture-based systems, family management of the farms, and good natural resources to produce cheap food for the dairy herd. Nevertheless, there are some differences. The North Coast of New South Wales has a heritage in dairy, larger herds and a larger production scale per farm than the Brazilian regions studied (see Appendix 3.1). The two Brazilian regions, originally engaged in growing soybean, wheat, corn and other crops, began dairy as a commercial industry mainly after the 1990s, as a support industry for the counties, co-operatives and farmers. The regional tradition in crops is expressed in the names of the co-operatives, like Cotrirosa. This acronym means: Co for co-operative, tri for trigo, which means wheat, and rosa for Santa Rosa, which is the name of the city where the co-operative has its main office. Cotrisoja means ‘co-operative of wheat and soybean’. There are differences between the two Brazilian regions. Alto Jacuí has larger herds than Santa Rosa and is ahead in the use of technologies.

#### 3.3.1 The Australian dairy industry – a brief history

The arrival of seven head of cattle from England in 1788 with the First Fleet marked the beginning of the Australian dairy industry. On arrival in Sydney Cove, now the site of Circular Quay beside the Opera House, the cattle escaped and was rediscovered only in 1795. By that time, the herd had increased to 40 head (ADC 2003). Despite difficulties and stock losses, the herd had grown to over 1,000 cattle in 1800, and in 1820 a small dairy factory was established at Berry, New South Wales. New cattle breeds were also introduced into the pastured areas of Tasmania and Victoria, and the industry began.
Dairying was the preserve of the working class battler, rounding up the cows before dawn, milking by hand, hand churning the butter, and transporting the product by horse-drawn cart (Strang 2003).

Dairy production and processing in Australia has one of the lowest cost structures in the world, a testimony to the efficiency of farm, herd, and processing management practices (Dairy Australia 2003). Dairy production was predominantly a farmhouse activity until the 1870s, when small cheese factories were established, encouraging the pooling of milk supplies and improved quality. In 1881 the first exports of refrigerated butter and cheese were made to the United Kingdom. With the advent of refrigeration in the 1880s dairy product manufacture expanded rapidly, becoming a significant sector of the Australian economy. The invention of cream separators in the late 1880’s marked a significant step forward in the modernization of Australian dairy farming. In 1892, a new test for measuring fat was introduced and this changed the payment system from volume of milk to fat content (ADIC 1996). In the early 1900s Australians improved and patented milking machines. Other steps in the Australian dairy industry were:

- Introduction of pasteurisation of milk for home consumption in 1914; it became compulsory only after World War II,
- Australian milk quality hygiene standards, such as refrigeration of the milk supply in the 1960s,
- Mechanisation of farm production methods continuously throughout the 20th century,
- Introduction of milk cartons (1958) and plastic bottles (1970) instead of glass bottles, 98% of which were replaced by 1987,
- Ultra High Temperature (UHT) processing installed in processing plants in 1964,
- Homogenisation of milk during the 1970s, and
- Membrane filtration, installed in the 1980s.
Production

In 1950, Australia produced 5.6 billion litres of milk with an average of 1,746 litres per cow. The main States in production were Victoria, New South Wales and Queensland with 38, 25 and 23% respectively of the national production. In 2002/2003, the ranking and the states were the same, but the participation changed to 64, 13, and 7% respectively for the three leading States (Figure 3.2). The annual production per cow increased to 4,800 litres without a significant difference between the States (Dairy Australia 2003). In 2002/2003 the country produced 11.3 billion litres of milk, a volume that was reduced to 10.3 billion litres in 2002/2003, mainly because of climatic problems. The Australian farm gate value of milk production in 2002/2003 was A$ 2.8 billion, ranking third behind that of the wheat and beef industries (Dairy Australia 2003). Dairy is also one of Australia’s leading rural industries in terms of adding value through the industry chain. Much of this processing activity occurs close to farming areas, generating local employment (ADC 2001).

Figure 3.2 – Australia’s dairy regions (shaded) and percentage of Brazil’s production by each state
Source: Dairy Australia (2003)
Chapter 3 – The dairy industries and R,D&E services in Australia and Brazil

**Processing**

The milk-processing sector of Australia is in a process of rationalisation as companies continue to increase processing capacity. Milk is processed mostly by farmer-owned co-operatives, and by companies, public and private. Co-operatives dominate the market with approximately 70% of the production (Dairy Australia 2003). Over 70% of all milk is used for manufacturing, mostly in Victoria. Most of Australia's dairy exports are shipped to Asia. Japan is the largest single market for dairy exports, with over 66% of the total. Other notable markets include the Philippines, Singapore, Thailand and Malaysia. Australia's biggest competitor in these markets is New Zealand. The United States and the European Union are also contenders for Asian market share; they are seen as a distinct threat to prices as they tend to sell product using export subsidies (ADC 2002b). Australian dairy exports into Asia are set to increase as these nations continue to adopt Western eating patterns and to integrate dairy foods into diets. Australia has the production capacity and infrastructure to meet this growing demand.

**Farmer numbers and labour**

New technologies in the dairy industry such as the introduction of modern milking machines, automated gates, and refrigerated trucks have brought benefits for dairy farmers. On the other hand, there has been a consistent reduction in the profit margin per litre of milk for farmers due to raw milk price reduction, and this demands constant improvements in labour, land, and animal productivity. These changes have brought dramatic changes in farmer numbers. In 1979/1980, there were 21,994 registered dairy farmers in Australia, in 2003 there were 10,654 (Dairy Australia 2003). A major shift happened in July 2000 through the deregulation of the market, because the federal government removed price support for manufactured milk and state governments removed farm-gate regulations for market (fresh) milk in all Australian states (Parker 2000). The result was a decline in farm-gate prices for milk and a shift in the basis of milk pricing from end use to prices determined by milk attributes (quality, composition, location and season). A consequence was significant changes in relationships between producers and processors, and throughout the supply chain. The federal government dairy structural adjustment program
provided opportunities for dairy farmers to either restructure their farm business or leave the industry (Inquirer 2001; Parker 2000). Figure 3.3 illustrates the decline in the number of farmers in the period between 1984 and 2001, showing an accelerated decline after 2000.

![Figure 3.3 – Australian dairy farmer numbers 1985 – 2001](image)

The reduction in farmer numbers and changes in the relationship along the supply chain reduced farmers’ positions in business and political bargaining. To compensate for this, State farmer organisations such as the Queensland Dairyfarmers Organisation (QDO) now strive to co-operate with other stakeholders in the dairy industry and become proactive in the discussions of the industry beyond the processing stage. The president of QDO said in 2001:

> ‘The days of processors and supermarkets negotiating away Queensland farmers’ livelihoods must stop (Chamberlain 2001)’

### 3.3.1.1 Brief history of dairy in New South Wales

It is hard to separate the history of dairy in New South Wales (NSW) from the history of dairy in Australia since NSW was the first state settled. The first cattle arrived in 1788, and the first dairy ‘factory' was at Berry in the Illawarra region, NSW (ADIC 1996). Through the years, settlers moved steadily to the south in
the search for suitable land, finally reaching the Murray River and Victoria. The first Co-operative factory was built near Kiama in the Illawarra district in New South Wales in 1884. In 1900, a group of 70 producers organised themselves to form a milk supply co-operative known as The Dairy Farmers’ Milk Co-operative. The co-operative was formed to ensure the freshness and quality of farmers’ produce when it reached city markets and consumers, especially those in the growing metropolis of Sydney. The initial capital was used in purchasing a five tonne refrigerator, milk tanks, horses and carts (Dairyfarmers 2003). New South Wales was also the pioneer state in improving dairy technologies. The first artificially-inseminated (AI) calf bred in Australia was born in NSW, in November 1944. By 1958, artificial breeding was introduced on a significant commercial scale. In the 1960’s there was a change to refrigerated bulk milk supply, meaning that instead of farmers separating cream from milk on the farm, whole milk was delivered to factories. This system resulted in improved milk quality, as well as savings in transport and labour costs. In 1979 NSW had 3601 dairy farms registered, but this number dropped to 1323 in 2002. The milk production of NSW grew from 907 million litres in 1979 to 1.3 billion litres in 2002. In other words, on average, each farm produced four times more milk in 2002 than in 1979.

3.3.1.2 North Coast of New South Wales

The main cities of the North Coast of New South Wales are Lismore, Casino, and Kyogle, shown in the circle in Figure 3.4. The other shaded areas are dairy regions in Queensland. Dairy industry production improved in the late 1890s because of a fall in the price of sugar. In 1895 the North Coast Co-operative Company (now Norco) was established as a factory in Byron Bay (ADIC 1996). The dairy industry grew from these first initiatives and in the 1950s the region had the greatest concentration of dairy cattle in Australia (Ashton 1952). The processing of milk is still dominated by Norco (AGTRANS 2000). Data collected in the field research for this thesis showed that in 2001 the region had about 160 dairy farms with an average of 130 cows per herd, in year-round and pasture-based production systems. Production of 80 million litres a year was delivered to local and other markets. In 2003 the Department of Agriculture staff
at Kyogle reported in a personal communication that the farmers’ numbers had dropped to 148 dairy farms.

The key issues facing the North Coast of NSW dairy region in 2000 were urban expansion into rural areas, the need for improvement in nutrition and reproduction in cows, low profitability of farms, effluent control, irrigation availability, succession planning problems, and the low entry rate of young people into the industry (AGTRANS 2000). The same report reveals that in 1997 farmers were working 64 hours per week. There are few people working on each farm and in some cases they are a ‘one man show’. However, in contrast to the AGTRANS report, the Subtropical Dairy Program (SDP) annual report (1999-2000) did not show the labour difficulties but listed the program’s local success stories, such as milk production specifications for grain-based supplements for grazing cows, prairie grass evaluation, natural resource management, and barley and triticale feeding trials (SDP 2000). In 2001, I found
many farmers complaining about the deregulation of the dairy industry in Australia. People also observed that Kyogle was more important in dairy in the past than today.

3.3.2 The Brazilian dairy industry – a brief history

The Brazilian dairy industry began along with the growing of sugar cane, when Portuguese people first came to the country in the sixteenth century (see Figure 3.5). Sugar was introduced in the northeast of Brazil, in Pernambuco state. *Bos taurus* (cattle) came to work in the sugar industry and provide milk and meat. From the 1500s the cattle herds grew and spread to the west and the south of Brazil, expanding Brazilian frontiers (ABAG 2002). Milk production grew slowly until the 1900s. In 1900 the Brazilian population was 18 million, and the biggest city, São Paulo, had 579,000 inhabitants. To provide pasteurised milk to the city, farmers organised themselves to collect milk, bring it to cooling stations in small cities, transport it by train to São Paulo and process it to sell to the growing population. That was the origin of a co-operative in São Paulo. In Minas Gerais state, in the 1940s, because of inadequate road structure to transport fluid milk over long distances, factories like Nestlé and Laticínios Poços de Caldas (Poços de Caldas dairy products) processed the milk into condensed milk and cheese (Teixeira 1997). Minas Gerais (MG) is now the largest milk producing state of Brazil (see Figure 3.5); it supplies 29% of the country’s production (Embrapaleite 2004). According to some authors (Griffin 2002; Rubez 2003), milk produced in Brazil is among the cheapest in the world. The country has the second largest herd in the world, and the Brazilian dairy industry is the largest national employer (Rubez 2003).

Production

Brazil is the sixth largest milk producer in the world; in 2003 the country produced 22.6 billion litres (Embrapaleite 2004). In 2002 dairy was the sixth most important agricultural product in Brazil in terms of gross production value (CNA 2003). Dairy is expanding in the Northeast and the South, with Rio Grande do Sul (RS) and Paraná (PR) states ranked third and fourth in production, and especially in the West, with Goiás (GO) the second largest
producing state of the country in 2002 (Figure 3.5). The tropical, pasture-based production system provides the opportunity for a low year-round cost of production; farmers received an average of A$ 0.20 per litre in 2003 (Table 3.1). However, the milk production per cow per year is growing slowly, from 767 litres in 1970 to only 1,177 litres in 2003. The dairy industry can be found in all agricultural regions of the country, in partnership with the beef industry, in small farms in the less developed regions, or in specialised dairy farms.

Figure 3.5 – Brazilian dairy production regions, with percentage of Brazil’s milk production per state

The government started to regulate the industry in 1945 but did not design an incentive policy for technological development and herd productivity improvement. The price for milk was manipulated by the government to control the cost of living. The situation remained unchanged until 1991, when the dairy industry was deregulated (ABAG 2002).
The stability of the Brazilian currency played an important role in dairy development from 1995 until 2001, and the milk production grew 4% a year in this period (see Appendix 3.2). Only Oceania countries had a larger growth rate at 5.5% (Meireles & Rubez 2002). In the same period Brazilian farmers increased the rate of adoption of new technologies and started to believe in the industry. Consumers also benefited from the growing Brazilian economy and currency stability, and purchased more dairy products. Nevertheless, dairy is still a small-scale farm business; 80% of Brazilian farms produce less than 300 litres a day (Alvares, Bernardes & Netto 2002).

The main challenge now is to be part of the world trade in dairy products. Issues include the price of dairy products in the international market, the creation of defences against dumping of prices by other countries, and the challenge of increasing dairy product exports. In 2002 the country exported A$ 62 million, 61% higher than in 2001, and the industry is working out how to overcome the barriers to improving exports. Some of the barriers to exporting are related to packaging issues, milk and dairy product quality, taxes applied in Brazil to dairy products, and the need for better export facilities (Milkpoint 2003a).

It is estimated that milk production will increase to satisfy the growth in the internal market and exports (Milkpoint 2002). In addition, on the domestic front the new Brazilian President announced one of his most important government programs, Zero Famine, where milk can play an important role. These scenarios encourage Brazilians to believe that dairy production is a good industry in which to participate.

**Processing**

From 1900 to the 1940s a large number of small processing plants were introduced. Revolutionary leader, dictator, and President, Getúlio Vargas, encouraged the formation of co-operative processing factories between 1930 and 1942. Since then Brazilian co-operatives have had a decisive role in the dairy industry. In 1984 they collected 60% of the officially recorded milk and this has continued to increase. Co-operatives generated almost 1 million permanent jobs in Brazil in 2002, most of them in rural areas (Martins 2003a). The five
largest processors in Brazil in 2002 were Nestlé, Parmalat, Itambé (co-operative), Elegê, which buys milk from co-operatives, and Paulista (co-operative). They represent only about 19% of the country's production (Embrapaleite 2004) and about 7% of the estimated 800,000 dairy farmers (Carvalho 2003). In Brazil, there is significant informal production of milk and dairy products that are delivered straight to consumers, without government inspection. Carvalho (2003) estimates this at 28% of Brazilian production.

**Farmer numbers and labour**

The number of Brazilian dairy farmers is a matter of controversy. Carvalho (2003) estimated 800,000 dairy farmers in 2003. On the other hand, Gomes (2001) wrote: 'In Brazil, it is hard to count the number of dairy farms because the industry is spread over all the states of the country and in many farms it is a sub-activity of beef cattle production and other activities'. The estimated 800,000 dairy farms in Brazil is a huge reduction from the previous estimate, which was 1.8 million in 1996 (Carvalho 2003). Dairy specialists expect the number to be less than 400,000 in the near future, because the regulation of milk quality from July 2005 will be more rigorous in terms of milk quality and milk temperature in the farm before delivery to processors.

The dairy industry employs 5 million people (Rubez 2003). According to Martins (2003b) each A$ 2,703 spent on dairy products creates a permanent job in the Brazilian economy. The dairy industry generates more jobs than other important industries, such as transport, mining, vehicle production, communication, and petroleum (Martins 2003c). The industry is also important in supporting other rural industries by providing security of monthly income which makes experimentation and innovation in other agricultural industries possible.

Farmers are recognized as the weakest link in the dairy supply chain and the price of milk for farmers has been decreasing in recent decades. To minimize this situation, some farmers are organizing associations to negotiate their milk price in groups. In Juiz de Fora, a city in Minas Gerais state, the dairy farmers organised the ‘Proleite’ project to help with technical advice as well as to sell the milk collectively (Martins 2003d). In 1999 they received A$ 0.038 more per litre
than the dairy farmers who were not organised. In 2000 an association of farmers from Vale do Rio Doce, in the Espirito Santo state, increased their milk price by A$ 0.032 (Milkpoint 2000). In addition, these associations are organising themselves to buy goods and machines more cheaply.

But this is not the situation of most farmers. In a survey of 39,904 landowners from every part of Brazil, each with more than 50 hectares, only 20% of these farmers were less than 45 years of age, 62% of the landowners had completed only the first grade of school, 4% could not read or write, and 53% had an average monthly income of less than A$ 266. Their main difficulty, according to 34% of landowners, was obtaining rural credit. The study showed that 44% of the farmers did not have electricity, only 6% had access to irrigation systems, 90% did not have milking machines and only 17% had access to a computer. According to the study, the trend of those farmers and their families was to look for a job off the farm and 64% were already working away from the farm (Agrosoft 2001).

3.3.2.1 Brief history of dairy in the South of Brazil

This region is located between the parallels 23 and 30°S in subtropical to temperate zones and has three states: Paraná, Santa Catarina, and Rio Grande do Sul (see Figure 3.5). These states are at the same latitude as the North Coast of New South Wales and Southeast Queensland dairying regions. Because of weather conditions and distance to markets, milk and cheese were formerly used only for family consumption. With improved transport dairy grew in importance as a commercial activity, and the three states now produce about 25% of the Brazilian national milk production. Because the region is able to grow tropical pasture and temperate pasture, it presents potential for the intensification of animal production on pasture-based systems. During the summer almost all the cropping area in the south of the country is used to grow crops such as soybean, corn and rice, though during winter only 20% of this area is used to cultivate other crops, such as wheat. Dairy production offers an alternative winter use for the labour, machinery, and land, without compromising the present direct tillage system. Most dairy farmers are inclined to adopt
technologies because they almost always have crops, and these require constant updates of technology in the South of Brazil (Fontaneli 2002; Oliveira 2002). In Rio Grande do Sul state co-operatives collect most of the milk as well as buying most of the crop. Co-operatives also participate in other animal industries such as poultry, beef, and pig production. This is a great contrast with the Australian dairy co-operatives, which work only with dairy.

3.3.2.2 Rio Grande do Sul: regions studied

Rio Grande do Sul is the third largest milk producer in Brazil with 2.3 billion litres of milk per year, 11% of the Brazilian production (Embrapaleite 2004). The production system is year-round and most of the farms are small, producing less than 200 litres / day. Almost 100% of the milk collection in Rio Grande do Sul is made by bulk. Most farms are managed by families, with few employees. They use milking machines with their predominantly Holstein cattle and cool the milk on-farm. Elegê Foods is the processor in partnership with the co-operatives, and is the fourth largest dairy processor in the country with 711 million litres / year in 2002 and 28,700 dairy farmer providers. The regions selected for study in Rio Grande do Sul State were Santa Rosa (151 million litres / year) and Jacuí (124 millions litres / year) (Embrapaleite 2004), chosen for their different technical stages of development and production scales. Both regions were settled by German and Italian people in the early 1900s. Figure 3.6 shows the two regions on the Brazilian and state maps. Argentina is the nearest neighbouring country to these regions and a player in the South American dairy export market. It exerts an influence on the regional milk price.

Santa Rosa

In the Santa Rosa region Coopermil and Cottirosa were the two co-operatives that Elegê Foods, the Brazilian processor that supported the field research, suggested for the study. The co-operatives each have an extension department with veterinarians, agronomists, and agricultural technicians to advise farmers about technical issues in crop and animal production, as well as to discuss the price of products. There is a government extension office in almost every county of Rio Grande do Sul state, but the agencies target the smallest farms
associated with the co-operatives or non-associated farms. None of the farmers interviewed for this study had an urban income. In Santa Rosa most dairy farms also conduct traditional activities such as soybean, corn, and wheat production. Most farmers exploit small areas of their farms for dairy and find it hard to mechanise areas for the dairy (10 to 20 ha). Dairy has thus become a support industry for many regions. A stakeholder declared:

‘Rio Grande do Sul State is a traditional grain region, but dairy became a financial solution for most farmers and counties, mainly after the 1990s’.

Figure 3.6 – Studied regions in Brazil – Santa Rosa and Alto Jacuí

Traditionally, dairy was part of women’s domestic work and women remain involved. Elegê Foods promoted a meeting with 1000 farmers’ wives in 2002, recognizing the importance of women’s participation in the industry (Photo 3.1). Men used to consider dairy as a women’s affair and dedicated more time to crop activities but are changing their minds because they need the regular dairy income to pay the farm bills.
Photo 3.1 – 1000 Dairy wives meeting in Santa Rosa in a co-operative conference in 2002

**Alto Jacuí**

Alto Jacuí is considered the most developed dairy region of Rio Grande do Sul. The two co-operatives selected for the research were Cotribá and Cotrisoja. The region follows the Santa Rosa general profile in terms of having German and Italian settlement background, as well as multiple farm activities. Farmers here have no city income, and extension people from the co-operatives play an important role linking the co-operatives and the farmers. Alto Jacuí is a leading region in dairy technology adoption, and had the larger number of benchmarked farms in the state in 2002 (Krug & Kliks 2003). A comment from a veterinarian from a co-operative in the region indicates the status:

‘The things that happen here in the dairy will only happen later in other regions of the state’.
3.4 Dairy Research and Development in Australia and Brazil

3.4.1 Australia

With the growing importance of the dairy industry in the first decades of the 20th century, the industry and the government realised the need for improved technology in both farms and factories. The Commonwealth Scientific and Industrial Research Organisation (CSIRO) established a dairy research group in 1938, and the School of Dairy Technology, Victoria State, started a similar group in 1939. The growing trend for industry to improve technology led to the formation in 1944 of the Australian Society of Dairy Technology, which proved to be a useful forum for exchange of ideas and knowledge. In 1958 a levy for research was introduced, to be administered by the Australian Dairy Produce Board. The levy had the objective of supporting research and co-ordinating extension efforts in the dairy industry, and was administered by the Dairy Research Committee, later the Dairy Research and Development Corporation (DRDC) (ADIC 1996). DRDC did not conduct R&D itself but supported organizations – such as departments of agriculture, universities, CSIRO and, in some cases, farmer groups – in scientific, social and economic projects.

Trends to increase the farmers’ say in research and downsize the organisations to a simpler structure are evident in Australian R&D. Dairy Australia is an industry-owned service company that assumed from 1st July 2003 functions previously undertaken by the Australian Dairy Corporation (ADC) and the Dairy Research and Development Corporation (DRDC). Dairy Australia has the vision of ‘growing an internationally competitive, innovative and sustainable dairy industry.’ Other rural industries such as pork, wool and meat have all been through a similar process. Dairy Australia also has responsibility for export control. Dairy Australia is under industry control and all levy payers can vote on the levy rate, while only members can vote at general meetings.
3.4.2 Brazil

From the 1950s Brazilian research was conducted by Government Research Institutes (IPEA – Instituto de Pesquisa Agropecuária) linked to the Ministry of Agriculture, developing experiments for different agricultural industries, including dairy, at the same station. In 1972 the Ministry of Agriculture defined the objectives and functions of Brazilian agricultural research (MAARA 1972). In 1974 the Brazilian National Agricultural Research Corporation (Embrapa) was created to drive agricultural applied research in Brazil, leaving the universities to develop the basic research (Olinger 1996). In the same year Embrapa Dairy, a research station to centralise the national research in milk production, was created in Juiz de Fora, Minas Gerais state. With the creation of Embrapa a model of integration involving research, extension and farmers was created to facilitate the flow of information to and from the farmers’ communities. Unfortunately the integration has not happened as expected and most R&D arises from direct activity of an individual researcher based in a research office/station. As in Australia, Brazilian researchers recognised the need for field research with production systems (Torchelli 1984).

In the 1990s Embrapa Dairy intensified its partnerships with private dairy corporations, to increase the integration with production systems and develop actions with higher returns to different regions. Elegê Foods is one of the processors that have ongoing interaction with Embrapa Dairy.

3.5 Extension in Australia and Brazil

3.5.1 Australia

In 1898 the Department of Agriculture of Western Australia, the first of this kind in Australia, had educative and protective duties under the Australian Minister of Lands and Agriculture. Almost one century later, the increase of national wealth was still one of the main rationales for the existence of agricultural extension services (Russell et al. 1989). In 1967, during the Second Australian Extension Conference, there were comments that extension was not working well. There
was only a vague notion of what the rural community thought of the adequacy of the services that were provided, a situation which largely remained till the late 1980s (Russell et al. 1989). Until the mid 1980s extension methodology was revised extensively, but the reviews were to examine failures of the existing paradigms rather than improve the participation of stakeholders in extension planning. The extension approaches started to be revised after the second half of the 1980s (Hamilton 1995). From the 1990s Australia has been debating and reflecting upon the effectiveness of agricultural extension, with effects on the new projects.

From the late 1990s the DRDC developed a new model to improve the R,D&E services to dairy communities and increase the farmers’ participation in R,D&E actions. DRDC created seven Regional Development Programs (RDPs), explained in Item 3.6.1. The model is still struggling to put into practice a broad consultation with farmers to improve their say in research activities. The Government still heavily influences the priorities for research, as well as providing funds matching farmers’ levies on a dollar-for-dollar basis.

3.5.2 Brazil

Extension activity in Brazil started at the Agricultural High School of Viçosa (ESAV), today the Federal University of Viçosa (UFV). The initial objective of the introduction of agricultural extension was to increase the productivity of rural industries and, as a consequence, improve the social and economic living standards of the rural population (Olival 2002). In 1930 the Farmers Week was organised to put agricultural knowledge on exhibition, and still remains (Olinger 1996).

During the 1940s the Brazilian Ministry of Agriculture and the State Agricultural Secretaries started the ‘Land Users Week’. During this week agronomists and veterinarians had to provide lectures with demonstrations of vaccination, tick control, how to select seeds before planting, and other agricultural issues. Other initiatives were the establishment of agricultural stations and rural missions. Also in the 1940s the Credit and Rural Assistance Association of Minas Gerais
(ACAR – MG) was created. That Association is considered the embryo of the second biggest extension service in the world, which was Embrater (Brazilian Technical Assistance and Rural Extension Corporation) (Olinger 1996; Resende 1990). ACAR made real a new philosophy of rural intervention based on educational principles (Oliveira 1987).

In 1954 the Brazilian Government, in partnership with the USA Government, created the Agricultural Technical Office (ETA) to conduct projects that could contribute to the development of Brazilian agriculture. In 1956 a group of extension leaders from different Brazilian States decided to create a National Association to coordinate the rural extension and credit services in the country (ACAR). The Brazilian Government and ETA supported the development of ACAR. The legal form was that of a non-governmental institution that did not have a profit objective (Olinger 1998), and the aim was to transform the Brazilian small farmer into an ‘American’ farmer (Figueiredo 1981). The basic team was an agronomist, a home science specialist (social services), usually a woman, and a secretary. The agronomist and the home science specialist were to visit communities in a Jeep to be in touch with farmers problems, organise meetings to discuss actions, make practical demonstrations, and organise rural credit from banks (Olinger 1998).

Between 1948 and 1967 most of the State extension organisations were created (Oliveira 1987), and almost every county in Brazil had an extension office. Rural credit was abundant and young people were encouraged to study rural professions. During this period, many training centres were built in all parts of the country. The objective was to supply the philosophy and knowledge required by extension that was not provided by universities and to keep the technicians up-to-date with new findings of research and policies of extension.

The decline of funds for extension services from the Federal Government in the 1990s saw many state extension organisations closed. State Extension Organisations still exist in some States like Minas Gerais and Rio de Janeiro. There has been a change in emphasis from the traditional Transfer of
Technology (TOT) approach to a focus on the farm family, and in particular the small farmers (Olinger 1998).

In the 2000s new models of extension, such as the previously cited ‘Proleite’ and ‘Educampo’, are combining financial support from counties and companies and farmers in the training of technicians for extension, in extension services themselves, and in the designing of actions with higher participation of stakeholders (Gomes 2002; Martins 2003d).

3.6 Australian and Brazilian initiatives for identification of priorities

The challenge for R,D&E in Australia and Brazil is to apply principles of participation in the identification of research priorities. This includes addressing the changes that globalisation brings to the dairy industry and the influence of trends in the industry, improving communication between the different stakeholders of the dairy supply chain, and identifying ways to improve co-operative action. Some strategies have been developed in both countries in an attempt to combine different types of data (e.g. internal data and external data) and tacit and explicit knowledge, to improve the understanding of the problem and the process needed to generate new knowledge (Bolloju, Khalifa & Turban 2002).

3.6.1 Australia

A number of new approaches have been developed in Australian agricultural R,D&E, e.g., Farmscape (Farmers, Advisers, Researchers, Monitoring, Simulation, Communication and Performance Evaluation), EFS (Eastern Farming Systems) for cropping systems (Carberry 2001), and a three stage approach for Queensland fruits and vegetables reported by Samanta Heritage in 2001. The Dairy Action Research Team (DART) process was developed to assist dairy farmers in leading group actions (McIntosh 1997), but is no longer in use.
In the 1990s and 2000s the funds for agricultural industries research and extension are becoming scarcer and efficient approaches to identify the needs of production systems are being required. The Dairy Research and Development Corporation (DRDC), now Dairy Australia, developed the Regional Development Programs (RDPs) in each State of the country to strengthen the link between research and the farming community. The model includes partnerships with State Departments of Agriculture, processors and other stakeholders (SDP 1999). The Subtropical Dairy Program (SDP), formed in 1995, is the RDP for tropical and sub-tropical Queensland and the North Coast of NSW (SDP 1999). In 2003 it was renamed Subtropical Dairy but I am using the name Subtropical Dairy Program in this thesis.

**Figure 3.7 – Subtropical Dairy Program to identify Queensland R,D&E needs**

Source: SDP (1998)

In the SDP, a structure (Figure 3.7) of seven Sub Regional Teams (SRTs) informs SDP and in turn Dairy Australia of the farmers’ priorities, and the types of research and development that are relevant to the region (SDP 1998). An important distinction from DART is that the SDP is directly linked to the source
of funds for R,D&E, which is Dairy Australia. Farmer members see themselves as investors, while others carry out R&D. The Government policy of matching industry levies for research (AFFA 2002) is encouraging farmers to be proactive in the participatory approach.

The SFP is a good initiative but it needs to be improved, for several reasons. Farmers are not used to deciding on research priorities. An evaluation of the SDP structure concluded that SRT members have to develop a system for collection and recording of ideas from a diversity of stakeholders from the dairy farming community (Roberts 2000). Further, the minutes of SRTs’ meetings demonstrated minimal participation by stakeholders other than farmers and R,D&E people from the local research station, and I noticed this also during some SRT meetings in which I participated. This may influence the identification of the regional needs.

3.6.2 Brazil

During the 1980s and 1990s, milk production increased in the west, northeast and south of the country. In the 1990s Embrapa Dairy began to establish written contracts with private and governmental organisations in an attempt to foster integration. The two main activities for integration of R&D with the main Brazilian production regions are described below.

3.6.2.1 Regional nucleus

In the 2000s, Embrapa Dairy moved researchers to the west, south and northeast of Brazil, where milk production had increased significantly in recent years. These local researchers are forming a link between the central research station and the regions, and are attempting to align identified technological priorities with projects and actions (Vilela 1999). The initiative was recognised by a director of Embrapa as a strategy that reinforces the connection of Embrapa with society (Embrapa 2002a). The projects involve co-operative contracts, and are based on priorities identified in quantitative surveys of farmers (EmaterRio 1998; Nogueira et al. 1998).
The methodology used in the regional nucleus of Embrapa Dairy does not include qualitative approaches, nor any deep involvement of the research with issues beyond production technologies. The initiative is very good but could be improved by looking up the present findings of extension science. The initiative of local researchers has contributed to understanding the different dairy scenarios, but local ownership is needed to increase the co-operative work. Decisions are normally made by people who seldom share the risk of the farms. In other words, their money is not ‘burning’ in the business. A separate study concluded that the major problem of Embrapa in scientific communication was the identification of Embrapa clients needs (Ribeiro 2001).

### 3.6.2.2 Platform Project

This is an initiative from Embrapa Dairy to identify constraints for the development of the Brazilian dairy industry in the main production regions of the country (large region of more than three states). The project methodology uses panels of experts involving different actors from the industry (Vilela & Bressan 2002; Vilela 2001). However, it was observed in one of the Platform Project publications that for the South of Brazil there were more people from universities, R,D&E organisations, and processors than farmers (none) or farmers’ representatives. In addition, because the objective is to focus on ‘macro’ demands, the venue of the workshops is distant from the production systems, and researchers do not understand the realities of the production system, and do not get involved in the day-by-day production system problems. Issues like family, the regional dairy industry, and communication networks are not captured because the stakeholders participating in the workshops organised were selected mostly by people who are unfamiliar with the farmers’ day-by-day technical and social issues.

The Platform project identified Transfer of Technologies as one of the main dairy industry constraints in modernisation. The ‘macro’ demands selected by the project for the dairy industry in Brazil were food security, sustainability of the industry, and improving the competitiveness and profitability of the industry and farms (Embrapa 2002b).
3.6.3  Success and failure in some Brazilian R&D approaches

Unless the production system is analysed in both a quantitative and qualitative way, the risk of non-adoption is high and R,D&E may be producing good technology but with unsatisfactory results, as reported in two of the next examples; the other two examples show how quantitative and qualitative research can result in good technology adoption.

3.6.3.1 Production of improved bean and corn seeds

In the period from 1986 to 1989, the Brazilian Agronomic Institute of Paraná (IAPAR) developed research about the ‘viability of the production of improved beans and corn seeds at farmers’ communities’ level’ at Rio Azul – Paraná. At the first approach the researchers did not exchange knowledge with the community. They believed the high quality of the technology was relevant to every category of farmer, and the technicians only explained the technological package. The result was non-adoption of the new seeds. Besides reaching economic and agricultural conclusions, the researchers noticed that it was necessary to discuss the community point of view first to understand their production problems. That suggested important methodological steps to follow in the development of other projects of that nature (Neumaier, Yu & Freire 1990).

3.6.3.2 Pasture rotation in dairy

In 1991, The Central Cooperative of Rural Producers (CCPR-MG/Itambé), started a project of elephant grass pasture rotation in partnership with 102 farmers. The Department of Animal Husbandry at the Agricultural Superior School of Luiz de Queiroz (ESALQ), gave the expert information and the extension agents were trained to give technical support. Later, encouraged by the industry, other farmers adopted that technology. In 1999 an evaluation showed that forty-four farmers did not reach the expected index of production, mainly, economic improvement. Alves (2000) wrote that there was an excess of investment in the technology but little attention to farmer skills, community possibilities and knowledge. In addition he concluded: ‘when the farmers do not
succeed well, the technology also fails. It is fundamental to know the limitations of the input market, technology, farmer, technicians and credit system’. In other words, Alves suggests studying the links that form community knowledge. His paper suggests that the experience of CCPR-MG is important to show the need to consider both quantitative and qualitative issues; it is insufficient to offer farmers the production technology alone.

3.6.3.3 Carrot named ‘Brasília’

Embrapa conducted this research with forty-four farmers and seven researchers involved in the ‘Brasília’ carrot research, a variety generated by genetic research. The positive results of the research were that the variety adopted by the farmers was tolerant to diseases and, that it increased productivity and also the profits of the producers. The process of transfer of technology of the carrot ‘Brasília’ was successful mainly because previous analyses of the needs were made in a participatory process putting together researchers, farmers and technicians, and also considering consumer demand (Macedo 1998).

3.6.3.4 Coopavel – Rural Show

Coopavel is an agricultural cooperative of Paraná State. In 1998 the extension agents of the dairy co-operative got in touch with Embrapa dairy to start the partnership for the Rural Show. The co-operative intended to organise a dairy farm at the event, with top technologies. Embrapa proposed to look first at the realities of the region. A survey and interviews were organized to put together researchers and the extension agents of the co-operative, who visited different communities and interacted with them. They collected quantitative and qualitative data, which together with the opportunity to talk to the community gave a broad view of the situation and enabled the team to structure a temporary dairy farm during the event. The result was a comprehensive definition of technologies to work towards for sustainable adoption on farms. The process gave a lead to develop studies in improving participatory approaches to identify needs (Teixeira & Novaes 2000).
3.7 Summary

Australia and Brazil have different histories in terms of dairy industry development. Dairy farming in Australia is a coastal industry with a focus on the international market (ADC 2002b). Australia has started later than Brazil in animal production but its dairy industry grew faster in terms of technology, production scale per farm, dairy product quality assurance, and export focus. In Brazil dairy occurs all around the country and only the north and part of the northeast and northwest lack a well-developed commercial dairy industry, though dairy is growing in those areas. Brazil has a focus on its internal market. However, depending on the outcome of negotiations with the World Trade Organisation (WTO), Brazil has the potential to become a major player as an exporter. Brazil produces a large volume of milk, over twice that of Australia, to meet the internal demand of the population, which is nine times larger than the Australian. In both countries the government has been the major force introducing and supporting the R,D&E services. Also in both countries government and private R,D&E organisations are striving to involve the rural production communities more and more in the design of R,D&E activities.

Despite the great distance between Australia and Brazil, the differences between the three regions studied, in many ways, are not so great. They are year-round and pasture-based, with cows producing 16 to 19 litres / day. The Australian dairy region studied has been established longer than the Brazilian regions, which were originally soybean, corn and wheat regions. The Brazilian regions studied have greater availability of water and better rainfall distribution. The Brazilian farms are predominantly small farms compared to those in the Australian region, and produce almost all necessary food for the family. They are able to minimise costs, while the Australian farmers rely almost entirely on the scale of milk production to buy other inputs. In terms of farm production the differences are very clear; the Australian farms average 199 cows (87% lactating) and produce an average of 2,802 litres a day, while the Brazilian farms studied average 22.8 cows (82.7% lactating) in Santa Rosa and average 43.4 cows (86.2% lactating) in Alto Jacuí. Although Holstein and Frisian are the most common breeds, Brazilian farmers look for larger animals with higher
production (Table 4.3), while Australian farms have smaller cows, within those breeds. In both countries there is increasing preoccupation with social issues and with the involvement of rural communities in the planning of R,D&E actions. In Australia the Regional Programs are striving to increase the farmer’s voice in the R,D&E projects. In Brazil, to improve the communication with people in dairy regions, Embrapa Dairy has located researchers in the dairy regions that are growing in milk production. The extension organisations in Brazil have two foci. Government extension has a social focus mainly to help small farmers (Boletim Pecuário 2003), while the private extension services are merging with research to achieve better interaction with production systems. This extension service works mainly with medium and larger farms. The similarity of the dairy production systems is important to provide comparable environment in which to evaluate the strategy proposed in this thesis. However, the differences between the three regions are also important in order to test the proposed strategy in various situations. Chapters 5 and 6 present the data from the study of the three regions, in the context of the similarities and differences described in this chapter. The initiatives of Australian and Brazilian R&D organisations in aiming for closer integration with the people and their production systems are a positive step. However, they need some improvements in understanding of the production systems and involving a broader range of stakeholders in the design of R,D&E activities. The aim of this research is to enrich the co-operative work between Research and Development, Extension and the dairy communities. The conceptual model presented in Chapter 2 and the methodology described in the next chapter explains how this thesis will complement the present strategies in use by Dairy Australia and by Embrapa Dairy in Brazil.
Chapter 4 – Methodology for a holistic view of dairy regions

4.1 Introduction

This study has been developed on the basis of the thesis that it is necessary for dairy R,D&E organisations to improve the design of R,D&E programs so that they meet industry needs comprehensively by involving a broad range of stakeholders in order to increase their understanding of regional production systems holistically. The ideas of 124 people, from three different regions and six different stakeholders groups in the dairy industry were sought and analysed. The expected outcome of the study is a strategy to complement the present Dairy Australia and Embrapa Dairy programs for identifying the R,D&E priorities by involving a broad range of stakeholders who could return a holistic view of the dairy industry in the regions selected.

This chapter presents the strategy designed and developed to collect information and gain support from participants in the dairy industry in Australia and Brazil, particularly in the three regions studied. A brief review of the literature on qualitative and quantitative research, case studies and designing qualitative research is given, before the procedures of the study. The interviewees’ characteristics, the methods used to analyse the data are described in detail. The measures taken to comply with ethical requirements are also recorded.

4.2 Networking and gaining support for the study

Working and networking in Embrapa Dairy provided me with a clear picture of the industry in Brazil. However, while I was still in Brazil, the Australian picture was obtained only through reports, discussion with researchers from Australia, or web sites. This was not sufficient to obtain a comprehensive impression of the dairy industry to guide the research. Networking with a diversity of Australian dairy stakeholders helped to give more insight into the research problem during
the definition of the research problem and during the study itself. According to Ban and Hawkins (1996), the development of a network to exchange information among relevant stakeholders is an important aspect of extension, and this process of integration often receives insufficient attention. Presenting the aim of the study during the networking was also fruitful in obtaining some logistical and financial support for the study. Major groups of people consulted were:

- Researchers and extension people in Brazil with knowledge in the subject and experience in Australia,
- Academics from the University of Queensland who provide courses on related issues, mainly in social science and extension. I attended their courses and discussed the implications for my study,
- Academics from the University of Queensland who had practical experience, going beyond their qualifications,
- Students who were developing related studies,
- Dairy farmer organisation staff in the head offices and in the production regions,
- Dairy research, extension and processing organisations in Australia,
- People in agricultural industries who had expertise in identification of priorities for R, D &E, and
- Government organisations in agriculture in Australia and Brazil.

### 4.2.1 Lessons from networking

The following information is included in the methodology since it belongs to the stage of refining the subject of the study before the real field research started. Some observations from the networking were:

- The deregulation of the Australian dairy industry was the most important issue for the industry in the early 2000s,
- In Australia and Brazil there are similar weaknesses of communication between R&D, Extension and production communities,
- Identification of dairy communities’ priorities is more important for the communities than identifying their level of knowledge, which was my former subject of study,
Financial resources for R&D are being reduced in Australia and Brazil. This fact is pushing R,D&E people to improve their strategies for identifying priorities for research,
The Subtropical Dairy Program (SDP), of Dairy Australia has a structure to identify industry priorities for improvement,
Farmers who attend SDP meetings appreciate this opportunity to be part of the research process,
Some farmers do not attend meetings but want to know about results of meetings and directions,
My academic challenge is to make good connections between the extension-related theory, a logical evolution of the methodology, research activities and the field research data (Jeff Coutts; personal communication),
Trust is one of the most important issues, in order to obtain community involvement. Staying on a farm, working with the farmer and the family, could be an effective way to get a closer understanding of the production communities, and their trust and commitment for the study at the same time,
Showing trends of the industry at international and national levels could be a basic step to challenge stakeholders within the process to identify realistic needs for their communities and for R,D&E activities,
Helping people to understand the reasons for changes in the dairy industry would provide stakeholders with motivational energy to engage in the study.

4.2.2 Support for the study

The main support for the research came from the Brazilian Agricultural Research Corporation (Embrapa) and from the Coordination for Professional Development of Graduates Foundation (Capes). In addition, I presented the proposal in Brazil to processors and extension organisations, aiming to raise their interest as well as logistical and financial support for the research. In Australia, the University of Queensland provided the major theoretical and financial support for the study in Australia. By networking I obtained an
agreement for co-operation in the study from the Dairy Research Development Corporation (now Dairy Australia), The Subtropical Dairy Program, the Australian Tropical Dairy Institute (now The Tropical Dairy Research Centre) and the Department of Agriculture of New South Wales. More details about the organisations that gave support for the study can be found in Appendix 4.1.

4.3 Qualitative and Quantitative research

Qualitative and quantitative methods are both important tools when employed properly. The assumption that ‘truth’ and ‘knowledge’ are fixed and singular entities has predisposed research towards numerical quantification procedures and technical controls, generally statistically oriented. Quantitative methods use standardized measures so that the varying perspectives and experiences of people should fit into a limited number of predetermined response categories to which numbers are assigned (Blacket 1996). However, standardized methods make it impossible to capture the richness and individuality of the points of view of subjects (Patton 2002), as is required in this study. Qualitative research provides important and often unexpected insights that would almost certainly have been missed by quantitative methods (Kozel 1999). Qualitative research attempts to gather evidence that will reveal qualities of life, reflecting multiple realities and perspectives (Burns 1997). Cezar (1999) wrote that qualitative data gathered from interviews is important to set the scene of a production community and understand reasons for human behaviour. Additional knowledge for the understanding of qualitative studies was obtained in the courses attended at the University of Queensland.

4.3.1 Case studies

Case studies have become one of the most common ways to conduct qualitative inquiry. ‘Case study is not a methodological choice but a choice of what is to be studied, by whatever methods we choose to study the case’ (Stake 2000). According to Yin (2003), case study is the method of choice when the phenomenon under study is not readily distinguishable from its context, such as community organisation. Case study research is an essential form of
social science inquiry when researchers have to deal with a broad topic, cover contextual or complex multivariate conditions and not just isolated variables, and rely on multiple and not singular sources of evidence. Selecting the cases for a case study requires understanding the specific reasons why you need a particular case or set of cases, then applying criteria in their selection.

Yin (2003) divides case studies into three categories: descriptive case study, which presents a complete description of a phenomenon within its context; explanatory case study, when each case study seeks to explain how and why some event(s) occurred; and exploratory case study, when the aim is to define questions and hypotheses / assumptions for a subsequent study (not necessarily a case study) or to determine the feasibility of the desired research procedures. The present study is basically exploratory.

Exploratory case study has three purposes: situation diagnosis, screening alternatives, and discovering new ideas. Diagnosing the situation helps to outline the limits of the problem in question, while screening the alternatives is useful in assigning research priorities given the available resources, and to judge the merits or otherwise of various alternative concepts. New ideas are often generated through continuous testing and discussion with possible research participants (Zikmund 1991).

4.3.2 Designing qualitative research

Maxwell (1996) stresses that, like a wheelbarrow, the research design needs to have the parts fitting and working together, requiring attention to the connections among the different parts of the design. Maxwell developed an interactive model with five components: purposes, conceptual context, research questions, methods and validity. For the purposes of this study, I will outline the issues related to the research questions, methods and validity are:

➢ Research questions – These should have a clear relationship to the purpose of the study: What you want to understand? What you do not know about your study? What questions will your research attempt to answer and how are these questions related to one another?
Methods: What will you actually do in the study? What approaches and techniques will you use? How do these constitute an integrated strategy?

Validity: How might you be wrong? What are the plausible alternative explanations to the potential conclusions of your study? How will you deal with these? Why should we believe your results?

According to the Australian Bureau of Statistics – ABS (1999) – an integral part of any survey is the questionnaire though which information is to be gathered. The design of the questionnaire can influence the response rate achieved, the quality of responses gained, and the reliability of conclusions. The questionnaire should:

1. Enable respondents to complete it accurately within a reasonable time,
2. Be properly administered by the interviewers,
3. Use language that is readily understood by respondents,
4. Appear orderly on the form, and
5. Be easily processed by both people and machines.

Questions may generally be classified as one of two types – open ended or closed questions – according to the degree of freedom allowed in answering the question. Open-ended questions allow respondents to answer the questions in their own words. To meet the objectives of this study a mix of open-ended and closed questions was required. Testing of interview questions, in a pilot test, should be conducted during the interview design stage to fix order, wording of questions, clarity, approach to the interviewees, and procedures for processing the data. To facilitate respondents’ replies, a researcher first needs to ascertain whether the information sought is readily available from the respondents. The questions should be designed so as to prevent confusion arising in the mind of the respondent. These processes treat interviewees as a reactive resource in a one-way communication for the collection of data. On the other hand, according to Freire (1992) the interviewee should be challenged to participate and think; this should be a two-way communication process between researcher and participant. Harmsen et al. (2002) considers this interaction should challenge the person’s mindset and stretch their perception of the future. For these reasons, and mainly because the objectives of this study stressed a two-way communication, in the semi-structured interviews, questions that challenge the
Interviewees were presented in between the ones that appear to be in a one-way communication. This way the interviews alternated moments of easy answers with the questions that returned more elaborated answers.

The questions for the semi-structured interviews were organized to challenge interviewees to see the farm business as well as the dairy industry from a broad perspective, beyond the farm gate and of his/her region and country. Presentation of trends of the dairy industry to participants expanded their perceptions of the dairy industry environment and helped them consider some challenging questions. It was assumed that farmers have a great depth of tacit knowledge. This consists of subjective expertise, insights and intuitions that a person develops from having been immersed in an activity, profession or industry for an extended period of time. It includes beliefs, perspectives and mental models (Nemati et al. 2002; Tattersall 2001). The questionnaire has been able to capture tacit knowledge through dialectical inquiry and some practical suggestions have been recorded, converting these to explicit knowledge.

The interviews were conducted so as to avoid stressing the interviewees, and the interview often alternated ‘soft’ with challenging questions, finishing with a ‘soft’ question, as suggested by Bruce Frank in personal communication. In addition to the publications about how to design a questionnaire, experienced extension academics from the University of Queensland provided valuable personal advice in the design of the interviews. More detail on the interview process is given in section 4.5 below. Main issues of the study, the field research material, and the whole questionnaire are presented in Appendix 4.2, 4.3, 4.4 and 4.5.

4.4 Criteria to select countries and regions

4.4.1 Criteria to select Australia and Brazil

Since this research evolved out of the needs of the Brazilian dairy industry, Brazil was the obvious first choice for study. The selection of Australia was
based on the observation that most Embrapa researchers with Ph.D.s developed their studies in the northern hemisphere, while the southern hemisphere has extension programs in recognised universities in Australia and New Zealand, as well as similarity with the Brazilian dairy industry in terms of low cost and pasture-based production systems. In terms of Research, Development and Extension (R,D&E) the major difference between Australia and Brazil is the stage of development of agricultural extension, as mentioned in Chapter 3. Australia treats extension as a science and keeps the country at the leading edge of extension knowledge. Those characteristics were observed by the Head of Embrapa Dairy in 1998 when he visited the Queensland dairy industry, Australian R,D&E organisations and became familiar with the Subtropical Dairy Program. In Brazil there is no Ph.D. course in extension, and the methods of extension corporations are mainly based on the Transfer of Technology model. However there are several researchers who are improving and using qualitative methods in Brazilian extension.

### 4.4.2 Criteria to select the regions in Australia and Brazil

In Australia, the North Coast of New South Wales region was chosen for the similarity of its tropical and subtropical pastured-based production systems with Brazil. In Brazil, the two regions were suggested by the processor because of their different stages in development. The regions in Australia and Brazil are at the same latitude. In addition, the Australian region selected has an extension office of the New South Wales Department of Agriculture which was the co-operating office for the purpose of the study. Additional reasons were:

- support for the study in those regions,
- expansion or contraction of dairy industry in the regions,
- concentration of dairy farmers,
- proximity to the University of Queensland for the Australian region,
- major milking processors, and
- opportunity to reduce dairy production costs in the three cases.

In Brazil, Rio Grande do Sul state, Elegê foods agreed to finance the study and suggested two regions with different stages of dairy development:
4.4.3 Criteria to select types of participants

The first selection of groups of participants was made during the discussion of the proposal for the course and first literature review in Brazil. Farmers are not the only stakeholders in the dairy business and most of them have a partial view of the regional production system. According to Cezar (1999), farmers have a communication network, and this network should be involved in order to achieve a broad picture of the industry in the region. Grimble and Wellard (1997) suggests that stakeholder analysis is useful for a better understanding of the different perspectives and sets of interests of stakeholders at various levels. The input market or suppliers, farmers, R,D&E people, processors and credit system were selected because of their participation and influence in milk production in different parts of the dairy supply chain. More details about sampling criteria are presented in the item related to the first stage of the strategy. Others beyond processors or from different parts of the community social system were interviewed whenever the interviewees mentioned that they were relevant people to be consulted. A way to validate the usefulness of these ‘others’ suggested for interview was the repetition of that suggestion by other interviewees.

4.5 The strategy

The objective of the strategy was to answer the research questions presented in Chapter 1. The research strategy was to collect a broad range of ideas from
different dairy community stakeholders in three case studies, one in Australia and two in Brazil, using the same approach for each. It is anticipated that this strategy will complement the present methodologies of Dairy Australia / Regional Development Programs / Subtropical Dairy Program, as suggested by Roberts (2000), by consulting not only with farmers, but also with people from their networks of communication, about the technical, social and other issues. The strategy will also complement the present Embrapa Dairy methods to identify R&D demands, which are mostly quantitative, and the Platform Project, which deals with large regions of three or more states and is not designed for micro regions, where most of the co-operative contracts are organised.

The research strategy is divided into three stages, which are: (i) build trust with stakeholders and become familiar with regional dairy industry through staying on a farm; (ii) individual interviews with a diversity of stakeholders from farmers to off-farm enterprises and R,D&E staff, and (iii) group interviews to converge ideas and identify priorities. The review of literature and the observations from networking suggest the need for a person with some years of experience and an understanding of the farming system and community issues to implement this strategy. The strategy is shown diagrammatically in Figure 4.1, and explained below.

4.5.1 First stage – Build trust

4.5.1.1 Presentation of the study objectives to key stakeholders and building trust

In Australia people from the Subtropical Dairy Program and from the Australian Tropical Dairy Centre introduced me to the Department of Agriculture of New South Wales, farmers and researchers. That was the starting point to organise the presentation of the study to people in the production community. In Brazil I was introduced to the extension managers of each co-operative by Elegê Foods and the extension managers introduced me to farmers and some other stakeholders. The regional sponsoring organisation selected key stakeholders, mainly farmers, to attend a presentation of the objectives of the study. The participatory aspect of the study was stressed as an essential means to identify
priorities for R,D&E activities. Feedback at the presentation also helped to refine the strategy. This stage of the strategy also included the first interviews with local extension people to show how future interviews with other participants would happen, share common points of view, and improve parts of the semi-structured interview if necessary. In Australia the New South Wales Department of Agriculture helped to sample the farmers, and provided maps and addresses. A letter signed by the Subtropical Dairy Program manager together with a one page abstract of the research (see Appendix 4.5) was sent to the farmers selected. Details for future arrangements were made by telephone. In Brazil Elegê Foods and the extension teams of the four co-operatives helped to sample the farmers and also organised the transport to the farms. This help from the various organisations demonstrated to the community that I had their support. The first farmers helped me to contact the other interviewees which showed these individual first farmers trusted me.

**1st Stage – Build trust**

- Stay on a farm (Participant observation)
- Identify network of communication (Participant observation)
- Present the study and sample first interviewees
- Understand farm and region issues

**2nd Stage – Individual interviews to identify priorities**

- Input Market
- Farmers
- R,D&E
- Processors
- Credit
- Other stakeholders

Semi – structured interviews and content analysis

**3rd Stage – Focus group interview to converge priorities**

- Focus group meeting and content analysis

Directions for R,D&E activities

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*Figure 4.1 – Stages in the strategy: a framework to identify the R,D&E needs of dairy stakeholders*
4.5.1.2 Staying on a farm

The idea of staying on a farm is based on participant observation methodology (McCall & Simmons 1969; Johnson 1975). Staying on a farm is related to a key point from the literature; that two-way engagement is important in order to improve R,D&E understanding of production communities issues. In Australia I returned to (and worked on) the same farm three times when I was conducting field work and making return visits. In Brazil I stayed three to five days in each of the 6 farms that hosted me. Participation with the members of a society in a particular context to fully understand the meanings of their activities is an essential ingredient of all valid observations (Johnson 1975). For instance, it was only staying on farms that I learnt that there was low motivation among farmers in all three regions and strong interest in leaving the industry in Alto Jacuí, Brazil. This lack of motivation for dairying was a source of preoccupation to me in terms of how much it could affect the method by deflecting participants’ attention from the research. On the other hand, I considered that this insight could also contribute to the understanding of the real needs of the region.

My approach involves participating in daily farm work on the selected farms. That means any work from fixing fences and helping with the milking to cooking (Photo on page xxviii), instead of trying to constrain the interaction to an interview and production issues. This involvement in the farm, dealing with the farmer and the family, was essential to gain trust and commitment from the farmer, the family, and the local community. A typical farm situation that made me believe that there really was a pre-existing technological label among farmers for R,D&E people is described below.

- Extension agent: This is Sergio from Embrapa, the one who will stay on your farm. After the first talks....
- Farmer: Do you want to see my cows, or my paddocks, or how I feed my cows?
- Sergio: Please, where can I change my clothes to work with you?
- Farmer: Look of surprise.
- After I change my clothes...
Farmer: Now we can go to see my farm!
Sergio: Please, what were you doing before I arrived?
Farmer: Some usual activity like: I was fixing my fence or feeding cows.
Sergio: So, let’s go and keep on fixing the fence.

At this stage the farmer’s look of surprise was still there but he started to change his behaviour, while still trying to give a good impression, not really relaxed. The farmer and his family only became really relaxed when I worked with them, milking the cows, washing dishes, feeding the animals or doing other jobs.

The farmers’ appreciative response to this approach was expressed in declarations like:

‘This is the first time that someone from R&D has stayed on my farm and given me the opportunity to interact better’, or ‘A bloke (Australian word for guy) like you should come to talk to us’.

In Brazil the Photos 4.1 show the warm reception that I had and how I participated in their communities’ meetings. In Australia I participated to a Christmas dinner, with my family, at the farm that hosted me during the field research.

Trust was treated in this thesis as the first step to be achieved in order to access the real thoughts of interviewees. The next step was getting engagement (the state of being involved in something) and commitment (dedication to a cause) from the participants in the study in order to obtain the best contributions that they could give. According to Adereth (1967), commitment is the acceptance of an attitude towards life to the best of one’s ability in everything one undertakes. I based my approach to getting their trust and engagement for the study on showing interesting data about dairying, ethical procedures, motivation theory and on a belief derived from ideas of Cowan (in a personal communication) and Sixsmith et al. (2003), namely: An outsider / researcher will not be immediately
linked to the regional technology issues by regional stakeholders; also he/she can encourage people to express personal reflections on other things that affect their lives, as they know that that person is unlikely to reveal their confidences to the community. Thus ‘outsider’ status can be turned to advantage.

According to Tattersall (2001) ‘...intimate contact through regular immersion in a given setting offers one of the best opportunities to research ‘real world’ situations’. This is a common practice in anthropological research but not so common in agricultural research. A basic rule was to make no comments about neighbours.

4.5.1.3 Identifying communication networks in the dairy production system

According to Carr (2002), understanding the knowledge network can be more effective than following hierarchical systems. Once the consultation with farmers has begun, the local network among the stakeholders can be used to obtain a wide cross section of views. During the period of staying on a farm the process...
of identifying the network of communication of the people in the production community started by recording the names of people that the farmer exchanged opinions with or even whose opinions he/she respected. The identification of the community network lasted till the end of the semi-structured interviews.

4.5.1.4 Selection of interviewees through purposive and snowball sampling

Purposive sampling is a sampling method to select information-rich people, organisations, communities, cultures, events, or critical incidents, because they offer useful manifestations of the phenomenon of interest (Patton 2002). Purposive sampling uses the judgement of an expert in selecting cases with a specific purpose in mind (Neuman 1999; Dooley 1995). Purposive sampling was used in the sampling of the first group of participants from the six groups of stakeholders described below, using a set of desired characteristics. Crowder (2001) emphasizes the need to link all system participants so that they are jointly involved in the subject of discussion. This joint or linkage of the participants is one of the most important criteria for the purposive sampling. However, it was not possible to know all other stakeholders that could be important to be interviewed, within the interconnected network of people or organisations. That was the reason for choosing snowball sampling (Neuman 1999). Snowball sampling is an approach for locating key informants through previous interviewees (Patton 2002). According to Patton there are no rules for sample size in qualitative inquiry. Sample size depends on what you want to know, what will have credibility, and what can be done with the available data. Using snowball sampling enabled relevant stakeholders from other groups of stakeholders to be included in the interview process to achieve the desired outcomes. Snowball sampling were used for identification of people who frequently exchange opinions about the dairy industry, those who provide good advice, and those who had a wide view of farmers and the dairy industry in the region. In this way snowball sampling was used to locate information rich informants. Triangulation was made from the interviewees’ suggestions for new people to interview. In other words, the new interviews were made because more than one interviewee recommended that person. The importance, criteria
for selection and desired numbers of each group of participants is described below:

**Farm input market**
Many of the daily contacts of farmers are with this group of stakeholders when buying products, such as fertilisers, semen or drugs, and asking about alternatives for their usual products. From this contact, technical issues are often discussed between the farmer and the seller. People from the input market hear the opinions and problems of different farmers and have a good idea of the main problems of the region. I aimed to interview three participants in the input market for each region.

**Farmers**
These are the main stakeholders of the dairy production systems, and the knowledge and technology that they use in their farms are the focus for R,D&E. At the present the R,D&E organisations are also devoting more attention to the farmers’ aspirations and social and family life to enlarge the understanding of factors that affect knowledge and technology (Andrews 2002). I aimed to interview an average of 20 farmers for each region. The criteria to select the farmers were:
- Farmers interested in their own business and achieving good results,
- Interested in technical discussion – participate in meetings,
- Interest in participating in this study,
- Interested in the regional dairy industry beyond the farm gate, and
- Range of herd sizes; some small farmers should be included.

**R,D&E people**
This category involves people from research to extension including consultants and veterinarians who provide professional and technical services. The main criteria were for people who deal frequently with different farmers and who are able to make linkages between the dairy community needs and research. I aimed to interview five people in each region.
**Processors**

Processors are the natural link to bring to the farm business the demands of the market. Processors are the linkages for the profitability of raw material. I aimed to interview approximately three people in each region.

**Credit system**

This group was selected because they are facilitators for the adoption of technologies; they have to make judgements about the feasibility of technologies and the financial health of farmers, and are in demand with different parts of the dairy chain. They also deal with different industries, and because of their interest in rates of return, can make a good analysis of the dairy industry for their regions of work. They can understand the current issues, evaluate the relation between a new priority and the creation of credit lines, and support industry policies. I aimed to interview three people in each region.

**Off-farm stakeholders**

This group of stakeholders includes every stakeholder identified at interviews with other participants as people that could provide useful contributions for the study and the region. This category includes people who exert influence in the community as well as in the dairy industry. They could be politicians, a priest, family members, and representatives of local groups or any person who could provide useful contributions. It was hard to predict the number of people who could be relevant, but not more than 10 were expected. These people were selected basically through the snowball technique.

**4.5.2 Second stage – Semi-structured interviews to identify priorities**

The individual semi-structured interview is a qualitative method that does not follow a fixed wording or fixed ordering of questions. Face-to-face semi-structured interviews offer the possibility of modifying one’s line of enquiry, following up interesting responses and investigating underlying motives in a way that survey or other self-administered questionnaires cannot (Robson 2002). The interview follows a guide focusing on the crucial issues of the study. The interviewer’s main job is to ask the questions in such a way as to obtain valid
responses and to record the responses accurately and completely. Freire’s (1992) ideas of challenging stakeholders to think about problems to stimulate them to recognise themselves as able to transform their realities was considered seriously in this study. The initial task for the interviewer is to create a relaxed atmosphere for the respondent. After introducing himself/herself in a friendly way, the interviewer should state briefly the purpose of the interview, but should avoid giving too much information about the study which could bias the respondent. That requires that the interviewer be familiar with the questions, their sequence, and have done a pilot test beforehand, so that the questions can be asked in a conversational tone (Burns 1997).

4.5.2.1 Advice for the field research

The following two pieces of advice from experienced extension people were useful in the pilot test and before starting the semi-structured interviews:

1. Most farmers are very smart and sensitive people. They will interpret what you want to hear from them, and at the end you will not have their real thoughts, unless you have created a relaxed atmosphere so that they trust you.

2. Dairy farmers always tend to ‘cry’ about the industry; if you are not careful in keeping to your points, they will ‘kidnap’ the meeting agenda and you will not have what you are looking for.

4.5.2.2 Interview process

The literature consulted about individual semi-structured interviews was highly considered in designing the interviews. This stage merged with the first stage and had the objective of collecting and preparing quantitative and qualitative data for the later focus group meeting.

Questions related to identification of the interviewee, some preferences, and about the regional background were structured. Bruce Frank, in personal communication, suggested that instead of reading the alternatives in the
questions that provided some alternatives for consideration, such as the person whom farmers consult first about technical issues, I should give visual information with the purpose of helping the interviewees, mainly farmers, to select their answers. Frank stated that ‘farmers like to handle things’. I therefore developed several set of cards, related to each subject of the interview. Showing cards over the table with the possible answers was very effective in helping all the interviewees, not only farmers. To stimulate an answer, I asked the interviewee to select three answers from the many possible answers represented in the cards, and then put them in order of preference, as shown in Photo 5.1.

The semi-structured interviews permitted greater flexibility and more valid responses reflecting the informant's perception of reality. The main objective was the identification of priorities to design R,D&E activities; some other objectives are described below:

- Challenge interviewees to think broadly about the dairy industry and obtain a holistic view of the dairy industry in the selected regions and its priorities,
- Identify the network of communication of farmers with other community stakeholders,
- Collect and understand the different stakeholders’ opinions about the farm business (including family), regional, country, and international dairy industry, and
- Collect information about the relation of the community with R,D&E people.

A helpful practice was to introduce myself slowly, instead of trying to appear an expert. Working on farms was also helpful in minimising barriers between me, the farmer and the rest of the farm family. The interviews took less than one hour, though I provided spare time between interviews for the possibility that the interviewee wished for further discussion. Many times useful contributions came after the ‘formal’ interview finished. To ‘warm up’ the interviews in Australia, I provided some information and photos about Brazilian farmers' life styles, and
Brazilian input market, processors and retail markets. In Brazil I did the same using Australian data.
The sensitivity of avoiding embarrassing questions and maintaining confidentiality played an important role in building trust. For some questions, gestures were used to explain, e.g., the whole industry was represented with a wide movement of the hand and arm and farm business with a small movement of the hand. An effective way of ending an interview was to repeat the conclusions and make a verbal summary of the interviewee's opinions. During my visits to farmers, when there was available time, I asked about the present achievements and problems of their farms and many times in Australia some farmers phoned the ones they had suggested as potential interviewees or other farmers to introduce me and tell them about my research project, thus creating a positive environment. Most times in the Brazilian case studies I was introduced to another interviewee by the host farmer. A host farmer commented:

‘…this is the researcher from Embrapa that came for the interview, but you can put him to carry silage, milk the cows or feed the animals, because he is just like us, simple people.’

Photo 4.2 – Near the wood stove, drying clothes, was where I had some good conversation
Comments such as this helped in keeping the atmosphere relaxed and achieving the aim of discovering the interviewees’ real feelings, instead of what they supposed that I preferred to hear. The Photo 4.2 shows a rural wood stove drying work clothes. Before or after dinner this was the place where good conversation flowed and I gained the family’s confidence.

4.5.2.3 Main interview questions to match the study objectives

The complete questionnaire is presented in Appendix 4.4. Table 4.1 presents the objectives and questions of the study in the left column and the main questions in the right column. Some of the questions were presented with arm, hand and even body movements or comparison with other industries to help interviewees to understand the question.

Table 4.1 – Main questions of interviews to match study objectives

<table>
<thead>
<tr>
<th>Research questions</th>
<th>Main interview questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Are there differences among the regions studied?</td>
<td>• Regional profile. Interviewees’ gender, age, years in the dairy industry; major income of farms. Farms size, milk production, number of cows and people involved.</td>
</tr>
<tr>
<td>• What made you select the dairy business?</td>
<td>• What made you select the dairy business?</td>
</tr>
<tr>
<td>• What are your goals in the dairy business and your personal goals?</td>
<td>• What are your goals in the dairy business and your personal goals?</td>
</tr>
<tr>
<td>• What are the good and bad things that happened to dairy farm business and for the dairy industry as a whole?</td>
<td>• What are the good and bad things that happened to dairy farm business and for the dairy industry as a whole?</td>
</tr>
<tr>
<td>• What has potential to work well?</td>
<td>• What has potential to work well?</td>
</tr>
<tr>
<td>• What are the priorities of each dairy region from a broad range of stakeholders’ perspectives?</td>
<td>The following interview questions relate to both research questions</td>
</tr>
<tr>
<td>• How can one involve the range of dairy stakeholders that influence the industry, and exchange information and ideas within a dairy community, to identify a comprehensive and relevant set of priorities for the design of R,D&amp;E activities?</td>
<td>• With whom you discuss dairy technological issues first?</td>
</tr>
<tr>
<td></td>
<td>• What is your main source of information?</td>
</tr>
<tr>
<td></td>
<td>• Who are the persons you consult to discuss your dairy issues?</td>
</tr>
<tr>
<td></td>
<td>• Which are the sub-systems of a dairy farm that you consider of high concern?</td>
</tr>
<tr>
<td></td>
<td>• If you were a manager of a R,D&amp;E organisation what would be your priority issues to address?</td>
</tr>
<tr>
<td></td>
<td>• Who else should consult for the study (Introduced after first interviews with the objective to identify properly the communication network).</td>
</tr>
</tbody>
</table>
4.5.2.4 Brief description of interviewees and farms sampled

The 124 interviewees who participated in the study in the three regions were grouped according to their role in the dairy supply chain. The groups were Input market (suppliers), farmers, R,D&E people, processors, credit providers and others. The distribution of the groups of interviewees per case study is presented in Table 4.2.

Table 4.2 – Distribution of the groups of interviewees per region studied

<table>
<thead>
<tr>
<th>Groups</th>
<th>Australians</th>
<th>Brazilians St Rosa</th>
<th>Brazilians Alto Jacuí</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N.</td>
<td>%</td>
<td>N.</td>
<td>%</td>
</tr>
<tr>
<td>Input Market</td>
<td>3</td>
<td>8</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Farmers</td>
<td>20</td>
<td>56</td>
<td>20</td>
<td>48</td>
</tr>
<tr>
<td>R,D&amp;E</td>
<td>5</td>
<td>14</td>
<td>7</td>
<td>17</td>
</tr>
<tr>
<td>Processors</td>
<td>3</td>
<td>8</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Credit</td>
<td>2</td>
<td>6</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Others</td>
<td>3</td>
<td>8</td>
<td>7</td>
<td>17</td>
</tr>
<tr>
<td>Totals</td>
<td>36</td>
<td>100</td>
<td>42</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4.3 presents a brief description of the farms sampled, permitting some comparison between the three case studies. It provides evidence of the different sizes of farm business. The size of herds demands external casual or permanent labour in most of the farms visited. Notice the similar stage of the industry in terms of good stage of reproduction in the three regions, and a contrast: larger farms in Australia producing less milk per cow than smaller farms in Brazil. Appendix 3.1 presents further background data from the three regions.

Table 4.3 – Farm size and technical performance indicators of the farms in the three regions studied

<table>
<thead>
<tr>
<th>Case Studies</th>
<th>Average farm profile data and technical performance indicators</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Farm size</td>
<td>Production per farm</td>
<td>Number of cows</td>
<td>Cows milking</td>
<td>Production per cow</td>
</tr>
<tr>
<td></td>
<td>ha</td>
<td>l/day</td>
<td>Number</td>
<td>%</td>
<td>l/day</td>
</tr>
<tr>
<td>Australia</td>
<td>236</td>
<td>2803</td>
<td>199</td>
<td>86.7</td>
<td>16.4</td>
</tr>
<tr>
<td>Br St Rosa</td>
<td>39</td>
<td>321</td>
<td>22.8</td>
<td>83</td>
<td>18.8</td>
</tr>
<tr>
<td>Br A. Jacuí</td>
<td>63</td>
<td>717</td>
<td>43.4</td>
<td>85</td>
<td>18.5</td>
</tr>
</tbody>
</table>
Australian interviewees and farms

The state government extension office staff in the North Coast of New South Wales helped with the identification of the first set of interviewees. From the purposive sampling, most of the people selected in Australia were male farmers; only five interviewees of the 36 were women. Nevertheless, the interviews were mostly carried out in the farm house environment; and the wives were present in most of the meetings. A frequent natural reaction during the interviews was the farmer looking at his wife before answering questions; in many situations, she started to answer and she finished the answer. That was a clear demonstration of the participation of women in the business (Table 4.4 – end of section 4.5.2); probably this participation is noticed by R,D&E people, but the invitations to events are mostly sent to male farmers. Farmers’ wives, as well as sharing in discussion on the farm business, participate as part of the labour force at the same level as sons and daughters (45%). Consistent with the North Coast New South Wales dairy tradition, 75% of the 20 farmers interviewed had 20 years or more in the dairy industry (Table 4.5 – end of Section 4.5.2). Many farmers were born on a dairy farm and 85% of the farmers interviewed were 41 years of age or over (Table 4.6 – end of Section 4.5.2). I found a man of almost 60 years taking care, with little help, of a farm of 100 milking cows. This kind of information makes it possible to infer that deregulation of the Australia dairy industry is just an additional issue leading to reduction in dairy farm numbers, rather than the only one. For most farms, dairy was the only business to provide income for the family. From the twenty farmers interviewed, only two had external income from the nearby towns. All farms produce more than 1000 litres a day, with an average of 2803 litres / day; 90% have more than 100 ha of land, and no farm had fewer than 100 cows; while 74% had more than 150 cows in the herd. Herd reproduction is a strength in this region; 89% of the farms visited had more than 80% of cows milking.¹ The production of more than 16 litres of milk per day per cow in 60% of the farms surveyed is further evidence of good achievement for pasture-based systems.

¹ Having more than 83.3% of cows milking in the herd is recognised as a desirable achievement.
Brazilian interviewees and farms

In the Brazilian regions studied, the Cooperatoril, Cotrirosa, Cotribá and Cotrisoja co-operatives extension services staff did a similar job to the state government Extension office in the North Coast of New South Wales, in helping with the identification of the first set of interviewees. In Brazil, however, instead of providing maps to find farms, the extension people or the farmers drove me to the interview sites. As in Australia, most farmers were 41 years of age or over (Table 4.6). That has implications for the farmers’ attitudes to the farm and for the industry. A Brazilian farmer said:

‘I like dairy, but I will stop dairying because my son prefers to work in an industry that returns more money with less labour’.

When farmers have this kind of idea, it is hard to make them interested in new technologies or participation in challenges for the future of the dairy industry in the region. The human issues are a significant part of this study since good results in business usually are human issues with technological implications. In terms of the next generation of dairy farmers; unfortunately the cities are winning in attractiveness for young people and also, as seen from the quote above, influencing the behaviour of current farmers. Photo 4.3 gives an image of the Brazilian herd in Santa Rosa.
Santa Rosa
In the Santa Rosa region, only 25% of interviewees had been in the dairy industry for 20 years or more (Table 4.5). Of 20 farmers interviewed, 65% were 41 years of age or older (Table 4.6). On average, the farmers interviewed from this region are younger than the Australians interviewed. Labour issues were a constant topic of discussion, but raised most of the time after the interview. In all the farms selected, there was a low level of external employees; only five out of 20 farms had external casual or permanent employees. For all these farmers, dairy was the only activity to provide income for the family. The average farm production of milk was 321 litres a day; only one farmer had more than 100 ha; the average sizes of sampled farms and of herds were 39 ha and 22.8 cows, respectively. Herd reproduction was a strength in the region: the average for cows in lactation was 83%, and only five farms had fewer than 80% of cows milking. The production per cow had an average of 18.8 litres of milk per day, but 8 out of 20 farms had an average of less than 15 litres per cow. Farmers’ wives participate as part of the labour force in 70% of the sampled farms. Appendix 3.1 presents more data about the three regions.

Alto Jacuí
Compared to the farms in the Santa Rosa region the farms in Alto Jacuí are a little larger in herd size and have more external casual or permanent employees (12 farms with employees out of 27 farms sampled). In terms of experience in the dairy industry, 67% of farmers interviewed were in dairying for 21 years or more (much higher than Santa Rosa and closer to the number of years of experience of dairy farmers in the North Coast of NSW). Of 27 farmers interviewed, 59% were 41 years of age or older (Table 4.6). Farmers from this region also were younger than the Australian farmers. On all these farms dairy was the only activity to provide income for the family. The average production of milk was 717 litres a day; 6 farmers had production of more than 1000 litres a day. The average size of the farms sampled was 63 ha (5 farmers had more than 100 ha) and the average number of cows was 43.4. As in Santa Rosa and Australia, reproduction was a strength also in Alto Jacuí: the average of cows in lactation was 85%, and only 3 farms had fewer than 80% of cows milking. The production per cow averaged 18.5 litres of milk per day, and 6 farms out of 27
had an average of less than 15 litres per cow. Farmers’ wives participate as part of the physical labour force in 85% of the farms sampled. This is the highest participation rate among the three regions.

Table 4.4 – Participation of family labour on farms in the three regions

<table>
<thead>
<tr>
<th>Regions studied</th>
<th>Farmers only</th>
<th>Son</th>
<th>Daughter</th>
<th>Wife</th>
<th>Other family members</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>30</td>
<td>30</td>
<td>15</td>
<td>45</td>
<td>20</td>
</tr>
<tr>
<td>Br St Rosa</td>
<td>0</td>
<td>30</td>
<td>30</td>
<td>70</td>
<td>38</td>
</tr>
<tr>
<td>Br Alto Jacuí</td>
<td>0</td>
<td>37</td>
<td>37</td>
<td>85</td>
<td>30</td>
</tr>
</tbody>
</table>

Notes: 1. More than one type of family member could be involved, and
2. Percentage calculation: e.g. in nine of the 20 farms visited the farmer’s wife participated in physical labour, that makes 45% of wife participation.

Table 4.5 – Farmers’ years of experience in dairy in the three regions

<table>
<thead>
<tr>
<th>Regions Studied</th>
<th>&lt; 10 years</th>
<th>10 – 19 years</th>
<th>20 – 29 years</th>
<th>30 – 39 years</th>
<th>&gt; 39 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N.</td>
<td>%</td>
<td>N.</td>
<td>%</td>
<td>N.</td>
</tr>
<tr>
<td>Australia</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>25</td>
<td>7</td>
</tr>
<tr>
<td>St Rosa</td>
<td>3</td>
<td>15</td>
<td>12</td>
<td>60</td>
<td>2</td>
</tr>
<tr>
<td>A. Jacuí</td>
<td>2</td>
<td>7</td>
<td>7</td>
<td>26</td>
<td>18</td>
</tr>
</tbody>
</table>

Table 4.6 – Age of dairy farmers interviewed in the three regions

<table>
<thead>
<tr>
<th>Regions Studied</th>
<th>&lt; 30 years</th>
<th>30 – 40 years</th>
<th>41 – 50 years</th>
<th>51 – 60 years</th>
<th>&gt; 60 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N.</td>
<td>%</td>
<td>N.</td>
<td>%</td>
<td>N.</td>
</tr>
<tr>
<td>Australia</td>
<td>1</td>
<td>5</td>
<td>2</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>St Rosa</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>35</td>
<td>7</td>
</tr>
<tr>
<td>A. Jacuí</td>
<td>4</td>
<td>15</td>
<td>7</td>
<td>26</td>
<td>10</td>
</tr>
</tbody>
</table>

4.5.3 Third stage – Focus group interviews to converge priorities

According to different authors (Mitchell 1979; Kiel 1999) the Focus Group Meeting (FGM) is a method originating from market research. The purpose is to invite a small group, 8 to 12 people, for integrative data generating and discussion of topics for up to three hours. It is ideal for shared exploration of people’s experience, opinions, wishes and concerns. The facilitator should explain briefly the purpose of the interview, the procedure and the need for recording the conversation of the group. The facilitator should be skilled to conduct the discussion smoothly and pleasantly around a few questions or
points, avoiding conflicts and not letting the discussion escape the objective of the meeting (Morgan, Krueger & King 1998a, 1998b; Barbour 1999). The facilitator must keep in mind that this is not a passive process, that it is a two-way street and works better when research team and participants are equally interested, and that the main objective is to define a goal.

Participants should have a background in the subject. Recruitment of participants and the agenda are critical parts for a successful FGM (Stewart & Shamdasani 1990). According to Morgan, Krueger & King (1998b) the importance of selecting people with relevant characteristics is often underestimated. It is a good practice to invite a few extra people just in case some decline the meeting. It should also be considered that, in group meetings, people can answer differently from individual interviews, especially if they feel themselves in an inferior position or if the group discussion prompts new thoughts. According to Michell (1999), combining the FGM with individual interviews is useful because in individual interviews shy people may say things that they would not say in a group meeting.

The data from the individual interviews were organised using content analysis and presented and used during the Focus Group Meeting (FGM) in each region. The aim was to provide opportunity to share the findings so far, help in the identification of more issues, and discussing and converging the main priorities. Details of content analysis of data from interviews are presented in Item 4.6.

4.5.3.1 Sampling criteria for Focus group interviews

The main criteria to select between 8 and 12 people for the focus group meetings were to have (i) representatives of all groups of stakeholders (ii) individuals who were interviewed previously. Female participation was sought and was achieved, though in small numbers, with each FGM having two women members. Other criteria were demonstration of understanding the objectives of the study and value of their contributions. The criteria included having proportionally more farmers, since they were the largest proportion of interviewees. Whenever possible, I included young people who demonstrated
interest during the interviews and had active involvement in the dairy business. Local extension people who helped in the purposive sampling for individual interviews and answering the interviews were also involved. I conducted the meeting in Australia with the help of my advisors and another student and with the help of my wife or daughter and an extension agent in the two Brazilian regions. These people took notes, organised the recording and other issues, such as photos, meals, and check lists, for the meeting.

4.5.3.2 Focus group interviews

The meetings lasted less than three hours and had three stages:

- The first stage was to introduce the participants, the objective of the meeting, and the program for the meeting. I explained what a focus group meeting is, then asked the first question, related to the strengths and weaknesses of each region, and a second question related to nomination of priorities for the region. There was then an interval in which I listed the FGM priorities on butchers’ paper, to use in the last stage of the meeting.

- The second stage was a presentation of data from the individual interviews, concentrating on showing the interviewees’ opinions about positive and negative ‘things’ for the farm business, potential activities and priorities for the region, and what interviewees would do first if they were managers of a R,D&E organisation, (see Appendix 4.6).

- The third stage started with the opportunity for the participants to add priorities or reflections to the previous ones from earlier in the meeting, listed on the butchers’ paper. After that each participant was asked to pretend they had an imaginary $100,000 to invest in the listed priorities. The participant could distribute the money wherever he/she decided. Finally the amounts of imaginary money invested in each priority were summed to rank the shared priorities for investment.

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2 The term ‘things’ was used to avoid opinions related only to production technologies.
4.5.3.3 Report of initial findings to FGM participants

After the FGM a brief content analysis of data collected in the FGM was made, and recorded with the previous individual interviews in a report, without identification of the stakeholders. Each person who participated in the FGM received a copy of this report and an invitation to give individual feedback on the FGM findings to the researcher in order to validate the findings. A common complaint observed during the interviews and particularly in the FGM was that R,D&E people collect data in the region but do not return information to support their regional decisions or even to get them confirmed. Unfortunately the feedback received in this study was more to compliment the process than to add new important information. Nevertheless, validation of the process in this way is very useful.

4.5.3.4 Report back of final findings

After the complete analysis of the data, a visit to each of the regions studied was organised to present the main findings of the study. I was not sure at the beginning of the study that I could accomplish this. However, in every region visited during the study there were complaints that researchers used to collect data and never returned the results, so I decided to include a report back to the regions studied at the end of the research. The report back was very well received in every region with compliments and offers from the regions for future application of results of the study.

4.5.4 Boundaries of the research

Some stakeholders in a community, such as priests, social groups, representatives of consumers, retailers, who may exert influence in a dairy industry, could not be represented individually in the study. Those kinds of people were classified as ‘off-farm’. However, I considered every suggestion of potential interviewees from any kind of group made by interviewed stakeholders. The study concentrated mainly on identifying the priorities of participants in the dairy industry, but it was not the objective to identify all of the priorities of processors, such as incentives to import processing machinery.
4.6 Analyses and processes used in the interviews

4.6.1 Content analysis of individual interviews

Content analysis is a technique for analysing the content of a text. The content refers to words, meanings, pictures, symbols, ideas, themes or any message that can be communicated (Neuman 1999). The unit of measure can be the individual word, phrases, paragraphs, or longer sections of text. ‘Code’ is a term to cover the classification of a set of opinions with similar meaning related to one topic. Key codes are determined either on an a priori basis or initial reading of the data. These codes served as templates or ‘bins’ for data analysis; the template may be changed as analysis continues. It may be necessary to examine the context in which a unit is set in order to categorise it. If you are interested in coding whether a treatment is positive or negative, favourable or unfavourable, it is likely that you will have to take into account the sentence in which the word appears. The degree of inference can be expressed in terms of manifest content (physically present word) or latent content (inference by the coder) corresponding essentially to low or high inference (Robson 2002).

Analysis of the data involves identifying the main issues and building a coding frame of the subjects raised. This process also helps to distinguish the opinions of different groups (Robson 2002; Neuman 1999). Content analysis became more important to social science in the start of the 20th century when the analysis of newspapers and speeches showed how worthwhile items were being dropped in the United States in favour of gossip, sports and scandals (Robson 2002).

4.6.1.1 Content analysis process

The answers were analysed to identify main codes and evaluate the nature of opinions classified under each code. Twenty two codes were identified. The same coding frame was used for the individual and group interviews (FGMs). The results of the data analysis for individual interviews are shown in Chapter 5 and for focus groups in Chapter 6. The data have been coded twice with an

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3 e.g. The word ‘deregulation’ in Australia was followed by good or bad comments.
interval of over two months to test the consistency of interpretation and coding. The coding frame is presented in Table 4.7.

### 4.6.1.2 Coding frame rules for individual interviews

These two rules were applied for individual and group interviews:

- The opinions were classified in one or overlapped in a maximum of three of the codes presented in the left column of the coding frame (Table 4.7). The right column lists the kind of opinions that were related to each code.
- When the same person introduced a different angle on the same subject (e.g. ‘we need partial budgeting – in addition to cost control) or a different subject in each case, it was counted.

Two additional rules for the FGMs are shown in Item 4.6.3.1.

Table 4.7 – Coding frame and criteria to classify opinions into the codes

<table>
<thead>
<tr>
<th>Codes</th>
<th>Opinions, subjects, ideas, suggestions or priorities related to the codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>HH – Health &amp; Hygiene</td>
<td>Diseases and animal care (cattle ticks, mastitis). (Overlaps with other codes: MQ, HM).</td>
</tr>
<tr>
<td>P – Pasture/soil/irrigation</td>
<td>Grass for year-round production, management of tropical pasture, system giving higher value to pasture and irrigation, drainage, forage that can help the structure of the soil, alternatives for Tifton grass, varieties of forages, fertilisation, soil fertility and preservation, water use, pasture quality, winter pasture, grass with deep roots to need less water, pasture division/rotation, plant nutrition, device to evaluate N and P. (Overlaps with N).</td>
</tr>
<tr>
<td>N – Nutrition</td>
<td>Hay, silage, balance of sources of food, supplementation of food, feed gap, food additives, nutrition in early age, food quality, energy supplementation, pasture digestibility. (Overlaps with P).</td>
</tr>
<tr>
<td>G – Genetics</td>
<td>Breed, heat tolerance, AI, breading programs. (Overlaps with R).</td>
</tr>
<tr>
<td>R – Reproduction</td>
<td>AI, embryo transference, efficiency, reproduction control, individual control of reproduction. (Overlaps with G).</td>
</tr>
<tr>
<td>HM – Herd Management</td>
<td>Skills to manage herds, farm to deal only with heifers, herd control (data), heat stress, electronic identification, heifer replacement, semi-confined herd, grow heifers, run more cows. (Overlaps with HH).</td>
</tr>
<tr>
<td>FM – Farm Management</td>
<td>Farm planning, better sustainable farm system, define production scale, set goals, modern dairy, increase dairy capacity, scenarios for dairy, buy cheap tractor, mechanical milking, investment on the dairy, business management. (Overlaps with IS, IP, L).</td>
</tr>
<tr>
<td>MQ – Milk Quality</td>
<td>Milk quality in general, payment on quality, add value to milk, milk collection, fast freeze, HACCP, mastitis control, ultrasound to kill bacteria. (Overlaps with HH, P).</td>
</tr>
<tr>
<td>NR – Natural Resources / Environment</td>
<td>Water use efficiency, sustainability of farming system. (Overlaps with P).</td>
</tr>
<tr>
<td>L – Labour</td>
<td>Time saving, increase labour productivity, milk faster (milking machine), another person to help, most time compromised with dairying, milking barn, pipe for milk, labour culture of the stakeholders, break for farmers.</td>
</tr>
</tbody>
</table>
Table 4.7 – Coding frame and criteria to classify opinions into the codes – 2nd part

<table>
<thead>
<tr>
<th>Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$F$</td>
<td>Finance: Money management, financial analysis, cost/budget control by simple tools, conscious investment, and dairy stability.</td>
</tr>
<tr>
<td>$Cr$</td>
<td>Credit: Attractive interest even for larger farmers, Credit to renew farms, Credit for processor to stock dairy products.</td>
</tr>
<tr>
<td>$PD$</td>
<td>Personal Development: Education improvement, technical training for farmers, training of technicians and farmers. (Overlaps with C, TA).</td>
</tr>
<tr>
<td>$C$</td>
<td>Communication, Information, Training and Education: Farm walks and focus groups for learning opportunity, easy access to information (web links), training in group processes, professionalisation of farmers through courses, information according to the periods of the year, goals to integrate different stakeholders, standardisation of technical information, do not try to teach theory to farmers, demonstrate technologies with positive and negative results, demonstration of technologies in farms, know the farm lifestyle better to plan information to deliver, benchmark, adult learning. (Overlaps with O, TA, PD).</td>
</tr>
<tr>
<td>$O$</td>
<td>Organisation/Association/union: Training for group process, cooperatives mobilisation, dairy stakeholders get together not only to demand price, stimulate association, groups of production, coordinated activities, farm only with heifers, goals to integrate the industry stakeholders, farmers’ representation in politics with one voice, common activities. (Overlaps with O, HM).</td>
</tr>
<tr>
<td>$TA$</td>
<td>Technical Advice: Better support to those seeking the technical advice, credit with technical advice, technical training for farmers. (Overlaps with PD and C).</td>
</tr>
<tr>
<td>$R&amp;D$</td>
<td>Research and Development: Validation units, research units for the region, R,D&amp;E see the farm as a whole, R&amp;D organisations’ policy, seek integration of R&amp;D with extension people, focus on one problem and go deep.</td>
</tr>
<tr>
<td>$M$</td>
<td>Motivation: Improve farmer self-esteem, leaders that motivate, create confidence, improve image of dairy farmers. (Overlaps with Mk).</td>
</tr>
<tr>
<td>$Mk$</td>
<td>Marketing/Market dairy products/Public Perception: Improve image of dairy in urban areas, attracting new investments to farms, marketing for processed dairy products, showing positive scenes, show the pleasure side of dairy products, market with support of the whole dairy chain, new products, overseas market, market share, niche areas, green and organic products, availability of seeds in the market, development of special products, image of poor farmers is not good. (Overlaps with M, IP).</td>
</tr>
<tr>
<td>$IP$</td>
<td>Industry Policy and Price: Deregulation of dairy, guaranteed year price, % of the market dairy price, coordinated activities, minimum price policy, price announced previously, quota, create opportunity for city to put $ in dairy, unprotected market, Brazilian price control till 1991, fair $ distribution along dairy supply chain, payment on quality. (Overlaps with IS).</td>
</tr>
<tr>
<td>$IS$</td>
<td>Industry Structure: Unification of dairy, farmer cooperative structure, understand the dairy to identify opportunities, modernisation of the industry, increase production. (Overlaps with IP, O).</td>
</tr>
<tr>
<td>$Ot$</td>
<td>Others: Low value of Au dollar in 2001, increase the population’s living standards, competition with other industries, Br currency stability, weather info with 3 days of anticipation, and teach farmers how a cow works.</td>
</tr>
</tbody>
</table>

4.6.2 Ranking of subsystems of high concern in a dairy farm

Ranks and scores are used to identify people’s evaluations of the ‘best’ or ‘most important’ item from a list of items. Some researchers address this aim by allocating a number of counters (e.g. pebbles, seeds). The number allocated provides a score. An alternative to scoring is to conduct a ranking. Abeyasekera (2001) wrote that the usual argument for using ranks rather than scores is that
farms are then more able to judge whether one item is better or worse, more or less important, than another item. The main difficulty in using ranks is that they give no idea of ‘distance’ between items.

### 4.6.2.1 Ranking process

At the start of the individual interviews, participants had been informed about data from both Australian and Brazilian dairy industries, as well as trends of the industry. During the interviews all participants were challenged to think as a farm manager and choose in which sub-systems of a farm they would concentrate their attention (Health & Hygiene, Reproduction, Pasture, Genetics, Herd Management, Nutrition, Finance, Farm Management, Labour, or Natural Resources). They were asked to select three sub-systems of high concern and put these three selected sub-systems in order of importance. The first sub-system chosen received 3 points, the second 2 points and the third a single point. Points for each sub-system were added to identify the sub-systems of higher concern for stakeholders. The results are presented in Chapter 5.

### 4.6.3 Focus Group Meetings

According to Frankland and Farquhar (1999) the process to analyse Focus Group Meetings (FGMs) data should start with a reading of the information transcript. The next step is the coding of issues that are closely related to help in the analysis of the whole content. The codes used for the FGMs were the same used in the individual interviews; they were presented in Table 4.7. Morgan et al. (1998b) reinforce some of the Frankland and Farquhar (1999) comment and suggests having a hard copy of the questions to help in the analysis of FGM data.

### 4.6.3.1 Focus Group Meetings analysis process

The additional coding frame rules for counting the stakeholders’ opinions are provided below to make the content analyses replicable and easier to understand.

**Additional rules for FGMs:**
When a person talked about a subject (e.g. cost control, which is related to the code Financial), it did not matter how many times this person said 'cost control' it was counted only once. If the next person in the FGM expressed his/her idea with only a ‘Yeah or I agree’ it was not counted unless a more complete idea was expressed.

When another person keep on talking about the same subject and someone responded with a different opinion (e.g. first opinion 'need enough information for farmer to reach and grab it' and another person said ‘internet should have a central page for dairy’), the second comment was considered as an additional opinion.

In the FGMs, the question for imaginary distribution of $100,000 among the listed priorities raised a climate of self satisfaction among participants, some participants waited for someone else start the process and previous investments influenced following investments in some cases. When everybody finished the investment the amounts of investment per activity were summed; the rankings thus obtained indicated the convergences of opinions, thus identifying the main priorities. The results of the data analysis for the group interviews are shown in Chapters 6.

4.7 Ethical Issues

Codes of ethics stress four main guidelines: (1) Informed consent, which means that the research subjects have the right to be informed about the nature and consequences of studies in which they are involved, (2) Deception, which suggests that researchers design experiments free of active deception, except where absolutely necessary; (3) Privacy and confidentiality, as a principle to protect people’s identities and reputations, and (4) Accuracy, ensuring that data are accurate (Stake 2000).

The University of Queensland requires that a project have ethical clearance from a committee of Research Involving Human Participants. Appendix 4.5 contains the Letter to participants, which presents the letters and information provided to participants and the Application form for Ethical Clearance from the
University of Queensland. Ethics clearance was obtained from the Behavioural and Social Sciences Ethical Review Committee at the University of Queensland (Clearance number B636 2001).

The ethics procedures for the field work include (see 4.6):

- Informed consent was assured by requesting a written approval from each research participant interviewed,
- The interviewee was explained the purpose of the research and reason for the interview request,
- There was no deception or withholding of any information from the research participant, or offer of any ‘in kind’ support or any direct or indirect payment,
- The confidentiality of information was assured in the written consent form from the participant and accuracy of data was assured by making audio files of the interview and storing it on the hard drive of my work computer,
- The data was recorded in tapes and forms at the moment of the interview. In many cases the participant was asked to make a summary of his/her contributions to avoid misinterpretations. All tapes and forms are stored in a safe place, and
- Rights to withdraw are recognised.

4.8 Summary

This Chapter has presented a description of the procedures of the field research. It has also reported arrangements made before the Ph.D. course and before the start of the field research since the networking conducted than was helpful in the design of the research. The research tested the three-stage strategy designed to identify priorities for R,D&E organisations’ work. Each of the three stages, namely, building trust, individual interviews to identify priorities and a focus group interview to converge priorities, has been outlined, together with the theory which underpins its design. The analyses of the data and the compliance of the research with the ethics procedures of the University of Queensland have also been described. In the next chapters the results of the
study are presented: in Chapter 5, the data from the individual interviews and in Chapter 6, data from the focus group meetings.
Chapter 5: Individual perceptions of regional needs

5.1 Introduction

This Chapter presents the data from the second stage of the strategy, the semi-structured individual interviews. A total of 124 people from the six groups of stakeholders were interviewed: 36 in North Coast of New South Wales, 42 in Santa Rosa and 46 in Alto Jacuí. The Interviewees had the opportunity to present their views and feelings about the dairy industry. They were challenged to see the bigger picture of the dairy industry and identify issues beyond the farm gate. They were also asked to help identify the community network to assist in the objective of locating further interviewees and having a diversity of stakeholders interviewed, in order to nominate priorities based on a holistic view of the dairy in the regions studied. The chapter reports answers to the questions related to why farmers had chosen the dairy industry and the farmers’ personal goals; individual evaluations of positive, negative and potential initiatives for the farm business and for the industry as a whole; participants’ perceptions of farm subsystems of high concern; participants’ suggestions of R,D&E priority activities, and suggestions of any nature to improve the interviewee’s dairy region.

5.2 Why farmers choose the dairy industry

The farmers were asked why they selected the dairy industry to work in and what their personal goals were. This part of the interview helped me to understand the background of the different regions studied and of the interviewees, helping also to understand their point of view about the dairy industry. Appendix 5.1 provides more details about the answers. The terms presented in this section, such as bloke, represent the actual words recorded from the interviews. The answers presented in this section helped me to understand how people from different parts of the dairy supply chain see the industry.
For 75% of the Australian farmers studied, dairy means *Life Style* and *Heritage*, even when there are other business alternatives. Despite the intensive labour on the farm, they do not want to stop dairying. In contrast, for Brazilian farmers in the regions studied, dairy is a desirable financial alternative. In Brazil the dairy industry grew out of home dairy activities into commercial dairying. In Santa Rosa this growth began during the 1990s, and 95% of the farmers chose dairy for the money. Commercial dairy was introduced in order to balance other business finances; farmers are keen to stay in the industry as long as it helps them to keep their farms. No one in Santa Rosa region said that he/she wanted to leave the industry. Two statements by Brazilian farmers confirm the financial importance of dairy:

> ‘The farmer who produces milk shops in the supermarket with a trolley and the one who does not produce milk shops with a basket’.

This message from a Brazilian farmer offers contrasting images of farmers who are in dairy and can keep on purchasing the amount of goods that they want, and the farmers who do not have dairy and miss a monthly income. Another statement reinforces the financial message of the first, but with reference to a larger scale of purchase:

> ‘My new car came through tiny holes’.

That was the response from a Brazilian farmer, to the surprise and comments of other farmers who wondered how he could buy a new car in a period of low soybean prices. The tiny holes are the milking holes of the cows’ teats.

Figures cited by a veterinarian from a Brazilian region show the importance of dairy for the income of the regions studied:

> ‘Dairy brings a monthly income of R$ 1,100,000.00 (AUD$ ~ 558,000.00) for four neighbouring counties; without dairy those counties would be bankrupt’.
In Alto Jacuí dairy was also introduced to balance farm finances; however in this region the distribution of the dairy industry income along the dairy supply chain has raised some doubts: 11 out of 27 farmers answered ‘depends’ when asked if they were going to stay in the dairy industry. Alto Jacuí farmers’ go beyond complaining to considering leaving the industry, while Santa Rosa farmers just complain.

5.2.1 Farmers’ personal goals – security for family and expanding production

In the three regions studied concern for family and stability form the background for farmers’ efforts in business. Farmers think about the future for young people, opportunities for children, and security for the family. Photo 5.1 shows the interview with a daughter of a farmer; she is the one who runs the day-by-day practical affairs of the farm with her husband and her mother.

Photo 5.1 – Interviewing the farmer’s daughter: she milks the cows every day with her mother

Other aspirations were in terms of improving life style, ‘saving’ time to spend more time with their families, or taking holidays. Every farmer in the three regions had planned to expand production. In Australia they say: ‘Get big or get lost’. During the interviews, many expressed their concern that expanding and
improving productivity are farm business requirements. During an interview, sitting on a farm house veranda, an Australian farmer said:

‘Can you see those ruins there and there? They were 400 and 600 hundred-litres-a-day dairy farms that went out of business. My farm produces 2,400 litres a day…’

5.3 What were the good ‘things’ that happened to the dairy farm business in your region?

The questions in sections 5.3 to 5.7 address the two objectives of the study. It responses helped me to understand the stakeholders’ point of view concerning future directions for their dairy region, and at the same time that they were challenged to evaluate the regional dairy farm business and the dairy industry as a whole. The word ‘things’ was used in the question to simplify the language and to cover an open range of options for the interviewee; it was explained that it could mean technologies, practices, behaviours, activities or others ‘things’ that the interviewee considered relevant. The interviewees considered that the main ‘good things’ that happened to the farm business were production technologies.¹ The majority of responses, in order of preference, fell under the content analysis code of Pasture/soil/irrigation. Interviewees stressed the adoption of better varieties of grass, better management of pasture rotation, the introduction of tropical pastures, and improvements in irrigation, fertilizers and their use, and legumes for pasture. It has to be mentioned that Pasture, mainly pasture rotation, is highly cited in Brazil as a good thing.

On the other hand, Australians did not mention Pasture rotation as much; however Australian dairy is ahead on pasture rotation with improvements such as mobile fence pasture rotation. Genetics was the second in preference; in the Brazilian regions studied this topic was raised in terms of artificial insemination, herd records, and embryo transference. Third was Nutrition; in the Australian region studied it was cited in terms of better silage, better balance of

¹ Production technologies in this study are the ones related to production, such as pasture, nutrition, genetics, reproduction, heath and hygiene.
concentrate with pasture, and improvement of the management of the feed gap between seasons. However, improved *Farm Management* was also discussed in the three regions as one of the ‘good things’ with comments citing improvement in business management, better farm planning, increased production scale, and increased labour productivity, better integration with other activities and proper facilities. Figure 5.1 presents these results about ‘good things’ diagrammatically, comparing the similarities and differences in responses between the regions studied. Notice that improvements in *Farm Management* and *Pasture* are identified as ‘good things’ in all three regions. Appendix 5.2 present percentages of interviewees citing each of the codes cited in the three regions.

Figure 5.1 – Stakeholders perceptions about ‘good things’ that happened to dairy farm businesses in the Australian and Brazilian regions studied

5.3.1 **Australian farm business: North Coast of NSW**

For Australian interviewees the main ‘good things’ in the farm business were related to production technologies. *Pasture* attracted the greatest concentration
of the interviewees’ opinions; the ‘good things’ they cited with regard to *Pasture* were water/irrigation efficiency, better varieties of grass, improvements in pasture management, and fertilizer utilization. *Nutrition* was the second preference; the interviewees cited the benefits of silage, better balance of concentrate with pasture, and improvements in the management of the feed gap between seasons. *Farm Management* was third among the good things. Interviewees mentioned the increase in the production scale, making dairy more modern and improving farmer skills in business management.

### 5.3.2 Brazilian farm business: Santa Rosa

In Santa Rosa also, participants stressed the importance of production technologies. *Pasture* had top preference and interviewees mentioned mainly pasture rotation and better varieties of grass. *Genetics* was second in preference and participants mentioned mainly artificial insemination. *Farm Management* was the third most cited ‘good thing’ in terms of higher production scale, planning of the farm, and mechanical milking to improve labour productivity.

### 5.3.3 Brazilian farm business: Alto Jacuí

As in the North Coast of NSW (Australia) and Santa Rosa (Brazil), the ‘good things’ in Alto Jacuí were related to production technologies. However, *Farm Management* was the first preference of interviewees. They mentioned the higher production scale, better farm planning, integration with other activities, and proper installations (equipment and buildings) linked to the improvement of labour productivity. One farmer considered that one of the best things that dairy brought was a monthly income. *Genetics* was the second in preference, as in Santa Rosa, but participants mentioned not only use of artificial insemination, but also embryo transference and herd record keeping. *Pasture* was the third in preference and was cited with reference to the benefits of pasture rotation management, legumes in pasture, irrigation, tropical pastures and better grass varieties.
5.4 What were the bad ‘things’ that happened to the dairy farm business in your region?

An academic staff member from the University of Queensland said that stakeholders would not feel comfortable about mentioning subjects related to ‘bad things’ that they have done, or things that they have done that did not work well. This was confirmed in the three case studies. In Australia, interviewees gave 62 opinions of things that worked well and 24 opinions on things that did not work well. In Santa Rosa the figures were 137 to 33, and in Alto Jacuí, 156 to 57. Figure 5.2 summarizes diagrammatically the data about things that were perceived as not having worked well for farm businesses. Notice that negative perceptions about elements of Farm Management are common for the three regions. The opinions on Farm Management were in terms of small production scale, poor planning of the farm, immobilization of too many assets, and too much time spent in the dairy. Labour was mentioned, but basically associated with some of the Farm Management comments, such as not building a better milking barn earlier. Other issues were related to Nutrition (problems with silage), Industry Policy (leaders who do not emphasize properly the positive side of dairy), and Pasture (varieties that are not suitable for the regions).

5.4.1 Australian farm business: North Coast of NSW

The ‘bad things’ in the dairy farm business, as perceived by Australian interviewees, were mostly related to Nutrition in terms of problems with silage, and Farm Management in terms of the need to have a higher production scale, too much time spent in the dairy, and wrong business decisions in the past.

5.4.2 Brazilian farm business: Santa Rosa

Interviewees showed regrets about Farm Management, mainly in terms of not having invested in dairy earlier, copying other systems without planning, immobilized capital, and bad planning of the farm. Industry Policy was also cited in terms of leaders who did not have a positive attitude to the dairy industry and unfair milk prices for farmers. Genetics were remembered in terms of regret
about the use of Gyr (an Indian breed) semen, and not starting artificial insemination earlier.

![Diagram showing stakeholders' perceptions about things that did not work well for the dairy farm businesses in the Australian and Brazilian regions studied]

5.4.3 Brazilian farm business: Alto Jacuí

The code most cited by interviewees in relation to ‘bad things’ was Farm Management in terms of trying to expand too fast, evaluating the dairy businesses only by the last bad results, poor planning for buildings, too many buildings, emphasizing the bad side of the dairy business, copying other systems without planning, and too much immobilized capital. Pasture was the second code most often cited in comments; interviewees mentioned unsuited Lucerne hybrids, grass varieties not developed for the region, not planting more tifton grass and problems of too much mud in the pasture on rainy days. Labour was remembered in terms of too much work; trying milking three times a day and not having built a better milking barn earlier.
5.5 What has potential to work well in your dairy region?

Figure 5.3 illustrates the preferences of interviewees in terms of potential technologies. If a new R,D&E program for the three regions were to be created, it should include Pasture and Farm Management as they were cited in the three regions as potential technologies to be developed. Notice that there is a strong correspondence between what did not work well and potential activities in the three case studies. Australians mentioned Nutrition in both questions, Santa Rosa mentioned Genetics in both, and Alto Jacuí did the same for Labour. Another congruence was the suggestion by all three regions that the two main codes for development of potential technologies should be Farm Management and Pasture. Farm Management was nominated in terms of improvements to planning the farm, looking at different scenarios for the dairy farm business, developing technologies or routines that save labour and time, developing a better (simpler) system to record farm data, and training farmers to see the dairy with business eyes. Pasture was identified in terms of developing a device to analyse quickly the protein and energy of grass on the farm before harvest, more research on grass varieties for the different regions, and studies to improve the management of irrigation, soil, and fertilizer.

5.5.1 Australian farm business: North Coast of NSW

The 36 Australian interviewees, when asked about potential technologies to be developed for the farm business, selected production technologies. Pasture was their first preference; they suggested improving the energy content and digestibility of summer pasture, developing new varieties of grass, and developing a device to analyse quickly the protein and energy of plants at the farm level. Nutrition was their second preference; interviewees’ suggestions were related to providing skills in balancing the diet of cows, improving energy and digestibility of summer pasture, developing feed additives, and more studies in nutrition management for cows in early lactation. Farm Management was cited in terms of training farmers to develop skills in planning the farm for different dairy scenarios and for managing the dairy as a business. An
interviewee from the processors’ group suggested that the industry should create opportunities for city people to invest in dairy farms.

Figure 5.3 – Potential ‘things’ for R,D&E organisations, as suggested by dairy industry interviewees in Australian and Brazilian regions studied

5.5.2 Brazilian farm business: Santa Rosa

In Santa Rosa, the question on potential activities for farm business elicited opinions from all participants. In order of preference, the most cited codes from the 42 interviewees were Farm Management, Genetics and Pasture. With regard to Farm Management, interviewees suggested easier data registration methods and appropriate installations (equipment and buildings) to save labour. In Genetics, they cited production with smaller cows more adapted to pasture-based systems. In Pasture, the suggestions were related to developing varieties of grass for the region, studies in irrigation, and in pasture rotation.
5.5.3 Brazilian farm business: Alto Jacuí

In Alto Jacuí, the question about potential activities for farm business raised several opinions. In 46 interviews, the most frequently mentioned codes were *Farm Management, Labour* and *Pasture*, in that order. *Farm Management* was mentioned in terms of farmers being more professional, integration of activities in the farm and planning for the farm. In the code *Labour*, interviewees suggested technologies that could improve labour productivity. The Photos 5.2 show the simple milking facilities in a Brazilian region studied in contrast with those of an Australian farm. In *Pasture*, interviewees suggested improved technologies in irrigation, year-round forage that grows during cold weather, improved production of winter forage to produce more hay and silage and free more land in the summer for crops, research in soil and forage management and forage planning.

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**Photos 5.2 – Australian and Brazilian milking facilities: contrast**

*Left photo* – An Australian rotary milking facility for 30 cows at time

*Right photo* – A farmer’s wife milking in a simple, two-cows-at-a-time milking facility
5.6 Comparison between different groups’ ideas

The interviewees were grouped for analysis into a Farmers group (F), the R,D&E people group (RE), and the Input market, Processors, Credit, and Others group (Off-Farm). Comparison between the groups shows many differences and gives a holistic view of the industry needs for R,D&E.

This section explores the frequency and distribution of the citing of the codes, not the contents of each code. That means, for instance, ideas related to the code Nutrition, not ideas such as silage or balance of concentrate with pasture, which are related to Nutrition. Those ideas were presented in the previous items 5.3, 5.4 and 5.5. In summary the groups have different behaviour depending on their location, but it became clear that the Off-farm group made more comments on issues beyond the farm gate, and had a broader view of the industry, than the F and RE groups. It was possible to observe that the Off-farm group, in different ways, depending on the region, can complement the F and RE groups’ points of view, such as in Marketing of the industry or Industry Structure, when F and RE groups did not mention those codes. As advocated in the proposed strategy, the mix of F, RE and Off-farm groups in the evaluation of a dairy industry would help R,D&E people to understand the realities of the different production systems.

5.6.1 Good ‘things’ in the farm business

In Australia the F group interviewees stressed Pasture and Nutrition more than the other two groups. The F and RE groups made no comments about off-farm issues. The Off-farm group mentioned issues that match those identified by the F and RE groups, but added issues beyond the farm gate related to Organization, Marketing and Industry Policy as ‘good things’ that had happened to farm business. In Santa Rosa the Off-farm group made as many comments beyond the farm gate as F and RE together. In Santa Rosa and Alto Jacuí, F and RE groups stressed Herd Management and Technical Advice, while the Off-farms group did not.
5.6.2 Bad ‘things’ in the farm business

In the Australian region studied the F group made concentrated comments in terms of ‘bad things’ in relation to Farm Management, Pasture and Nutrition and made no comments about issues beyond the farm gate. RE and Off-farm groups made few comments about ‘bad things’, but again the Off-farm group mentioned some issues beyond the farm gate while the F and RE groups made no such comments.

In Santa Rosa the Off-farm group heavily concentrated comments on management issues (Farm Management, Finance and Labour), mainly in Farm Management, and made almost no comment on production technology issues. In Santa Rosa and Alto Jacuí there was a convergence of comments of the three groups of stakeholders on Farm Management. In the three regions studied the Off-farm group presented more diversified comments.

5.6.3 Potential ‘things’

Unsurprisingly, the group Off-farm in Australia put more stress on factors beyond the farm gate (e.g. Organisation, Marketing) than the F and RE groups. An Off-farm group suggested attracting urban people to invest in dairy farms. This group provided diversified opinions in the three regions studied; the group distributed their attention over production technologies, management technologies and issues beyond the farm gate.

5.7 Good, bad and potential ‘things’ for the dairy industry as a whole

When responses from the three regions data were added together, the number of opinions about the whole industry (400 opinions) was smaller than the number of opinions about the farm business (671). This was not a surprise because most interviewees were involved with the farm business (54% were

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2 Those codes are not represented in Figure 5.3 because not many interviewees mentioned them; nevertheless, they should be noted in the study to show that off-farm issues were mentioned.
farmers). For example; when talking about Milk Quality participants mentioned that milk coolers have been a good thing. For the whole industry, they mentioned credit to buy milk coolers for farmers, rather than, for instance, the customer confidence in the quality of dairy products.

An analysis of the combined data from the three studies showed that there is a common opinion that Industry Policy has brought both good and bad results to the industry. In the Brazilian studies, interviewees appreciated the initiatives for new legislation to improve milk quality as well as Brazil’s initiatives to identify and reduce dumping in the international dairy market. On the other hand, some Australian interviewees were not happy with Industry Policy, mainly with deregulation. They mentioned that, with deregulation, it is harder to plan the future, farmers have lost power, deregulation was not introduced properly, and that deregulation brought uncertainty to farm business. Interviewees in the three regions also complained about the individualism of farmers and the lack of industry organisation; such organisation is seen as fundamental to reaching fair industry policy and good industry structure. Interviewees concentrated suggestions for potential activities on Marketing, mainly on improving the image of dairy among the customers, developing positive images showing the pleasurable side of using dairy products (as opposed to stressing health aspects), and developing new and ‘green’ products. Other suggestions were to stimulate the whole dairy industry to plan together the directions of the industry, plan the industry directions with Embrapa help, and to develop a clear policy for the industry.

5.7.1 Australia: North Coast of NSW

There were contradictory results in Australia on Industry Policy. Many interviewees (16) considered that Industry Policy, mainly in terms of deregulation, was a ‘good thing’ for the industry. Some of the positive things claimed for deregulation were that the price is no longer locked, deregulation will be good in the long run, and that a good package of benefits (financial compensation) came with deregulation. In contrast, 19 interviewees considered Industry Policy as a ‘bad thing’, again in terms of deregulation. Some of the bad
aspects of deregulation, in their opinions, were that it took power from farmers, left no security, made it harder to plan the future, and that the government did not implement deregulation properly. Among the 36 interviewees, only 12 gave opinions about ‘potential initiatives’. Marketing was the code mentioned most often, mainly in terms of development of new products, increasing exports, development of ‘green’ products and improving the image of dairy products. One interviewee stressed working together in co-operative ways with a focus on activities rather than sharing information.

5.7.2 Brazil: Santa Rosa

Even when all opinions from the three groups of interviewees in Santa Rosa were put together, most of them were still related to farm business instead of the whole dairy industry. The two main codes cited about issues beyond the farm gate were Milk Quality, in terms of quality assurance of raw milk to produce better dairy products, and Industry Policy, in terms of legislation for better milk quality, an open Brazilian market, Brazilian activities against dumping in the international market, and deregulation. On the other hand, Industry Policy attracted a number of criticisms as ‘bad things’ for the whole industry, mainly in terms of unfair distribution of the dairy incomes along the supply chain, imports, unprotected market, and government control of prices till 1991. Industry Structure was criticised in terms of selling the co-operative processing factory to private processing, with a resultant monopoly. Other related opinions were greater power of supermarkets over the price of dairy products, and multinationals’ control of the Brazilian dairy industry. The criticisms of the Market was related to a lack of understanding by the public about the importance of milk in the diet, lack of attractiveness of dairy farm business, the image of the poor farmer, and negative leadership. Potential actions in terms of Industry Policy suggested by the 42 interviewees are Brazilian activities to reduce subsidies in USA and EU, reducing the profits of parts of the dairy supply chain to improve consumption, ensuring fair payment for milk, regulation of milk quality, and developing a clear policy for the industry. Industry Structure ideas were related to seeking industry unity (including the processors), and returning the milk processing plants to co-operatives instead
of selling them to private processors in Rio Grande do Sul. Marketing suggestions were that a percentage of the price paid by the consumer for dairy products should go to promoting a positive image of the industry and that the pleasurable aspects of consuming dairy products should be emphasised.

5.7.3 Brazil: Alto Jacuí

When talking about ‘good things’ that happened to the whole dairy industry, only 9 farmers out of 27 in Alto Jacuí had opinions, indicating a lack of a broader view of the industry in terms of what is happening beyond the farm gate. Under Industry Policy, some interviewees recalled mainly a political action undertaken in 2002 to analyse what was going wrong in the industry (CPI) and they recalled the anti-dumping process in 2000. In terms of Milk Quality, some interviewees cited bulk transportation of milk, vats to cool milk, new legislation for quality assurance, and prizes for quality. On the other hand, the code Industry Policy was also associated with ‘bad things’ by 20 out of 46 interviewees, namely, unfair distribution of incomes along the dairy supply chain, permitting importing of subsidized dairy products, and the failure to plan well for the deregulation of the market in 1991. Industry Structure elicited some negative comments in terms of the present monopoly, the change of processor status from co-operative ownership to private company ownership, cartel, and rapel.

‘Potential things’ attracted many contributions; these suggestions were mostly related to Marketing. Interviewees mentioned using the media to stimulate consumption, showing the pleasurable side of dairy products, and educating young people for the industry. Industry Policy involved suggestions like fair distribution of dairy profits, introducing a warranty price, including dairy products in public school lunches, and a clear policy for the industry. Industry Structure evoked suggestions of organizing a processor for the region (currently the milk

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3 Parliamentary Commission of Inquiry.
4 When supermarkets charge some money or lower the price paid to the processor in return for better positioning of products in the shop.
is transported out of the region for processing) and planning regional production.

5.8 Which sub-systems of a dairy farm do you consider of high concern?

Sections 5.8 to 5.10 address the objective related to the identification of priorities. Participants had been informed about data from both Australian and Brazilian dairy industries, as well as trends of the industry. Now they were challenged to think as a farm manager and choose in which sub-systems of a farm (from a given list; see Table 5.1) they would concentrate their attention. First they had to select three sub-systems and then put the three selected sub-systems in order of importance (see section 4.6.2.1).

5.8.1 Comparing sub-systems of high concern in the three regions studied

To combine results from the three regions studied, the sum of points for each sub-system from each region was weighted according to the number of interviewees in each region. The combined data showed that the four sub-systems of higher concern were Farm Management, Finance, Labour and Health & Hygiene, in order of preference (Table 5.1).

In Farm Management, Finance and Labour, interviewees stressed the need to understand dairy beyond just production technologies. In addition, from the data collected during the field research, Farm Management has a strong connection with Labour. Labour has already been commented on in Chapter 3 as a preoccupation of dairy farmers, mainly as something that has not worked well because of the nature of dairy farm work (intense, always requiring higher labour productivity, no vacations). Finance was mentioned for the first time as a preoccupation in the answers to the present item. Finance was raised positively in Chapter 3 in terms of regular income of money for Rio Grande do Sul cropping counties and in Section 5.2 (above), for the same reasons. Now it had for the first time the connotation of concern in the three regions. No farmer
mentioned that he/she was planning on the basis of financial records developed for this purpose.

Table 5.1 – Farm sub-systems of high concern

<table>
<thead>
<tr>
<th>Sub-systems of a dairy farm</th>
<th>Australia</th>
<th>Brazil St Rosa</th>
<th>Brazil A. Jacuí</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td>Number of interviewees</td>
<td>36</td>
<td>42</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>Original and weighted points</td>
<td>O  W</td>
<td>O  W</td>
<td>O  W</td>
<td></td>
</tr>
<tr>
<td>Farm Management</td>
<td>47  54</td>
<td>26  25</td>
<td>67  60</td>
<td>140  139</td>
</tr>
<tr>
<td>Finance</td>
<td>40  46</td>
<td>42  41</td>
<td>47  42</td>
<td>129  129</td>
</tr>
<tr>
<td>Labour</td>
<td>21  24</td>
<td>25  24</td>
<td>51  45</td>
<td>97   93</td>
</tr>
<tr>
<td>Health &amp; Hygiene</td>
<td>13  15</td>
<td>42  41</td>
<td>24  21</td>
<td>79   77</td>
</tr>
<tr>
<td>Nutrition</td>
<td>24  27</td>
<td>30  29</td>
<td>12  11</td>
<td>66   67</td>
</tr>
<tr>
<td>Pasture/soil/irrigation</td>
<td>13  15</td>
<td>26  25</td>
<td>17  15</td>
<td>56   55</td>
</tr>
<tr>
<td>Environment</td>
<td>21  24</td>
<td>5  5</td>
<td>17  15</td>
<td>43   44</td>
</tr>
<tr>
<td>Genetic</td>
<td>6  7</td>
<td>19  19</td>
<td>11  10</td>
<td>36   36</td>
</tr>
<tr>
<td>Herd Management</td>
<td>0  0</td>
<td>10  10</td>
<td>16  14</td>
<td>26   24</td>
</tr>
<tr>
<td>Reproduction</td>
<td>3  3</td>
<td>6  6</td>
<td>8  7</td>
<td>17   16</td>
</tr>
</tbody>
</table>

Each person’s first choice was allocated 3 points, the second 2 points and the third one point.

E.g. for Farm Management in Australia: 47 points x 41 (mean group size) / 36 (Australian interviewees) =~ 54

Notice that the first three sub-systems of highest concern have a strong relation to human resources and skills needed during physical or intellectual activities. Also notice that the order does not hold for each region. While Farm Management is of first concern in Australia and Alto Jacuí, in Santa Rosa Finance is of greater concern.

A second layer of preoccupation is related to the production technologies. Nutrition and Pasture were mentioned in section 5.3 as good things and section 5.4 as bad things. However, the Brazilian regions expressed more concern about those production technologies than the Australian region (compare at Table 5.1). Health & Hygiene was mostly stressed in St Rosa. There was no comment about the code Reproduction, probably because the three regions manage it well.

5.8.2 Comparing the opinions about sub-systems of high concern between the three groups of interviewees

It was not possible to find a strong difference of opinion by comparing the three groups of stakeholders (F, RE and Off-farm). They tend to agree in the two higher concern sub-systems, Farm Management and Finance. However, it is
possible to find some particular differences, such as the $F$ and $RE$ groups in Santa Rosa did not consider *Farm Management* as a higher concern subsystem; they concentrated on *Finance*, while the *Off-farm* group, in the same region, preferred to concentrate on *Farm Management* (Table 5.2).

### Table 5.2 – Stakeholder groups’ opinions about issues of high concern on dairy farms

<table>
<thead>
<tr>
<th>Sub-systems</th>
<th>Farmers</th>
<th>R,D&amp;E</th>
<th>Off-Farm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NSW</td>
<td>St Rosa</td>
<td>A. Jacui</td>
</tr>
<tr>
<td>Number of interviewees in each group and region</td>
<td>20</td>
<td>20</td>
<td>27</td>
</tr>
<tr>
<td>HH</td>
<td>Health &amp; Hygiene</td>
<td>8</td>
<td>28</td>
</tr>
<tr>
<td>R</td>
<td>Reproduction</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>P</td>
<td>Pasture/soil/irrigation</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>G</td>
<td>Genetics</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>HM</td>
<td>Herd Management</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>N</td>
<td>Nutrition</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>F</td>
<td>Finance</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>FM</td>
<td>Farm Management</td>
<td>25</td>
<td>1</td>
</tr>
<tr>
<td>L</td>
<td>Labour</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>E</td>
<td>Environment</td>
<td>13</td>
<td>4</td>
</tr>
</tbody>
</table>

#### 5.9 What interviewees would do if they were managers of R,D&E organisations

The focus of this question was to define what would be the interviewees’ priorities if they were managers of an R,D&E organisation. In this sense this was the most important stage of the interview. Results would be compared with other strategies, particularly those of Dairy Australia and Embrapa dairy, and compared with opinions from Focus Group Meetings (Chapter 6). Participants were invited to wear the shoes of a manager of a R&D organisation and then of an extension organisation. The answers rarely came immediately after the question. Many times, after a vague answer, such as ‘research in pasture’, I asked: ‘Can you be more specific?’ In addition they were asked to recall the name of a person with either an R&D or E function in the region, to help them think about the answer.

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5 The questions were separated at this point because it proved difficult for the interviewee to think about both R&D plus E at the same time.
The combined results of the three regions show *Pasture* and *Communication* as shared main priorities if interviewees were in the shoes of an R&D or E manager (Table 5.3, Figure 5.4). Comments about each region are presented below. *Pasture* was expressed in terms of developing varieties of grass for the region, studying alternative pasture-based systems to reduce the concentrate costs, cost-benefit studies to show the relative benefits between investing in concentrate and pasture fertilization, studying ways to fill the pasture gap between seasons, searching for persistent legumes to plant with grass, improving pasture digestibility, breeding a perennial grass with deep roots which would need less irrigation, and improving pasture management technologies. *Communication* concentrated on better interaction of R,D&E with farmers, mainly through visiting each other, relaxed meetings (barbecues) in the community, and developing a better channel of communication with group projects.

<table>
<thead>
<tr>
<th>Main issues cited</th>
<th>Australia %</th>
<th>Brazil St Rosa %</th>
<th>Brazil Alto Jacuí %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication</td>
<td>39</td>
<td>86</td>
<td>58</td>
</tr>
<tr>
<td>Pasture/soil/irrigation</td>
<td>44</td>
<td>29</td>
<td>59</td>
</tr>
<tr>
<td>Nutrition</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farm management</td>
<td></td>
<td></td>
<td>59</td>
</tr>
<tr>
<td>Technical advice</td>
<td></td>
<td></td>
<td>28</td>
</tr>
</tbody>
</table>

Table 5.3 – Interviewees’ main priorities if they were managers of R,D&E organisations

Note: the percentages indicate the proportion of all interviewees mentioning each code.

5.9.1 Australia: North Coast NSW

Australian interviewees concentrated their opinions on production technologies, mainly *Pasture* (44% of the interviewees) and *Nutrition* (30%). However, they also expressed concerns in terms of improvement in *Communication* (39%). For *Communication*, participants suggested that farmers and researchers should be visiting each other to see what each other is doing; R,D&E people should come to the farms and listen to the farmers’ needs; R,D&E should develop a learning and development style to help them work more effectively with farmers; R,D&E should have a project with groups of farmers to improve understanding of their thinking. For *Pasture*, the interviewees mentioned studies on filling the pasture...
gap between seasons, better nutritional qualities of tropical pasture, persistent legumes for year-round availability, management of tropical grasses and legumes, pasture digestibility, and developing perennial ryegrass with deeper roots to reduce the need for irrigation. For Nutrition, participants mentioned a better understanding of the balance between fertilization of pasture and cows’ nutrition requirements, filling the pasture gap, and a better balance of nutrients. The Off-farm group took a broader view of the industry, citing studies in Milk quality, such as increasing the percentage of fat, protein and calcium in milk. In terms of Marketing, they cited more specialized products and increasing the use of health arguments for milk consumption. On the other hand, the F and RE groups cited farm business issues, better use of water, and ways of dairying that could minimize the impact on the environment.

Figure 5.4 – Interviewees’ priorities if they were R,D&E organisation managers
5.9.2 Brazil: St Rosa

In Santa Rosa, interviewees selected Communication as the primary code; the suggestion was expressed in terms of defining a target public for R,D&E communication, and using more participatory demonstrations of technologies. Some stakeholders associated Communication with Motivation, suggesting barbecues to put people together in a relaxing way. Some farmers expressed the feeling that even some co-operative directors, many of them farmers, do not know the dairy farmers' problems; two recorded comments were:

‘We should stimulate people from the co-operative administration to work closely with farmers and their problems’; and
‘Give more time for extension people to deal with farmers or designate an ombudsman/watch dog to hear farmers, would improve the understanding of farmers’ problems, and help to plan activities’

5.9.3 Brazil: Alto Jacuí

Interviewees in Alto Jacuí concentrated their comments on Pasture, expressed in terms of developing varieties for the region, and studying the financial return of different kinds of fertilization. Farm management was expressed in terms of planning the farm using data analysis, presenting alternatives for investment for farmers, and analysing the present situation of the industries and farms of the region. Communication was cited in terms of showing practical research results with associated costs, identifying regional priorities, and intensifying the relations between farmers and extension people. To illustrate the importance of this last point, a farmer commented:

‘A couple of months ago, the co-operative transferred an extension agent to another industry of the co-operative; we demanded that they bring him back. The technician is not so technically qualified as he should be, but he is a link with the co-operative that farmers want to keep.’
5.10 How would you introduce technologies in your region?

The objective of this question was again to put the ones who receive the service in the position of those who deliver the service. The reason for applying the question is because on a number of occasions R,D&E people have commented that their audiences have whispered that the presentation subject (a technology) would not fit in the region for some reasons, but these reasons were seldom discussed with the speaker. The listing of stakeholders’ ideas as to how to transmit good ideas or new technologies to their production systems was produced by grouping the different opinions given in each region studied into a logical order of events, e.g., identifying a problem should come before the suggestion of how to solve it.

The interviewees suggested an approach beyond methods of diffusion of technologies. Their suggestions assume an interactive model of extension, as advocated by contemporary extension experts but not necessarily practiced throughout their organisations. The participants of the study also show that it is necessary to balance the R,D&E people’s intention to transmit information quickly to achieve results, probably required by their organisations, with the processes sought by people in the production systems. R,D&E people should be aware that people from production systems may demand more participatory activities, such as co-operative work or planning for the industry.

5.10.1 Australian interviewees’ suggestions to present technologies

Most of the 36 Australian interviewees made suggestions as to how to introduce good ideas or technologies to their production community. These have been organised by the author into a sequence of actions:

1st Action – Identify in the production community the common problems before choosing an idea to present.

2nd Action – Work on good ideas and look for high involvement of field agents and company representatives to make practical demonstrations or farm trials about the subject of interest, for focus farms.
3rd Action – Encourage discussion groups through field days or other events where interested stakeholders are engaged in a process that enables them to think about new ways of farming. One of the main objectives is to improve confidence in each other.

4th Action – Find a person to stimulate continued co-operation around common interests.

5.10.2 Brazilian interviewees’ suggestion to present technologies

5.10.2.1 Santa Rosa region

Brazilian interviewees in St Rosa were very interested in having an Embrapa researcher holding an in-depth interview with them, and gave many contributions as to how to introduce good ideas or technologies to their production community. Some of the following actions could be ordered in a different way. The suggestions have been combined in the same way as the Australian responses:

1st Action – Discuss where the industry in the region wants to go, identify the needs and ask appropriate organisations to co-operate,

2nd Action – Transmit to farmers the global view of the dairy industry, explain the effects of technology, prepare the leaders, and introduce the ideas through them,

3rd Action – Stimulate groups of farmers; discussion groups; extension groups; encourage co-operative work among regional stakeholders; associations to discuss the production community issues, alternatives, and technologies; project / plan the future of the industry in the region; and help farmers to express their ideas,

4th Action – Organise demonstrations in farms showing the positive and negative side of technologies. Invest in potential farmers, field days, visit other dairy communities, benchmark successful farmers, work on motivation and self esteem of farmers, and

5th Action – Improve communication involving the production community and R&D organisations.
5.10.2.2 Alto Jacuí region

In Alto Jacuí interviewees showed the same degree of interest as in Santa Rosa. The suggestions are presented in the same way as the two other regions. Notice that this region includes future generations in the process of learning and interaction with the production community.

1st Action – Develop among farmers a long term vision for the dairy industry,
2nd Action – Improve communication through the media (radio stations) during milking hours,
3rd Action – Make more demonstrations of ideas or technologies in farms, showing the financial, the good, and the bad side of the ideas. Show scenarios for before and after the introduction of the ideas in a farm. Introduce the ideas and give time, stimulate discussion. Involve the agricultural college or even kids. Stimulate groups of farmers to visit each other, with the supervision of extension people who could convey any doubts about the technologies to the right institutions. Hold field days, present alternatives to reduce cost, conduct benchmarking, pilot projects before presenting ideas to the whole production community.
4th Action – Participatory management of the regional dairy industry, organise smaller groups to discuss the ideas, and
5th Action – Improve the motivation of farmers, plan more trips to other regions.

A surprise was that sets of steps to introduce good ideas, instead of one simple idea, were suggested by two farmers. Those contributions were combined into the following steps:

1st Action – A visiting speaker should visit farms of the region before giving his/her presentation,
2nd Action – Speaker presents ideas to stakeholders and then stays out of the meeting for about an hour,
3rd Action – Facilitator encourages discussion among the audience members and makes notes during this hour,
4th Action – The speaker returns, facilitator introduces the notes and encourages discussion with the speaker,
5th **Action** – During the meeting speaker, facilitator, and farmers plan future actions for a selected farm,

6th **Action** – Possible positive and negative results of the action should be shown at the meeting to the stakeholders, and

7th **Action** – Discuss alternatives.

5.11 **Do you have suggestions of any nature for your dairy community?**

To finalize the interviews, participants were encouraged to give further suggestions on topics different to those already mentioned; they could be about politics, sports, religion, about the farmers’ welfare, or any kind of issues that were crossing their minds. A veterinarian from one region suggested:

‘**Farmers need at least 1 week off a year**’

The suggestion of a break for farmers was mentioned on many occasions after I had told the interviewees that the interview was finished.

Common responses to the above question in the three regions were **Organisation** and **Communication** (Figure 5.5). Many comments related **Organisation** to **Communication**. Interviewees stressed the need for unity among farmers; they advocated more socialising among farmers, and the encouragement of discussion groups. **Organisation** was also related to **Labour**, in terms of helping farmers to organise their affairs and tasks better, so as to save time and get together. Issues were also related to **Motivation**, such as improving farmers’ motivation through social meetings. In **Communication**, interviewees wanted other ways of communicating technical issues in addition to books and papers. An Australian farmer said:

‘**Can you see the books on my shelf? I have all sorts of books, but I do not read them…I prefer other ways to communicate with R&D (more face-to-face communication)**’
Many comments were related to the desire for direct contact among farmers and between farmers and R,D&E people.

**Figure 5.5 – Interviewees’ suggestions of any nature for their regions**

### 5.11.1 Australia: North Coast of NSW

In Australia, of the 36 interviewees, 15 made no suggestions. The suggestions presented were mostly related to *Organisation*, such as expanding the SRT (Sub Regional Team) to involve more farmers and agribusiness people, farmer unity, and creating a job position for a person whose function would be to give a break to farmers once a year for about 3 weeks. Some *Organisation* suggestions were related to *Labour*, such as creating an organisation like the Moshav condominium of production (An Israeli structure of production where a group of families produce agricultural or other products sharing production
resources); some others related to Motivation, such as socialising among farmers, promoting monthly meetings, arranging for teenagers to take care of young children so that farmers could get together. The Communication issue brought three suggestions: (1) presentations of production alternatives to farmers instead of text books or papers, (2) R,D&E people should develop motivational approaches; and (3) use videos at farmer meetings to show production methods in other regions.

5.11.2 Brazil: Santa Rosa

Of the 42 interviewees in the Santa Rosa region studied, almost everybody gave opinions. The suggestions were mostly related to the same issues identified in the Australian region, Organisation, Communication, and Labour, and in the same order of importance. Under Organisation the main contributions were in terms of association, changing from individualism to co-operative behaviour, and formation of machinery groups. In common with Australian interviewees, under Labour, they recognise the need for farmer vacations; they suggested organising a production calendar so that farmers can have about 15 days off a year. For Communication the main suggestions were keeping farmers up-to-date by inviting them for entertaining meetings and showing positive messages about the dairy. An interesting one was regular meetings with about 12 farmers on a farm each month, to provide an opportunity to discuss the practices of that farm. An extension agent should be a participant at the meetings to clarify points or to pass on unanswered questions to his technological information sources or R&D people for solutions.

5.11.3 Brazil: Alto Jacuí

Of the 46 interviewees in the Alto Jacuí region, almost everybody gave opinions. The suggestions were mostly related to Organisation, Communication, Motivation, Industry Policy, and Farm Management. The Organisation suggestions were about regional association or related to the Industry Structure in terms of the region having its own processing plant, or regional planning for the dairy industry, and better roads. The Communication issues were expressed in terms of farmers’ work groups, creating an information channel to reduce the
distance between R&D results and the production community, visiting other regions to find out what other farmers want from their farms and using effective language to communicate with farmers. The Motivation issues elicited suggestions of social events for farmers, community barbecues, prizes for competence, and incentives for farmers’ children who want to study, and stimulating mutual confidence among farmers. Farm Management suggestions were to show the profit and cost benefit of each agricultural industry per hectare, alternative ways to pay employees in balance with the farm profits, and to teach the philosophy of adding value to raw products. Notice that even when interviewees were asked about any other issues for their region, they kept on mentioning issues related to the dairy industry.

5.12 Summary

The questions about why farmers selected the dairy industry and what were their personal goals revealed the different histories of the communities. Heritage and Life Style were the main reasons of Australian dairy farmers for choosing dairy farming, while Brazilian dairy farmers had their origins in crop production, but found in the dairy industry the solution for their financial problems. Australian dairy farmers love their activity; despite the intensive labour, they will not leave the business unless it ceases to be viable. On the other hand, the three regions have common points in terms of goals; they all have the welfare of the family and time to have a vacation in their minds. Few farmers interviewed referred to production when talking about personal goals.

In the evaluation of ‘things’ and technologies for the farm business interviewees attributed great value to Pasture, Farm Management, Genetics and Nutrition. On the other hand, Farm Management was indicated as a ‘bad thing’ for the farm business in the three regions. Interviewees considered that they need to increase the production scale, make better plans for the farms, and reduce the immobilised capital on the farm and the time that they spend in the dairy. The most frequently indicated potential activities for R&D&E were Farm

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6 There are farmers who chose to remain in the industry through a major recent restructure.
Management, with suggestions mentioned before, and Pasture, in terms of analysing quickly the energy and protein content of forage, better grass varieties for the region, improvements in irrigation, soil and fertilizer management. Metaphorically it means that interviewees kept one foot in the field and the other foot in the farm business office. In terms of sub-systems of high concern on a dairy farm the combined results of the three regions put Farm Management, Finance and Labour, in this order, as the subsystems of highest concern. The interviewees’ choices reinforced the importance of Farm Management and Financial aspects of the farm business.

When stakeholders were asked to evaluate ‘things’ and technologies for the whole industry, they were less comfortable in talking about the whole industry than in talking about the farm business. They also showed conflicting opinions in terms of ‘good’ and ‘bad things’ for the whole industry. Industry Policy was considered as a ‘good thing’ by some and as a ‘bad thing’ by others. This was particularly evident with Australians participants; deregulation of the dairy industry had 16 opinions as a ‘good thing’ and 19 opinions as a ‘bad thing’. Some opinions were not completely against deregulation, but how it was implemented. In Brazil, a common point made in the two regions was the need for improvement in the relationship of the whole dairy environment with the final consumer, thus aiming at better returns for the whole industry, instead of initiatives that may benefit only part of the dairy supply chain.

Participants were also challenged to put on the shoes of managers of a R,D&E organisation and indicate which should be their priorities. Most of the time they showed some delay in answering this question, which shows how hard it was to give opinions on something that stakeholders usually complain about, namely, the activities of R,D&E. Most opinions were related to the usual activities of R,D&E, mainly Nutrition, Technical Advice, Farm management, and Pasture. However, the final result was a clear indication of the need to improve the communication strategies of R,D&E. The choices of the respondents reflect what was written in Chapter 1. Researchers are mainly stimulated to produce technical results and publish them, not to prepare them properly for use by the production systems.
Further suggestions of any nature were sought and the leading common ideas for the three regions were: Organisation and Communication, and to a lesser extent Motivation, Labour, Industry Structure, and Farm Management. One could sum up the different opinions on this issue in one word ‘socialising’. A farmer in Australia said:

‘We need somebody who will come to have a cup of tea and tell us what is going around and discuss our farm issues’.

Suggestions like ‘Save time to get together’ and ‘Improve farmers’ motivation through meetings’ show the need for the social integration of farmers. In Australia, because of the proximity of the processor, the processors could play an important role in the integration of farmers. In Brazil, the co-operatives are the ones who could play this role.

A comparison of the opinions of the different groups of stakeholders revealed that, in most situations, the group Off-farm took a broader view of the dairy industry, as shown by the suggestion of attracting external investors to dairy farms. The Off-farm group in each of the three regions was selected by purposive sampling. Other interviewees suggested a variety of people from a political leader to a person who served behind the counter in a shop. The study showed a convergence of opinions of the three groups F, RE, and Off-farm all of which selected Farm Management and Finance as the sub-systems of highest concern in a dairy farm. On the other hand, some divergences were also found, with regard to concerns about other sub-systems of a dairy farm. The F group stressed Health & Hygiene, Herd Management and Labour more than the RE and Off-farm groups. The comparison of the points of view of the three groups suggests how their ideas can complement one another.

The results of individual interviews with a variety of stakeholders shows the achievement of the objectives of the research: (a) Develop a strategy to Involve a broad set of stakeholders in a dairy community to obtain a holistic view of their priorities for R,D&E, and (b) Document and compare the R,D&E priorities of
dairy stakeholders in one Australian and two Brazilian regions, including the views of different groups of stakeholders within each region. In Australia some interviewees considered that the Sub Regional Team (SRT) of the region studied was not open enough to different participants. The differences between the two Brazilian regions, which are less than 200 km apart, can demonstrate that the strategy proposed in this thesis can complement a much broader project such as the Platform Project in Embrapa dairy, which uses panels of experts and studies larger regions.

This chapter showed the opinions of individual interviewees. The only external influence on their opinions came from their families when participating in the interview. The main characteristics of the interviews were a relaxed atmosphere and a commitment that the participant’s opinion was not going to be identified as his/her opinion by anyone else but me. The next chapter explores the results of the group interviews on setting priorities for each of the three regions studied. The synergism of the exchange of opinions was expected and achieved.
**Chapter 6: Groups’ perceptions of regional priorities**

6.1 Introduction

This Chapter presents results from the third stage of the strategy, Focus Group Meetings (FGM). Participants for the FGMs were selected on the basis of their participation in the individual interviews. In this stage, the data collected in individual interviews from a broad set of stakeholders became the basis for the group meeting. The priorities for the dairy industry in the regions studied were discussed and converged to identify the main perceived priorities for the dairy industry in each region studied. The perceived strengths and weaknesses of each region studied are also presented.

6.2 Participants in the FGMs in the three regions studied

In each region studied one FGM was conducted. Photo 6.1 shows the different representations of each group of stakeholders. Table 6.1 presents the number of interviewees in the third stage of the research and the number of participants from each group of stakeholders in the FGMs. In Australia, one invited participant from the Off-farm group could not attend the meeting. In the two Brazilian regions, there were no people from the Input Market group because most advice about products is provided by extension people instead of the Input Market group. In Santa Rosa, the person from the Credit group could not attend the meeting.

<table>
<thead>
<tr>
<th>Groups of stakeholders</th>
<th>Australia: NSW</th>
<th>Brazil: Santa Rosa</th>
<th>Brazil: Alto Jacuí</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmers</td>
<td>20 5</td>
<td>20 6</td>
<td>27 6</td>
</tr>
<tr>
<td>R,D&amp;Es</td>
<td>5 2</td>
<td>7 2</td>
<td>7 3</td>
</tr>
<tr>
<td>Off-farm</td>
<td>11 4</td>
<td>15 2</td>
<td>12 3</td>
</tr>
<tr>
<td>Totals</td>
<td>37 11</td>
<td>42 10</td>
<td>46 12</td>
</tr>
</tbody>
</table>

171
6.3 What are the strengths and weaknesses of your dairy region?

The comments described below are related to the most common codes discussed during the FGMs. Some comments are expansion of a former idea, when one issue stretched the mind of other participants who added new angles. This was a desirable synergic situation which helped to bring more relevant issues to the discussion and elucidate the most important priorities for each region.

6.3.1 Strengths: Combined results from the three case studies

In each of the three case studies, Natural Resources and Labour were perceived as strengths of the region. In terms of Natural Resources, Australian participants mostly mentioned the ability to grow dry matter to feed the dairy
herd. In the two Brazilian case studies, participants mentioned good soil and rain throughout the year. The three regions are at similar latitude, but Rio Grande do Sul state has better year-round distribution of rain than Australia. *Labour* was considered as a strength and a weakness in the three regions. It was seen as a strength because of the work capacity of the people; in the Brazilian case studies, the capability of the German and Italian immigrants was emphasised as a strength. In Australia, a non-farmer participant mentioned:

‘*It seems to me that there are a lot of people who became dairy farmers because they loved it*...’

*Farm management* was considered a strength in Brazil because of the assets that dairy farmers are accumulating and the financial stability that dairy brings, mainly to the small-sized farms. In Australia, participants mentioned *Marketing* as a strength, mainly in terms of proximity to large markets, while in Brazil the major markets are at least 500 km distant.

### 6.3.2 Weaknesses: Combined results from the three regions studied

Three codes perceived as weaknesses were *Organisation, Industry Policy* and *Labour*. In terms of *Organisation*, interviewees complained that the industry was fragmented. With reference to *Industry Policy*, the opinions were that there were no clear policies for the dairy industry. There were some complaints about *Labour*, related to the nature of the dairy work, which requires daily attention and keeps farmers tied to their farms. A common comment was how hard it was to keep young people on the farm, working for the dairy. In terms of *Financial issues*, Brazilian participants complained that dairy farmers do not see big money, compared with what they see when they harvest soybean or other crops, and complained that farmers have to invest too much in equipment, buildings, or animals, with only a short period for amortisation. Other complaints were that they had to pay the bills monthly and had to make high indirect government payments for external workers. One farmer from St Rosa, Brazil said:
'What farmers improve in productivity of pasture, animals, labour or other farm sub-systems they lose in reduction of milk price.'

6.3.3 Australia: North Coast of New South Wales

6.3.3.1 Strengths

In the North Coast of New South Wales, the *Natural Resources* of the region and its advantages in *Marketing* were identified as its two main strengths. *Natural Resources* were cited several times, in terms of the ability to grow dry matter. However, the water restrictions were immediately mentioned (see weaknesses). *Marketing* issues were mentioned several times in terms of the proximity to the large population of Brisbane, the third largest city of Australia and capital of the state of Queensland, and other neighbouring cities. The regional market, comprising the North Coast of New South Wales and South Coast of Queensland, has more than 4 million people. The region also has a huge tourism industry that attracts people from all over the world, raising the consumption of dairy products. One participant commented on the value of the Subtropical Dairy Program, which encourages high participation of farmers and helps the local agricultural extension service to understand the farm business issues and so return better services.

6.3.3.2 Weaknesses

North Coast participants perceived the dairy industry in the region to have a number of weaknesses, namely *Natural Resources, Organisation, Industry Policy, Industry Structure, Communication* and *Labour*. *Natural Resources*, although previously named as a strength, were cited as a weakness as well. An extension agent stressed that the restriction in water access will make it hard to produce milk based on pasture irrigation. He said:

‘...the biggest thing we have to face is the availability and access to water. That is going to have far more impact on the dairy industry up here than deregulation ever had, and if you thought deregulation
was disastrous, then water is going to be even worse. That's the main challenge that I see that we've got at present.'

Participants saw a strong relationship between Organisation, Industry Policy, and Industry Structure. They considered the lack of unity, or using their words, 'fragmentation of dairy farmers’, one of the worst things for the farmers, as well as the lack of a critical mass of farmers. Declining numbers of dairy families meant fewer ‘dairy’ workers in the electorates, less influence on government, and potential loss of infrastructure. A participant commented that farmers themselves are the farmers' worst enemies. This comment is related to farmers' individualism. A participant said:

‘…if we are unable to maintain the critical mass of farmers that we have and we lose the infrastructure, that then makes the whole thing so much less of a viable proposition. And I think it's a socio-economic thing. The powers-that-be must realise that agriculture and the dairy industry, have a place up here in the North Coast, and, without that, there is going to be a big void as far as the economics within the region is concerned.’

Participants emphasized that farmers were unable to keep a stable position for their business, as they were not attracting people to the industry, were being pushed to the west by high coastal real estate prices, and were in need of improved support from the Department of Agriculture. They also considered that it was necessary to improve Communication, both in the way R&D prepared results to deliver to farmers and in the education of children for the industry. The regional processor was also criticised over the way it was dealing with farmers and the lack of effective communication with them. A farmer said:

‘If I was the processor, I'd make sure I had people in the field that knew everything that was going on with their farmers. …. If a field officer of the processor was visiting that farm at least once, or twice a year, even if it's just a courtesy call, he/she could ask if there are any problems, and say ‘Let's discuss it', and ask ‘What do you think
your family is doing? ...Are you going to keep growing?’ And plus, with the Department of Agriculture guys, feeding as much information to them to make sure that those people have access to the information they are looking for.’

Another weakness mentioned was Labour because of the long hours, the hard work and the high cost of hired labour. The data collected in the field research revealed that some farmers were working 80 hours per week, sometimes almost alone. A farmer made a comment about employing labour:

‘...probably we will pay them more money than you (the farmer) think you ever earned anyway. In addition, farmers see the kids going away from farms to find another job and earn more money.’

6.3.4 Brazil: Santa Rosa

6.3.4.1 Strengths

In the Santa Rosa region, the two main codes cited as strengths were Natural Resources and Pasture. The Photos 6.2 show a typical March view of the Rio Grande do Sul landscape with soybean everywhere and a dairy farm presenting the simple facilities to raise heifers and tifton pasture. These two codes were strongly related in both the Brazilian regions studied. Some participants, who had international experience, considered Rio Grande do Sul the best region in the world to produce pasture-based milk, because of the Natural Resources (e.g. soil, rain) available. Labour was also cited as a strength in terms of vocation of the German and Italian immigrants to work in agriculture. Participants identified two main strengths related to Farm Management, the higher value of assets in the dairy farms when compared to farms that did not have dairy and the financial stability that the dairy industry brought to the farms, co-operatives and counties. Notice that, in this study, there were comments in favour of the accumulated assets and financial stability of dairy, and against the amount of assets required by the dairy industry and the constant financial demands of the dairy industry. Technical Advice was also considered a
powerful strength; that was in terms of the extension services of the co-operatives, which exert a strong influence on farmers’ decisions and provide a good linkage between farmers, co-operative, processors and farmer organisations. They also assist in the negotiation of milk price. This variety of roles for the extension services was not observed in the Australian region, where the co-operative or the private extension services are not as close to farmers as in the two Brazilian regions. Another positive consequence of the co-operative extension service is that it is helping to maintain farmers’ loyalty to the co-operative and to the dairy industry, and that the co-operative extension service heads many of the production system initiatives. An excellent example is that the field research for this thesis has been financed, in Brazil, by a processor, with total logistic support from the co-operative extension services.

Photos 6.2 – Typical landscape of the regions studied in Brazil
Left photo – Typical Rio Grande do Sul landscape with soybean everywhere.
Right photo – Dairy farm with simple facilities for heifers and tifton pasture.

6.3.4.2 Weakness

In Santa Rosa, issues of Finance headed a list of weakness. Farmers complained because they could not see ‘big money’ in the dairy industry, compared to what they are able to get when they sell the whole harvest of their crops. In addition, they said, farmers had to keep investing in equipment,
buildings, and animals, and pay off the resultant loans monthly, in short periods of amortisation, reducing the visible money. A farmer said:

‘...he/she (the farmer) cannot see the end, when will he/she see the finish of investment and start to see the profits?’

It seems that the farmers studied do not perceive that their farms are increasing in value through the dairy. An additional practice to prejudice the dairy image is that is the co-operatives deduce any monthly expenses of the farmers from their dairy account, and this understates the real dairy income of the farmer. An extension agent mentioned that it is necessary to demonstrate how much the farmers have accumulated in capital and assets, showing the increased value of their farms. Other weaknesses cited were: Industry Policy – participants complained that there is no clear policy for the dairy industry; Nutrition – considered a weakness because of the small paddock areas; Labour – cited also as a weakness because Brazilian law for labour imposes many indirect payments, because farmers considered it too hard to educate and keep children working in the farm, and because the daily demands of the dairy are more restrictive than the lighter labour routine that farmers used to have with crops alone. A participant said:

‘We had a period of farming wheat, soybean and other crops, after that it is hard to work again on the weekends.’

Credit, as a weakness, was expressed in terms of high interest to borrow money with a short period for payment. The Organisation code attracted negative comments in terms of lack of unity and of proper representation of farmers. A participant expressed doubts about whether the representatives of farmers' interests were talking the same way that farmers would talk, when negotiating milk price with the processor. Industry Structure was cited as a weakness in terms of small-scale farmers being pushed to increase production quickly by the industry.
6.3.5 Brazil: Alto Jacuí

6.3.5.1 Strengths

In Alto Jacuí region, as in Santa Rosa, participants identified several strengths of dairying. The codes *Natural Resources* and *Pasture* were cited many times in the two Brazilian regions with the same emphasis, which was mainly on good soil and good climate. The value of *Technical Advice*, which has been provided by more than 20 years of services in the region, was recognized as a strength to keep farmers in the dairy industry. *Nutrition* was mentioned as a strength in terms of easy availability of tropical or temperate pasture and good food resources for the winter provided by silage. *Genetics* was mentioned in terms of the selection of the herd with a focus on high production per cow. *Farm Management* was cited because of the help provided by the co-operative for all farms, from small to large farmers, to maximize farm income. It was mentioned that dairy is a good investment to keep the farmer in agricultural industries. A participant said:

‘I see many very successful farmers in the region, many of them have invested heavily in the infrastructure of the farm, because dairy has never been a bad business here; if it was, we would have been bankrupt many years ago, but we keep on growing.’

*Labour* was mentioned several times in terms of vocation of the German and Italian immigrants,\(^1\) and co-operative support for the dairy industry. A person from Alto Jacuí region noticed that the dairy farmers’ houses had a better appearance than those of the other farmers. Those are externalities that the usual financial analyses of the industry do not identify. It has to be recalled that in the individual interviews, some people mentioned the good cash flow that the dairy industry provides for farmers and the region.

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\(^1\) There are other European immigrants that also have a vocation for agriculture in the regions studied.
6.3.5.2 Weaknesses

In Alto Jacuí, participants complained mainly about the Finance situation. The complaint was that farmers are always pushed to invest in their farms and that the more they make progress in productivity, the more the milk prices are reduced. In addition, participants complained about two main issues related to Industry Policy (although these also related to finance), farmers get information related to the milk price about 30 days after the sale of the milk and usually receive a payment that decreases their motivation. Alto Jacuí and Santa Rosa shared the same problem of farmers seldom seeing ‘big visible money’ in the dairy and that the co-operative deducts all farm expenses from the dairy account, even when the investments are with crop industries. An interesting comment from a farmer’s wife was related to how a strength in dairy can turn to a weakness in neighbour relationships. She said that after her farm achieved success in the dairy, the next door neighbour was making comments demonstrating envy and not visiting her anymore.

6.4 Preferences for investment from Focus Group Meetings

For this question, each stakeholder in the three Focus Group Meetings was asked to invest an imaginary $100,000 in the priorities previously selected. The priorities were the ones identified previously during the individual interviews, presented to the group during each FGM, enlarged during the meeting, discussed and converged to the most important ones. Because there were a different number of people in each of the three meetings, the mean imaginary investment per person is shown in Table 6.2. Table 6.2 shows that the codes Farm Management, Finance, R&D, Communication and Organisation are considered important in all three regions, and that production technologies are not mentioned among the nine most-cited issues. This provides managers of R&D organisations with a guide to future R,D&E actions and improvement in understanding of the production systems. During the FGM in Australia participants did not ‘invest’ much in the R&D. The complete list of priorities and investment in each region studied can be found in Appendix 6.2. The findings in the regions studied are presented individually below.
### Table 6.2 – Mean investment preferences of participants in each FGM in $

<table>
<thead>
<tr>
<th>Subjects and priorities</th>
<th>Australia NSW</th>
<th>Brazil St Rosa</th>
<th>Brazil Alto Jacuí</th>
<th>Mean combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of participants</td>
<td>8</td>
<td>10</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>32,500</td>
<td>5,000</td>
<td>19,500</td>
<td>19,000</td>
</tr>
<tr>
<td>Finance</td>
<td>26,250</td>
<td>1,000</td>
<td>23,916</td>
<td>17,056</td>
</tr>
<tr>
<td>Industry Policy</td>
<td>0</td>
<td>24,000</td>
<td>6,666</td>
<td>10,225</td>
</tr>
<tr>
<td>Marketing</td>
<td>12,500</td>
<td>15,000</td>
<td>0</td>
<td>9,167</td>
</tr>
<tr>
<td>R%D</td>
<td>1,880</td>
<td>15,000</td>
<td>4,585</td>
<td>7,155</td>
</tr>
<tr>
<td>Farm Management</td>
<td>9,380</td>
<td>7,000</td>
<td>3,125</td>
<td>6,500</td>
</tr>
<tr>
<td>Organisation</td>
<td>1,850</td>
<td>7,000</td>
<td>10,375</td>
<td>6,408</td>
</tr>
<tr>
<td>Credit</td>
<td>0</td>
<td>12,000</td>
<td>3,917</td>
<td>5,307</td>
</tr>
<tr>
<td>Motivation</td>
<td>0</td>
<td>12,000</td>
<td>0</td>
<td>4,000</td>
</tr>
<tr>
<td>Technical Advice</td>
<td>0</td>
<td>2,000</td>
<td>8,500</td>
<td>3,500</td>
</tr>
<tr>
<td>Pasture</td>
<td>2,500</td>
<td>0</td>
<td>6,917</td>
<td>3,139</td>
</tr>
<tr>
<td>Milk Quality</td>
<td>0</td>
<td>0</td>
<td>8,333</td>
<td>2,778</td>
</tr>
<tr>
<td>Labour</td>
<td>3,130</td>
<td>0</td>
<td>4,166</td>
<td>2,430</td>
</tr>
<tr>
<td>Herd Management</td>
<td>5,630</td>
<td>0</td>
<td>0</td>
<td>1,875</td>
</tr>
<tr>
<td>Natural Resources</td>
<td>2,500</td>
<td>0</td>
<td>0</td>
<td>835</td>
</tr>
<tr>
<td>Health &amp; Hygiene</td>
<td>1,880</td>
<td>0</td>
<td>0</td>
<td>625</td>
</tr>
<tr>
<td>Total</td>
<td>100,000</td>
<td>100,000</td>
<td>100,000</td>
<td>100,000</td>
</tr>
</tbody>
</table>

Note: The figures in this table have been calculated as follows.
- Total investment by members of a Focus Group (e.g. Australia), under each subject (e.g. finance),
- Divided by number of participants in that group (8 for Australia) to give the mean investment per person.
- The final column, combined means, is the sum of the three group means, divided by 3. Appendix 6.2 shows the original figures.

### 6.4.1 Australia: North Coast of New South Wales imaginary investment

The main priorities at the Australian Focus Group Meeting were Communication, Finance and Marketing. Communication priorities were expressed in terms of farm walks bringing together a small number of farmers and R,D&E people to discuss farm business issues, preparation of easy-to-use and uniform information to be delivered to or discussed with stakeholders, and efforts to integrate the different parts of the dairy supply chain. Notice how R,D&E, particularly extension is pushed to an information management role. Finance was discussed in terms of the need for simple tools to manage farm finances, to carry out financial analyses of the dairy business and to draw-up partial budgets for farm sub-systems. Marketing was expressed in terms of the need to improve milk quality and marketing for the whole dairy industry, rather than specifically for dairy products, and to create, in urban areas, a positive and sustainable image of the dairy industry. It was seen as important to strive to attract new investments and new people as well, to the dairy farm business.
6.4.2 Brazil: Santa Rosa

In Santa Rosa, the Focus Group Meeting identified *Industry Policy*, *Marketing* and *R&D* as the priority issues. *Industry Policy* was the most quoted concern; participants stressed the need to have a guaranteed price for the milk; they suggested that it should be a fixed share of the retail price. Under *Marketing*, they advocated stressing the pleasurable side of the dairy products. A participant asked:

‘*Have you seen Coca-Cola or beer companies say that they have healthy products?*’

In fact, it was said that initiatives were needed to improve *Marketing* in all the Brazilian agricultural industries. On the other hand, one of the main television networks, Rede Globo, prepared in May 2003 a television series showing how progressive Brazilian agriculture is and how it helps the national economy. Nevertheless, the contribution of the dairy industry was not adequately acknowledged. The evidence that the dairy industry is no longer a silent industry in Brazil was the prompt reaction from the president of Leite Brasil, an organisation which supports the dairy industry in Brazil. He sent a letter to the network, explaining how important the dairy industry is and urging another TV program to show the benefits of the industry to the country (Rubez, 2003). Brazilians drink more beer (52 litres) and soft drinks like Coca-Cola (70 litres) than milk (32 litres) annually (Milkpoint, 2002). The participants also identified *R&D* as a priority because of the need for units of validation of research findings for the region.

6.4.3 Brazil: Alto Jacuí

In Alto Jacuí the Focus Group Meeting selected as the main issues *Finance*, *Communication* and *Organization*. Participants saw stimulating farm cost management as a priority in *Finance*; they identified a need for simple tools to help farmers to access, in less time, the minimum financial information needed to manage their farms. *Communication* priorities were expressed in terms of the
need to define dairy business goals, improve discussions on technical issues involving stakeholders and R,D&E, offer more training courses to farmers, and organise meetings to discuss and standardise technical information. Participants identified a number of issues that could be addressed through Organisation, the need to organise a farm in the region to grow heifers, to involve farmers in defining goals for the industry and actions along the dairy supply chain, to improve farmers’ motivation, achieve better prices for raw milk, improve research for the region, and seed solutions to others issues that a group of stakeholders could achieve.

6.5 Summary

A common ‘strength’ in the three regions studied was that participants considered their region a very good place to produce dry matter to feed the dairy herd. Labour was considered a strength and weakness in the three regions: A strength because of the work capacity of the people to deal with agricultural industries, a weakness because farmers are finding it difficult to educate and keep children to work on the farm and in the dairy.

Two common points of weakness in the three regions were Industry Policy and Labour. Participants at the Focus Group Meetings complained that the industry was fragmented and that there was no clear policy for the industry. There were some complaints about Labour in Brazil, which were related to the nature of the activity, which requires daily hard work. Australians added that farmers become tied to their farms. In the Brazilian cases, participants considered the indirect payments that they have to make to government too high. Other comments about strengths and weaknesses are presented in the specific case studies. It is noticeable that few comments were related to production technologies, which is the strength of R,D&E organisations. Nevertheless, the findings of this study can be compared to the present activities of SDP and Embrapa Dairy, to see how the proposed strategy can complement the strategies of the two organisations by revealing issues not brought into focus or not properly exposed at present.
When data from the three regions studied were combined, the priorities from the Focus Group Meetings disclosed four main priorities, which were Communication, Finance, Marketing and Farm Management. Organisation was another important priority and had some shared areas with Communication and Industry Policy. A comparison of the main priorities identified with the objectives and questions of the study shows the importance of the involvement of a broad set of stakeholders. Particularly in the group interviews, a variety of stakeholders stressed items that can be considered barriers for the adoption of R,D&E outcomes. The priority Communication brought suggestions that are linked to studies of adult learning, which cannot be neglected when R,D&E prepares for the diffusion of traditional or new production technologies. This strategy can be very useful when compared to the Platform Project of Embrapa Dairy because regional realities are most of the time too far from the research station realities, and the method enables a combination of many different regional realities, some of them with high influence on the national level.

There was no comment about the code Reproduction, probably because the three regions manage it well. They have more than 80% of cows in lactation. Technical issues like Health & Hygiene, Nutrition, Pastures, Irrigation, and Genetics were placed in the second layer of priority actions. That can be understood as a good message when associated with what had been identified in the individual interviews as 'good things' that happened in the farm business, where production technologies were frequently nominated. However, the lack of nomination of production technologies among the main priorities can also be considered as an alert to R,D&E organisation in relation to new projects.

The next chapter compares the data presented in Chapter 5 with the data presented in this chapter. The objectives of the study and the usefulness of the tested strategy to achieve the desired results are discussed as well as the effectiveness of the strategy for dairy R,D&E organisations.
Chapter 7: Discussion of the relevance of the study

7.1 Introduction

This chapter presents what was expected from this study and what was achieved. The results are summarized and compared with the objectives and research questions of the study and with related theory. Another comparison is between the priorities for R,D&E projects identified in this study with some dairy industry activities in Australia and Brazil as well as with research projects in practice in the Subtropical Dairy Program and Embrapa Dairy. The chapter also analyses the originality of this study. The final section is about my field observations and some stakeholders’ comments.

7.2 Extension trends contradict stakeholders demands

The study disclosed that there are some contradictions between the trends in R,D&E and what is demanded by stakeholders. In extension, there is a trend for group advice and internet delivery of services; however the stakeholders interviewed demand more personal relationship with R,D&E in their farms. Group advice and internet delivery are useful approaches for exchanging opinions and for the presentation of technologies that show an evident advantage, but are not well suited to a deeper discussion of how it affects or will be affected by the people and environment in the production community. New varieties of crops, the next generation of machinery or recognized veterinary products are examples of new technologies that can be introduced with little explanation for the customers who are already using earlier versions of the technologies. However, when the new technology is related to management or needs a higher standard of farmer and community knowledge, it needs a method of delivery that permits a two-way in-depth communication with the client. The internet has limitations for Brazil and even for Australia in terms of the number of people who are able to access or know how to use it.
In terms of R&D, the stakeholders interviewed complain about the lack of a holistic view of their realities by research people. However, the evolution of research demands more specialization from researchers. The solution is not to try to have every researcher a specialist in the holistic view of production communities, but to have higher participation in research projects by extension people and stakeholders, together forming a team that can bridge the gap between researches conducted in research stations and the realities of the production systems.

### 7.3 What was expected and what was achieved in the study

This section presents issues that became important for the study, such as trust, and compares the objectives and questions of the study with the results of the study. It also discusses the relevance of the literature, the methods used and the results achieved.

#### 7.3.1 Issues related to trust, involvement, and understanding

According to Philip Chamberlain in a personal communication, earning trust as an ‘outsider’ is a key point in getting information from people in production systems. Observations during field work for this study and authors such as Pretty and Ward (2001), Spies (1996), and Johnson (1975), reinforced Chamberlain’s comment. In addition, principles of motivation, such those of self-respect, status, and recognition, were considered and also played an important role in the involvement of participants. The methods reviewed do not describe how to improve trust and participation of a diversity of stakeholders. However, my temporary but deep involvement in the production system and in the day-to-day life of farmers was rewarded by the farmers’ and their families’ trust in me. That trust was also transmitted when a farmer, or other interviewees, introduced me personally, by phone to other stakeholders, or through talk ‘on the grapevine’ about me. My advisor was positively surprised when a farm worker came to talk to me like an ‘insider’ when we arrived at one of the towns where I developed the field research in Australia, where I had made just four visits. This kind of involvement by the researcher has been suggested by authors such as Chambers (1988) and Tattersall (2001) and is familiar to anthropologists, but
not usual for agricultural R,D&E. My involvement with on- and off-farm issues showed how a researcher can create two-way engagement in the identification of production communities’ priorities. The time for the interviews and time after the interviews, designed in the methodology, permitted higher family participation and even some confidences that stakeholders asked me not to disclose. Photos 7.1 show the relaxed environment achieved after a working day or during lunch time, in the kitchen, exchanging cultural values and ideas with the farmer and the family.

By doing the day-to-day work, by dealing with the variety of interviewees during the interviews, and by participating in social events (Photo 7.2), my understanding of the regional production systems was improved considerably and transferred to my field observations, which are reported below. During the field research, I realised that the cost of trust is cheap in terms of money (I even saved some hotel and meal expenses), but it generates returns of high value in terms of support and engagement of participants.
7.3.2 Diversity of stakeholders and their perceptions of the dairy industry

The focus of extension has shifted from production and productivity issues of a single enterprise to a holistic view of farming; this means looking at the production systems from a broader angle (Scott-Orr & Howard 2000; Fontes 2002). Cesar (1999) stressed the existence and benefits of the use of production community networks for agricultural R,D&E. Roberts (2000) suggested that it was desirable to involve a diversity of stakeholders in the collection of ideas from the community. As noted previously, Hamilton (1995) considered that the information and knowledge of community members became the important factor in such a process, leaving the scientists’ technical knowledge in the background; also Dillon (1992) emphasised that systems theory stresses that one system interacts with other systems in a complex way and cannot be decomposed into independent sub-systems. The purposive sampling and snowball technique were very useful to trace the dairy communication network and achieve the desirable involvement of a diversity of
stakeholders. Through such diversity of participants, a wider view of the regions studied was achieved. Photo 7.3 shows the participants in the Focus Group Meeting in Santa Rosa, Brazil; they represent different parts of the dairy supply chain and are participants who contributed with good ideas during individual interviews. Their involvement in this research was sought in order to ensure a broad vision in the identification of priorities.

7.3.2.1 Different groups of stakeholders

To evaluate the achievement of the objective of having a broad view through a diversity of stakeholders, the opinions of the interviewees were grouped into farmers (F), R,D&E people (RE), and input market, processors, credit providers, others (Off-farm). The involvement of a diversity of stakeholders returned the desired result. The groups RE and Off-farm presented a broader view of the industry than the F group. In both countries, the F group concentrates on regional activities and production technologies (Pasture, Nutrition, Genetics, etc), while the RE and Off-farm groups recall the regional activities and production technologies, but add suggestions of communication and exchange of information with other production systems and organisations in order to show a variety of ways of dealing with their farming issues. For example, the Off-farm group in Australia suggested the creation of opportunities for city people to invest in dairy farms. In Brazil, the question about how to encourage the introduction of good ideas in your region elicited different responses between F group and RE / Off-farm groups. F group suggested community discussion, technical meetings, farm trials (showing positive and negative points of technologies), while RE and Off-farm groups suggested broader involvement, beyond the regions, such as benchmarking across different regions, intensifying the relationship with research organisations, and improving knowledge about the macro-environment of the dairy industry, as some of the best ways to encourage the introduction of good ideas.
The perception of the international dairy environment was limited among some stakeholders in the regions of Rio Grande do Sul State, Brazil. In the case of $F$ group this was evident, even after the researcher drew attention, in the interview, towards trends in the dairy industry in the world. However, the groups $RE$ and $Off-farm$ are very aware of the movement of the international dairy market beyond Argentina. On the other hand, at least in Brazil, the view of on-farm issues was better discussed by $F$ and $RE$ groups. In Santa Rosa, Brazil, $F$ and $RE$ groups stressed *Herd Management* and *Farm Management* more than the $Off-farm$ group. In Alto Jacuí, Brazil, again $F$ and $RE$ groups recalled *Herd management* but $Off-farm$ did not. The groups $F$, $RE$ and $Off-farm$ thus had different outlooks in each of the regions studied. This may be because of the differences in community knowledge.

### 7.3.2.2 Stakeholders’ perceptions of the dairy industry as a whole

As indicated by the literature, farming communities are complex and diverse and local knowledge is unique to each community. The aim of the study was to have stakeholders identifying priorities for their regions, taking into account the complexity of the macro dairy environment (dairy environment beyond the
regions and countries). Therefore, the study explored the interviewees’ perceptions of the dairy industry as a whole. However, when responses from the three regions were put together, the number of opinions about the whole industry (400 opinions) was smaller than the number about the farm business (671). That was not a surprise because a majority interviewees were involved with the farm business (54% were farmers). During the interviews, it was stressed that questions related to the whole industry sought issues beyond the farm fence. Nevertheless, even after this emphasis, many participants mentioned issues related to farm business instead of the whole industry (See section 5.7). Even though, pushing stakeholders to stretch their perceptions of the macro dairy environment, helped on the stakeholders’ involvement on the two-way engagement to identify priorities for the production communities studied. In Australia, considering the whole sample, interviewees show evidence of a broader view of the national and international dairy environment than Brazilians. The origin of this broader view can be associated with the fact that the Australian dairy industry exports more than 50% of its dairy products and this transmits the idea of the international market to people in the production communities.

The presentation of world trends in individual interviews was useful to at least increase, for many interviewees, their perceptions of the whole industry. In some situations, the presentation of trends took some time, with explanations and discussions when participants presented their thoughts. The involvement of different groups of stakeholders, such as processors and off-farm stakeholders also helped to widen the discussion of priorities, thus enlarging the perceptions of participants of external factors that influence small dairy communities.

7.3.3 Priorities for the dairy regions studied

7.3.3.1 Individual perceptions of regional priorities

The objective of the individual and group approaches was, starting from the individual meetings, to gain trust and closeness to the interviewees. The individual interviews gave time for in-depth conversation and for participants to
believe that they were important for the study, that the study could be important for their region, and that they were free to express their real thoughts without the constraints of others who could limit their capacity to express ideas. As suggested in the literature, ownership of ideas and motivation issues were given great consideration.

In the three regions the interviewees related ‘good things’ for the farm business chiefly to production technologies, mainly Pasture, Genetics and Nutrition, but Farm Management also featured strongly (See Chapter 5 – Figure 5.1). This is taken to mean that R,D&E have done a good job with technology, but need to help dairy farmers improve their management skills. In opposition to the good things, Farm Management was strongly commented on as something that ‘did not work well’ (see Chapter 5 – Figure 5.2). To check the consistency of the participant’s opinions, they were asked about sub-systems of high concern in a dairy farm. Combined results from the three regions showed that Farm Management, Finance, Labour, and Nutrition, in order of preference, were the most stressed codes (See Chapter 5 – Table 5.1). Notice that production technologies were lower in priority. Farm Management was also selected as something that has potential, if studied more, to provide a good return for dairy farm business. Pasture can be considered as the second most important potential code for research. Notice that Farm Management was mentioned both as a good feature and potential research issue as well as something that did not work well. The concentration of opinions on Farm Management is an indication that the popular mental picture of a dairy farmer sitting on his/her veranda, on a working day, may become rare. When dairy farmers are not working with their hands, they might be working with their brains, with the focus on the farm business. Off-farm issues related to Industry Policy were stressed as something that is not working well for Brazilians, not only in terms of price. A farmer said:

‘Show us that the dairy farm business is reliable and then we can learn about technologies.’

The study was designed to encourage interviewees not just to list priorities, but also contribute with ideas of how they would manage R,D&E organisations. In
the combined opinions from the three regions, *Pasture* and *Communication* were selected as priority issues to be managed. In the context of these interviews this is taken to indicate that stakeholders would balance physical activities, such as on the research station – *Pasture*, with human resource activities – *Communication*.

### 7.3.3.2 Group perceptions of regional priorities

In the three cases, participants considered their region a very good place to produce dry matter to feed the dairy herd. Market proximity is a major strength for the north coast of New South Wales, Australia, since it is near a tourist region with more than 4 million people with a high standard of living. Two common weaknesses are *Industry Policy* and *Labour*. *Labour* was considered a strength and a weakness for the three cases, a strength because of the work capacity of the people and a weakness because farmers are facing a hard time in educating their children and keeping them for work on the farm and in the dairy industry. With regard to *Industry Policy*, interviewees complained that the industry is fragmented and that there is not a clear policy. There were some complaints about *Labour* in Brazil; they were related to the nature of the activity, which requires daily hard work, and to the high indirect payments that they have to make to government to keep an external worker. Australian farmers commented that their dairy farms are taking too much of their time.

When the data from the three regional studies were put together, the six main priorities from the FGMs, in order of importance, were *Communication, Finance, Marketing, Farm Management, Industry Policy* and *Organisation*. Section 6.4 and Table 6.2 give specific details of the codes. The code *Organisation* has some overlapping opinions with *Communication* and *Industry policy*. Production technical issues like health and hygiene, nutrition, pastures, water usage, irrigation, reproduction and others have been placed as a second layer of interest.
7.3.3.3 Comparison between individual and group opinions

The literature stressed the linkages of different sub-systems (Checkland 1981; Dillon 1992). People are representatives of those different sub-systems. The methodology of this study was developed so as to capture both the opinions of different groups of stakeholders and the differences in behaviour in individual and group interviews. A comparison of individual perceptions and group perceptions reveals contrasting expressions of view by the participants. In the individual interviews, they mentioned more ‘good things’ that happened to farm business and fewer ‘bad things’. In the group discussions, however, they stressed the weaknesses of their regions more than the strengths. This may be because individuals were unwilling to discuss bad things relating to their own farm, but would discuss them in a regional context; and also because the FGM participants felt a responsibility to address regional problems. The results also show different foci on priorities when individual opinions are compared with group opinions. Individual interviews had more focus on on-farm issues while group opinions had more focus on off-farm issues (Figure 7.1).

Figure 7.1 – Priorities broadened from farm issues to regional issues as interviews moved from individual to Focus Group Meetings
Group meetings mentioned the on-farm issues of production technologies only when the subject was strength and weakness of their regions. It shows the importance of the two approaches. Without the individual interviews, we would not be able to have a clearer picture of the on-farm priorities and without the group contributions we would not be able to see the whole picture. The combination of the two results provides directions to R,D&E for farm business blended with a broader view of the dairy industry regional priorities. Ignoring the broader view may result in misunderstanding or ignoring the several other issues that are involved in a production community and that may affect the effectiveness of research and extension activities or dairy sustainability.

7.4 Study results versus real world activities

A constant question in my mind during the study was whether the priorities identified were already being acted upon by the dairy industry, and whether the research and extension organisations were already applying the methods or activities I was proposing. In fact, the R,D&E organisations are employing various methods to encourage higher participation of stakeholders in the design of R,D&E activities, but there is room for improvement. The comparisons made in this section reveal a number of needs and concerns which differ from region to region. The proposed R,D&E strategy could bring different results according to different realities. This section presents the mission of some dairy R,D&E organisations in order to provide a comparison between the priorities identified in this study, and those of Dairy Australia's Subtropical Dairy Program and in Embrapa Dairy research and extension. In addition some dairy industry activities related to the priorities are presented.

7.4.1 Missions and activities in Australia and Brazil

According to Kerlinger (1973), science consists of two parts. The first is static, where new facts are classified and added. The second is dynamic, where new concepts and new kinds of classification are found and enlarge the existing knowledge at the boundaries of science serving human needs. The Australian and Brazilian roles of agricultural R,D&E organisations are following, or being pushed to follow, the trend to make R,D&E focus more strongly on providing
primary benefits to the stakeholders of the industry, not for R,D&E itself (AFFA 2002; Eponou 1993). This focus can be understood through the mission statements of R,D&E organisations. Table 7.1 presents the mission statements of some dairy R,D&E organisations in Australia and Brazil. Notice that every mission statement stresses the benefit to agricultural industry people or sustainable development of dairy farming.

Table 7.1 – Mission statements of some Australian and Brazilian R,D&E organisations

<table>
<thead>
<tr>
<th>R,D&amp;E organisations</th>
<th>Mission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embrapa Dairy (Brazilian National Agricultural Research Corporation)</td>
<td>Provide solutions for sustainable development of the Brazilian dairy agribusiness, with emphasis on the primary sector, by generation, adaptation and transference of knowledge and technologies for social benefit.</td>
</tr>
<tr>
<td>Emater Rio (Rio de Janeiro state rural extension organization)</td>
<td>Contribute to the development of agricultural industries, especially on small/medium farms, in an integrative and sustainable way, through transfer of technical, economic and social knowledge, incorporating agribusiness advice in the technical, extension and rural engineering advice program for the benefit of Rio de Janeiro State population.</td>
</tr>
<tr>
<td>Dairy Australia after 2003</td>
<td>Provide services to the dairy industry that are better performed by Dairy Australia than by individual industry participants for the ultimate benefit of levy payers</td>
</tr>
<tr>
<td>DRDC (Dairy Research and Development Corporation) till 2003</td>
<td>To maximise economic, environmental and social benefits for our stakeholders through targeted investment in R&amp;D.</td>
</tr>
<tr>
<td>TDRC (Tropical Dairy Research Centre)</td>
<td>Enhance the competitiveness, profitability and sustainability of the northern segment of the Australian dairy industry.</td>
</tr>
<tr>
<td>SDP (Subtropical Dairy Program)</td>
<td>Foster a collaborative and unified approach to farm viability, by facilitating research and extension, improving technology and empowering people in the industry.</td>
</tr>
</tbody>
</table>

However, mission statements and realities may be different. Franz et al. (2002), studying the Cornell University Co-operative Extension System, found that campus staff see county staff as an implementation team, while county staff see their own role as the pivotal linking point connecting state / campus resources and community needs. The county staff way of thinking noted in the Franz study is more likely to obtain a broader view of production communities as well as to
achieve effective engagement of stakeholders in R,D&E activities. It may be that policies such as dollar-for-dollar funding for R&D will be of great help to the two-way relationship between research station staff, field workers and the production community.

Since the aim of agricultural R,D&E organisations is to serve agricultural industries, the interaction of agricultural research and development with people in the production systems assumes greater importance. Priorities for research should be generated from the production communities. There is increasing financial support by agricultural industries for R&D projects, and industries, with the community, and government, want to keep closer watch on where their money in being spent.

7.4.2 Subtropical Dairy

In 2003, staff of the Subtropical Dairy Program organised a meeting to reinforce the objective of the Regional Development Programs of providing a mechanism for dairy farmers to have a strong involvement in identifying, selecting and managing R,D&E activities (SDP 2003). The main projects for the Subtropical Dairy Program operating plan for the period 2004 and 2005 are:

- Management of feed, emphasising the implementation and management of sustainable (socially, economically and environmentally) feed systems;
- Management of natural resources, reinforcing the first project, and sustaining their productive capacity and environmental integrity;
- Animal management, stressing the use of management practices that enhance the efficiency of production, animal welfare and the quality of dairy products; and
- Whole farm management, reinforcing sustainability with a focus on a systems approach. Human resource management, concentrating on concerns about the capacity of people to be effective farm owners on one hand and contribute to the development of the dairy industry on the other hand.

In the past, while putting more effort into production technologies, Subtropical Dairy Program never neglected farm management issues. In the period
between 2000 and 2003, it offered 15 training courses for extension agents and farmers, with four of the courses related to farm management.

In comparison with the 1999-2004 plans, those for 2004-2005 plans seem to be more interactive. This study revealed a demand by dairy farmers for even more direct relation with R,D&E people. Many modern extension publications reinforce the need for closer contact between R&D with extension and with the people in the production systems. However, the reduction of the number of extension agents in the field has made this more difficult. In addition, for many R,D&E people, it is easier to write about encouraging participation in two-way communication than actually to change the old style of doing research and extension.

On the other hand, Subtropical Dairy is supporting a Department of Primary Industries project in Queensland, Australia, in an experiment where family issues are a focus considered. They are testing 5 different production systems (dry land, pasture-based, without irrigation, to total irrigation and feed lots) to test profitability and directions for future dairy development. An interesting part of the project is the involvement, in in-depth interviews, of nine dairy farmers and two farm families. From their responses, the researchers have identified some key social issues for dairy farmers: (i) Frequent mention of absence of opportunities for young people to enter or stay in the dairy industry, (ii) the physical, mental and financial stresses associated with the current industry environment which were seen to have a major impact on dairy farm families, resulting in little time to spend with family or to participate in local school and community activities, (iii) the decline in the social and business structure of rural communities associated with the restructuring of the dairy industry, (iv) labour issues; most farmers see family labour as the only reliable source of labour (Andrews 2002). This experiment demonstrates an example of a type of research that could become a trend, with the inclusion of social issues in combination with production issues.
7.4.3 Embrapa Dairy

Embrapa Dairy is in a constant process of improving communication with its clients. In 2003, more than 220,000 people accessed the research organisation’s home page, which is an increase of 130% in comparison to 2002. Many of those accesses turn to contacts with staff members to obtain or exchange information. However, this is far from representing the whole picture, since most Brazilian farmers do not have computers or access to the Internet. Embrapa Dairy is recognised among the Embrapa units as one of the best units in regards to its relationship with the people in the production systems, and was even before the internet facility. The unit has always promoted events to attract stakeholders, mostly farmers and extension people, to interact and exchange opinions and even provides accountancy services for dairy farmers. The organisation’s high concern about interaction with stakeholders is represented by the creation of the three regional nuclei with research and extension objectives. It is also represented by the creation of a management role of communication, in which 11% of the 280 Embrapa Dairy employees work, and which is linked directly to the Head Manager of Embrapa Dairy.

The analysis of the Embrapa Dairy program, in comparison with the priorities identified, reveals that the organisation is matching most of the identified priorities. Figure 7.2 shows, in the central common area of the three ellipses, the common priorities/projects identified in group interviews, individual interviews and Embrapa Dairy projects. Embrapa is stressing research in production technologies prioritised in the study, such as Pasture and Genetics; these two codes cluster 48 (Genetics 29 and Pasture 19) out of Embrapa Dairy’s 88 sub-projects in 2004. However, there are no projects or sub-projects directly related to improving Labour productivity or developing simple tools for Farm Management. There are no social issues, such as integration with people in the production communities addressed in Embrapa Dairy projects, perhaps because of the cultural belief that these are an extension issue. Future projects should include social-issues research, as did the project developed by the Department of Primary Industries in Queensland, described above. It will be necessary to convince or present evidence to production systems researchers
of the need to include social and family issues and to involve a researcher who has proper skills for social issues subjects.

![Diagram showing R&D priorities identified by this study and the Embrapa Dairy projects](image)

**Figure 7.2 – R&D priorities identified by this study and the Embrapa Dairy projects**

A response to suggestions of Guerin (1999) and particularly, of Cowan (1995) of having an extension component in Embrapa Dairy R&D projects can be observed in only three out of the 88 research activities. It was also observed that there are no names of stakeholders in the teams for the main projects of the six thematic nuclei. Even the three regional nuclei presents research projects with minimum partnership with farmers’ organisations, suggesting a top-down approach still prevails, instead of participatory actions to involve people in the production systems in the R&D research activities.

The Platform Project described in Chapter 3 is providing a broader view of the constraints for the development of South, Centre-west, South-east, and North-east dairy regions of Brazil (Vilela 2002). However, in this project, communication with or participation of people in the production systems was mentioned indirectly through trials in farms or training for extension people, but there was no indication of engagement of grass-roots stakeholders or identification of regional communication networks. The strategy presented in
this study can complement the Platform Project with regard to these issues. Table 7.2 presents a comparison between the proposed strategy and the Embrapa Dairy Platform Project.

### Table 7.2 – Differences between the Platform Project (Brazil) and the strategy proposed in this study

<table>
<thead>
<tr>
<th>Issues of comparison</th>
<th>Platform project</th>
<th>Proposed strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region/target</td>
<td>Whole country / Macro regions e.g. south of Brazil</td>
<td>Small regions – three to five local government areas e.g. North coast of NSW</td>
</tr>
<tr>
<td>Involvement of R&amp;D</td>
<td>Panel of experts selected by R&amp;D organisation with active participation of R,D&amp;E people in the selection of priorities</td>
<td>R,D&amp;E people as facilitator(s) help stakeholders to select other relevant stakeholders from their regional communication network. They are invited to express their opinions and judgements about priorities for their region.</td>
</tr>
<tr>
<td>Evaluation of priority</td>
<td>Grades from 1 to 10, given by the panel of experts towards mainly technical priorities</td>
<td>Individual and group interviews to identify priorities and group interviews to discuss and converge the main priorities</td>
</tr>
</tbody>
</table>

Notice that the Platform Project deals with larger regions than the proposed strategy, and has different methods to involve stakeholders and to identify priorities. From the results presented in Chapters 5 and 6, it is possible to foresee how different the activities could be when planning R&D projects or extension activities for the two regions studied, as they are close together.¹

### 7.4.4 Dairy industry initiatives around the world

Both Australia and Brazil export dairy products although on different scales. With the aim of becoming stronger in the World Trade Organization, they created in 2002, together with a number of other nations, the Global Dairy Alliance. The main target of this alliance is the reduction of the effects of the daily subsidies of A$ 3.10 per cow that each European farmer receives, on farms that do not receive this help (Milkpoint 2003a).

¹ Santa Rosa region is less than 200 km from Alto Jacuí region.
In different countries, the dairy industry is already developing some of the ideas suggested in this study to improve the industry; I will describe just three examples. In New Zealand, Fonterra (Dairy processor) is using genetic engineering to develop new flavours for dairy products (Milkpoint 2003b), as suggested in the region studied in the North Coast of New South Wales. In Argentina, Entre Ríos farmers have created an official organisation to represent all dairy farmers (Espósito 2003), like that proposed in this study in Santa Rosa, Brazil and like Queensland Dairyfarmers Organisation (QDO) in Australia. In U.S.A., the farmers pay for part of the advertisements for dairy products (Carvalho 2003), as suggested during this study in Brazilian regions.

7.4.4.1 Australian dairy industry

In Australia farmer organisation, such as the QDO, aim to participate with other sectors of the dairy supply chain (Chamberlain 2001), and organise meetings of supermarkets representatives with dairy farmers to talk about the domestic market (QDO 2003). In addition the dairy industry image and labour issues are being discussed by a committee, created within QDO, to think about dairy futuring, owing to concerns about the attractiveness of careers in the industry (QDO 2002a, 2002b). These examples explain the role that communication is playing in modern industry development.

7.4.4.2 Brazilian dairy industry

In 2003, the experts on Brazilian dairy were brought together during a dairy event, Expomilk, to answer the question: How can one earn money in the dairy? (Milkpoint 2003a). An analysis of the comments of Carvalho (2001) on their discussion revealed that most of the eight main points were related to off-farm issues. They were the relationship between farmer and processor; the cooperatives; the future of small farmers; the marketing of the industry; the exports; and the role of government. Only two issues, production systems and milk price, were related to on-farm issues. That gives a similar picture to what this study found, namely that the sustainability of the dairy industry is perceived to depend mainly on factors beyond the farm gate.
The Brazilian dairy industry is taking other initiatives that match the priorities identified in the current study. A Brazilian farmer wrote an article related to motivation; he said that farmers need to rebuild their pride in being dairy farmers (Siqueira 2003). The Brazilian Ministry of Agriculture started two councils, one for the agricultural exports with the aim of bringing public and private sectors together to work for Brazilian exports, and another specifically for the discussions about the milk price (Milkpoint 2003d, 2003e). These kinds of council are becoming popular in Brazil; the States that produce most of the Brazilian milk have already started their councils. In those councils, different parts of the dairy supply chain are involved in discussing the costs and prices of the dairy products with the aim of establishing the fair price for each part of the chain (Canziani and Guimarães 2003). Another initiative is that co-operatives from Paraná, Santa Catarina and Rio Grande do Sul States, the three states of the Southern of Brazil, are now analysing strategies to become stronger together (Milkpoint 2004).

7.5 Contributions of the study

7.5.1 Priorities for the three regions and R,D&E activities

If a new R,D&E program for the three regions had to be created, it should stress Communication, Finance and Farm management as these were cited in the three regions both in the individual and group interviews. Details about these activities can be found in Chapters 5 and 6. Pasture should also be included because it was cited, together with Farm Management, as a potential technology to be developed in balance with a strong interactive program to enhance the communication of the findings. Labour studies should also be strongly considered in terms of increase productivity of labour as well as studies in ergonomics.

7.5.2 People issues in the regions studied

In the three regions studied, the family and its welfare are the farmers’ paramount concerns; it is also a first forum to discuss dairy technologies, followed by R,D&E people (see Appendix 7.1). R,D&E people should consider
that most of the time, technologies are presented only to a fraction of the decision-making people of the farm, the farmers. The message has to be strong enough to convince the farmer that he, in his turn, should assemble good arguments to convince the family as well. Since farmers’ wives play a major role in the studied farms’ labour force (see Appendix 3.1) and children/young people keep on being attracted by the facilities and lifestyle of the cities, R,D&E should improve family participation in its activities. Unfortunately this goes against the trend for group advice, where usually, only one member of the farm family is involved.

Why are farmers in the dairy business? According to the farmers in this study, Australians concentrate on lifestyle and heritage, while Brazilians focus on the money and financial stability. The two appendixes tables mentioned in the previous paragraph present other differences and the similarities between the three regions studied, such as where farmers discuss technical issues, participation of farmers in farmers’ associations, how farmers see the objectives of R,D&E organisations, years of involvement in dairy, age, and size of their business.

7.5.3 R,D&E in the regions studied

Farmers see R,D&E organisations with technical eyes. That can be observed through the results presented in Appendix 7.1. Farmers link research to improvements in production / productivity. Maybe the integration of research organisations with the production community is in their minds, but not expressed in the ways participants see the R,D&E organisations’ purpose. However, farmers expressed a wish to interact more with R,D&E people in the farm. A farmer said:

‘I would like to see people from R,D&E coming to my farm, seeing what we are doing, and discussing about what to do, instead of staying in their offices.’
R,D&E are in different stages in Australia and Brazil. In Australia, the public and co-operative or private processor extension services are not as close to farmers as in the two Brazilian regions. As a consequence, co-operative extension people in the Brazilian regions studied exert stronger influences on production community initiatives. Actually, it was observed during the study that managers of extension people spend almost 50% of their time discussing price and other political issues. This is a hint to co-operatives and R,D&E organisations to improve their employees’ skills in different subjects such as business management. Co-operative extension people in Brazil are a good link between farmers and processors, helping to keep farmers’ fidelity to the dairy industry, co-operative, processor, and organisation of farmers, as well as helping the diffusion of technologies and in the negotiation of milk price. In the North Coast of New South Wales, Australia, it was observed that the Subtropical Dairy Program, with its high participation of farmers and few local extension people, is taking the place of government extension service in terms of providing a forum for discussion of technical issues, although the extension activities are still carried out by the public extension staff. An interesting contrast in terms of sources of information is that the Australian farmers studied prefer papers, books or the Internet while the Brazilian farmers prefer lectures (few Brazilian farmers have computers).

7.5.4 Methodological contributions for extension science

7.5.4.1 Building trust quickly

Trust is essential to genuine communication on important issues. A researcher is usually perceived as an ‘outsider’, an ‘expert’, and narrowly focussed on technical topics, not a person with whom farming people could relax and discuss frankly a wide range of issues. Therefore it is important for the researcher, and extension staff to establish trust. However, the personal advice of some experienced extension academics such as Shankariah Chamala and Bruce Frank, the manners of arriving at the regions studied not behaving as an expert, breaking the image that I was there to discuss only production technologies, and staying on a farm were effective in establishing trust quickly and developing positive environment for talking with stakeholders. Doing
common jobs with the farmer’s family helped me to ascertain what farmers really think about dairy priorities in the region, instead of what they thought that I wanted to hear from them. The approach also shows that the traditional way of inviting only the male farmer to discuss the various issues, may need improvements, since during this research other members of the family often showed high interest in participating in the discussions. Encouraging participation by other family members may avoid jealousy and feelings of exclusion, which can generate, in the family, distrust of good R,D&E initiatives.

7.5.4.2 Identification of communication network

The relationship and trust developed with the first interviewees were used intentionally to help in the identification of the communication network, including off-farm stakeholders, using purposive sampling and the snowball technique. Participants were keen to identify farmers and other stakeholders who they believed, could be good participants in the study. Most of the time the interviewee made contact with the next interviewee for a chat; many of those recommended interviewees were off-farm people who gave more comprehensive answers to the questions in the semi-structured interviews. These people added their external view of farms or of the dairy industry. Some of these people gave a management view of the industry because they were in a management role.

7.5.4.3 Synergistic combination of individual with group interviews

The individual and group interviews returned different opinions. The individual interviews showed that production technologies were important for the farm business, but also included issues different from production technologies, like farm management and communication. The synergism of the FGMs put aside opinions about production technologies and concentrated discussion on off-farm issues and on-farm management issues. The important contribution to extension science is in the way the individual interviews were organised, giving people the opportunity to provide detailed information, even unpublishable details, that gave a deeper understanding of the community and also helped in making a selection of people who could actively participate in the group
interviews. The message for extension practice is that these methods combine well: they should be considered complementary, not as alternatives.

### 7.5.4.4 Broader image for R,D&E people, beyond the production technologies

Stakeholders are not stimulated by the traditional research approach to see R,D&E people as offering more than production technologies; this was confirmed in this study (see Appendix 7.1). Nor are researchers in production technologies stimulated to see the farm and community from the farmers’ perspective. The result of the usual conversation between farmers and R,D&E people is illustrated in Chapter 1 – Figure 1.2. The strategy developed for this research broke away from this usual way of seeing each other and improved the two-way understanding and engagement. The strategy facilitated the expression of farmers’ concerns about family, labour, and community issues to a researcher who became familiar to them after a few days of work with them. On the other hand, the researcher, by doing the different kinds of farm job with some families, could accelerate his understanding of regional issues. A typical farm situation that made me believe that there really was a pre-existing technological label for R,D&E people was described in Chapter 4. I had to display the attitude of someone who really wanted to work milking or in other dairy activities to make the farmer believe that I was not there just for production technology issues. That was the stage to get their real thoughts about their dairy and the other parts of their world. Most of the time they emphasised issues related to their family, education of children, and the need for farmers to organise themselves. I used this favourable environment to ask the farmer to introduce me to the next interviewee.

### 7.5.4.5 Broader view of production communities for more informed planning

A first and fast analysis of the importance of the strategy for R,D&E organisations may suggest to some researchers in production technologies that the strategy is useless in planning their R,D&E activities. But from another
perspective, the strategy lays the basis for effective planning. It provides to R,D&E people a broader angle from which they can consider what the major issues are before starting to present production technology issues. The strategy can make a positive difference in terms of quickly developing a holistic view of a production community for an organisation that wants to develop R,D&E activities and suspects that technology is not the main issue, but does not know what the main issues are. It enables the researcher to see the whole scenario and where technology can fit. By having a larger systemic view, also involving stakeholders from throughout the industry, one produces a different and more useful view of R,D&E needs. Technologies are seen in their context and needs beyond technologies become evident.

A strength of the strategy is that it was tested in three different regions in two different countries which are at different stages of the dairy industry, but returned similar results.

7.5.5 Implications of the research

This research brings arguments for new design of research teams as well as ways to improve the strategies to obtain support from production systems to develop research

7.5.5.1 Research and Extension teams in research organisations

The research and extension teams in research organisations was already mentioned by authors such as Guerin (1999), Cowan (1995), and Paine and Kenny (2002). This study, through comments of stakeholders demanding a more holistic view of production systems from researchers, reinforced the need for a diversified research team, such as the one that DPI Queensland assembled to study the five farm systems. Actually the Brazilian research and extension service was designed to act this way but that did not result in social issues being given higher consideration in Brazilian extension services. The involvement of extension staff and stakeholders in research organisations’ projects can return not only realistic priorities for designing R,D&E activities but
be beneficial in the following steps when the research trials are carried out and the results are ready to be demonstrated to the people in production communities. It seems that R,D&E organisations recognise the farmers’ knowledge, and that is acknowledged in the literature, but they do not make much effort to include farmers and other stakeholders in research or research teams. There seems to be a common written agreement about the need to involve stakeholders and a common unwritten agreement not to involve stakeholders in research and extension planning and development.

7.5.5.2 Opportunities identified in the study for better stakeholder support for R,D&E activities

Participation of stakeholders in research became a trend in Australia in the 2000s (see APEN conference 2001 and APEN forum 2003) and, in the same period a strong demand in the Brazilian regions studied. R,D&E organisations can take advantage of this. A positive result from the presented strategy is that after the field research, a farmer reported to me that he and other farmers took the initiative to organise a meeting to encourage and support research if it followed the strategy that I applied, and if they had effective participation in the different stages of research. This action implies a desire for a closer involvement of farmers and other stakeholders in research. A new model of systems research such as this offers new prospects for reducing gaps between theory and practice as reported by McCown (2001).

7.5.6 Contributions to my personal development

This study has provided the opportunity to enlarge my knowledge of extension science. My idea, before I started this Ph.D. course, was to identify the level of community knowledge of a dairy region in order to have a picture of what to offer. Through the learning process I found out that my approach would be a one-directional approach, if the stakeholders were not properly engaged in defining and prioritising activities by themselves. I found out that my best contribution would be as a facilitator to help them to describe what they wanted, rather than to have them answer closed questions, with their answers analysed by software. The focus of the study evolved as I consulted authors such as
Chamala, Coutts, Frank, Hamilton, Ban, Carberry, Carvalho, Cezar, Ison, Paine, Rogers, Guerin, Eponou, Gastal, Freire, McCown, Olinger, Pretty, and Scoones, and exchanged information with advisors and other people through the network that I developed during my research. My objective changed to that of developing a strategy to improve dairy research organisations’ holistic understanding of production systems by involving a broader range of stakeholders to exchange views, leading to the identification by the stakeholders of a comprehensive set of priorities for a dairy region, including specific priorities for R,D&E.

7.6 General observations and some stakeholder comments

During the study the strategy was under constant judgement by me while I was putting it into practice. This item summarises the notes that I made during the study.

7.6.1 The importance of establishing good relationships

The work at the farms made possible closer relationships with the stakeholders than would have been possible if I stayed in a hotel, and also increased my view of the whole puzzle (technical and social) of the realities of the regional farming systems. It also suggested to me that the image that R,D&E people have about farmers is incomplete; it is better to merge it with the opinions from stakeholders by staying and talking in hours of relaxation with farming families and the community.

The fact that the host farmers introduced me to other farmers for interviews created a favourable environment for accessing local knowledge and perceptions. Comments of host farmers that I was like them, instead of putting me at a disadvantage, made the introduced farmer more confident to tell me what he/she was really feeling. In addition, I felt this response was better when a farmer introduced me to the next interviewee, compared to when I was introduced by other R,D&E people. Despite the social and labour problems, I saw few gates limiting entrance to farmers’ houses and no fences separating
Brazilian agricultural farms in the regions studied. In Australia, the farm gates were always open.

The exchange of information that I promoted during the field research encouraged a group from Elegê Foods (a dairy processor) and of Brazilian co-operative managers from different dairy regions of Rio Grande do Sul state to visit Australia to exchange information and learn some skills (Photo 7.4).

7.6.2 Technical issues

Extension people from the participating co-operatives of the two regions in Brazil are working to improve the farmers’ skills in controlling their costs through computer programs, but the programs need to be improved to work as practical
management tools. On the other hand, I heard no farmer from the three studies talking about sitting in front of numbers to record or analyse their financial data or future plans and possible consequences. However, even though their business management skills need improvement, it became clear that dairy provides stability and more assets for the Brazilian farmers studied than any other agricultural industry.

I could find no identical milking routine in Brazil and Australia. However, the Brazilian farmers studied, especially the women, are gentler with cows than the Australian farmers studied. That may be explained by the number of animals that each farmer has to deal with.

### 7.6.3 General observations

An interesting observation is that, from the 1990s and early 2000s, it seems that extension science has been moving from having practitioners who are all agricultural graduates to having some who are social science graduates. There are an increasing number of students from social science developing studies in areas such as rural development, environmental issues or women’s or family issues. I also had a feeling during the field research that extension agents do not like to be called extension agents; the ones from private organisations, especially, seem to prefer a title related to consultants, perhaps in a bid to differentiate themselves from the social extension.

The most motivated extension people participating in meetings were over 45 years old. However, I noticed that young farm people became very interested when I treated them as having the same level of importance as stakeholders who had more tradition in the region. They were proud to be in that position and became more enthusiastic about participating. Nevertheless, I saw few activities in the three regions studied to show dairying activity for children at school or to advertise how good the dairy industry is as a way of life.

In terms of tradition, I did not expect to find Australian farmers mentioning selling their farms since they said they were in the industry mostly for the life
style and because, typically, families have a long tradition in the industry. However, the industry pressures, in terms of reducing milk prices associated with the need for an increased production scale, may be pushing them to rethink their expectation of staying in the business. Industry pressures are overtaking tradition. In addition, while sharing the day-by-day experience of Brazilian dairy farmers, I observed that they are not in the same daily rush as the Australian farmers interviewed, but they also have very little spare time. However, in Australia or Brazil, motivating participants became a strong issue in getting participation. R,D&E organisations seem to neglect motivation and in this study motivated farmers found time to talk to me beyond the pre-arranged 40 minutes of interview. Motivation could be important in helping farmers to help R,D&E efforts.

7.6.4 Observations from participants and R,D&E people consulted

Few interviewed stakeholders returned comments after I sent them the final report about their regions. But a number of verbal comments were made while I was in the field and accessible. The first positive result of the strategy came through the comments of two participants. A veterinarian and coordinator of extension people in one of the Brazilian regions studied said:

‘Your research shows points that are very similar to the ones that we found in a meeting of the extension people of the co-operative but with a broader view of the community issues’.

After reading the final reports of the Brazilian cases, a processor made the following comments:

1 – The issues that you studied, different from only technical issues, are the issues that I keep on raising comments on,
2 – We need to use your strategy in Embrapa Dairy to improve a holistic view of dairy regions, and
3 – Your research will change the research program of Embrapa Dairy.

After I presented a seminar about my study to researchers in animal science and economics researchers in Embrapa Dairy, I received these comments: (i) We are in need of a qualitative approach in Embrapa Dairy because we have almost only quantitative ways of working, (ii) you should compare your results with the Platform Project and Research program of Embrapa Dairy, and (iii) a Embrapa researcher in animal nutrition said he was in need of an approach like this, since he felt that farmers were not expressing their real thoughts about some farm issues.

Other comments were:

- I have to express my gratitude for the way Sergio devoted serious effort in his study. It is a great step for research to come to the grass-roots people to discuss their problems with them,
- Primary industry is many times the target of people without any commitment to farmers; we are glad that Embrapa is developing this kind of initiative; we hope that we can benefit from this action,
- This research shows clearly the lack of credibility that the industry has among the farmers at the moment,
- I am happy for the opportunity to express my opinions about priorities in so democratic a way,
- We would like to have more meetings with people from different parts of the dairy industry,
- Thanks for returning the results of your study to our community; many researchers come, collect data, and never return the results.

In the next chapter, General Conclusions, a review of the objectives of the research together with the lessons and key findings of this study for extension, as well as limitations of the study and suggestions for future studies are presented.
Chapter 8: General conclusions

8.1 Foundation of my study

Dairy plays an important role in both Australia, as main supplier of the domestic market and an export industry, and Brazil, as a support food industry and as an export industry with potential for growth. R,D&E has been critical to the successful development of the dairy industry in both countries. The Australian and Brazilian dairy R,D&E organisations have developed technologies that have helped their industries to achieve world importance. Owing to their missions, they continue to have a major responsibility for providing solutions for the sustainable development of the dairy industries in their respective countries. If they do not satisfy this objective, sooner or later they will not have support. However, there are many topics to which research efforts could be directed. Finding the right priorities for R,D&E is paramount to effectively help the stakeholders in dairy, as in all the agricultural industries.

The present Australian and Brazilian dairy R&D organisations’ methods to identify priorities for R,D&E activities can be improved by stakeholders’ interaction and involvement in the process, in order to focus design of R,D&E activities that will address those priorities. To make improvements I have reviewed the theories related to this subject, especially adoption studies, communication theory, behaviour theories, community studies and systems theory. The main objective of my research was to develop and test a strategy to involve a broad set of stakeholders in a dairy community, in order to obtain a holistic view of their priorities for R,D&E and to help R,D&E people to understand the dairy farms and production realities of small regions. In addition, the R,D&E priorities in one Australian and two Brazilian regions, including the views of different groups of stakeholders within each region, were also documented and compared. The strategy thus developed and tested will complement the strategies presently employed by Dairy Australia and Embrapa Dairy.
8.2 Lessons from the literature and its practical use

The literature reviewed showed that the extension approaches developed in recent years include several improvements when compared to the early Transfer of Technology approach, mainly in terms of transition from a one-way delivery of information to a two-way communication with stakeholders. The literature confirmed that farmers exchange opinions and make decisions by consulting a diversity of people in their community, and R,D&E does not always have the major say. There is a diversity of stakeholders who form a communication network which represents the community knowledge, and can be better understood through systems theory. However, while the extension models reviewed satisfy part of what can be accomplished through systems theory and systems thinking, they need improvements to generate a holistic picture of production systems. That should be done by involving the main elements of the production community, from the farm family and its production issues to the industry and its participants beyond the farm gate, involving the whole of the communication network. The dairy region communication network should be identified, and its members challenged to think about the best directions for themselves and about priorities for R,D&E activities, considering the regional, national and international dairy environments. These people and the synergism of their discussion can bring their experience and intrinsic knowledge to benefit R,D&E projects. On the other hand, R,D&E people need to improve their understanding of production communities’ issues beyond production technologies, in order to achieve two-way engagement. In addition, the literature suggested me that extension is being pushed towards an information management role.

My challenge was to combine systems theory with behavioural theories, communication theory and community literature. ‘Ice breakers’ to introduce me to the production community, purposive and snowball sampling and some lessons from the literature about trust played an important role in the design and outcomes of the study. By removing my usual ‘research shoes’ and getting involved in the day-by-day work of the farms, I could change my position from that of an ‘outsider’ to that of an temporary ‘insider’, build stakeholders’ trust in
me, and so have a better picture of the farm and community production system, and the people's choices of priorities.

8.3 Key findings of the study related to extension science

A strength of the strategy is that it was tested and compared in three different regions in two different countries that are in different stages of the dairy industry.

8.3.1 An effective way to establish trust quickly

The concern about trust revealed through my networking and in the literature was a key point to be addressed in the methodology in order to achieve the objectives of the study. Trust and participation of farmers and their families could be achieved with participation in the day-to-day farm work; it broke the image that I was there to discuss only production technologies. During the field research I realised that the effort needed to achieve trust consisted mainly in showing normal human values and following ethical behaviour. This behaviour returned much more than it cost. It returned support and engagement of participants and even reduction of the research budget. Another positive result was the ‘ripple effect’. Trust from the first farmers interviewed spread to the next participants.

The approach of staying on a farm and thus getting to know the family also revealed the importance of involving family members in extension issues. It revealed that the traditional way of inviting only one farmer to participate in an activity, usually the male farmer, may need improvement since other members of the family often showed high interest in participating in the discussions. The farmers said that the first people whom they consulted about technical issues were, usually, the family members (see Appendix 7.1). When not invited, some family members can act to make farmers distrustful of useful R,D&E initiatives.
8.3.2 An effective method of identifying and involving members of a communication network

An effective method of identification and involvement of members of a communication network was particularly important to achieve the objective of involving a broad set of stakeholders who influence the industry, and exchange information and ideas within a dairy community. The relationships and trust developed were used intentionally to enlist the help of interviewees in identifying further farmers and other stakeholders from their communication network who they believed could have good ideas. Many of those thus identified were off-farm people who gave rich answers to the questions in the semi-structured interviews. These people added their external view of farms or of the dairy industry, providing a holistic view of the production community. Some of these people gave a management view of the industry because they were in a management role. The snowball technique used with interviewed stakeholders brought names that extension agents had not identified in the purposive sampling.

8.3.3 Benefits of involving different sets of stakeholders: different behaviour and different priorities

The intention to involve different groups of participants to see if they have different views of their regional priorities returned the expected results. The groups Research and Extension (RE) and Input Market, Processors, Credit and Others (Off-farm) showed a broader view of the industry compared to the Farmers (F) group. In both countries the F group concentrated on regional activities and production technologies (Pasture, Nutrition, Genetics, etc), while the RE and Off-farm group also nominated the regional activities and production technologies but added suggestions for exchange of information with other production systems and organisations to show a variety of ways of dealing with their farming issues. The groups F, RE and Off-farm had different viewpoints in each region studied. This may indicate the differences in community knowledge.
8.3.4 Benefits of a combination of individual with group interviews

The individual and group interviews seem to be complementary in generating results and data. The individual approach gave the opportunity to build trust and was useful for a deeper understanding of the stakeholders, farm issues and their communities. It was also useful in selecting people who could participate actively in the FGMs. The synergism of the FGMs pushed aside opinions about production technologies and resulted in a concentration on off-farm issues and on-farm management issues.

8.3.5 Changing images to help R,D&E obtain a holistic view of a farming system

Stakeholders are not usually stimulated to see R,D&E people as more than suppliers of production technologies, nor researchers to see the farm and community from the farmers’ perspective. The result of the usual conversation between farmers and R,D&E people is illustrated in Chapter 1 by Figure 1.2. The strategy developed broke this usual way of seeing each other only in terms of their main roles. At the beginning, farmers insisted on showing me technological issues, but after I put on working clothes and shared some farm and home activities, their image of me solely as a technologist, started to change. This change of image also happened when I was introduced to other stakeholders or even through the grapevine. The strategy facilitated the farmers to express their concerns about family, labour, children’s education and community issues to me. On the other hand, by doing the different kinds of jobs, I could accelerate my own understanding of regional issues, which was one of the objectives of the study.

8.3.6 A way of rapidly developing a holistic view of a production community

Embrapa Dairy and Dairy Australia methods have proved very useful, but they have not been able to identify certain vital issues that the strategy presented here has shown to be of the highest priority for farming stakeholders; these are issues beyond production technologies, such as family issues or reasons to stay in the industry. The strategy can provide R,D&E people with a broader view
of what the major issues in a region are, before they start to develop and present production and other technologies to the farming community. The strategy can make a positive difference in terms of giving a rapid holistic view of a production community to an organisation that wants to develop R,D&E activities but does not know what the main issues are. It can enable the organisation to see the whole scenario and where technology or other industry improvements can fit. By having a larger systemic view by also involving stakeholders from throughout the industry, one can produce a different and more useful view of R,D&E needs.

8.3.7 Farmers and other stakeholders want effective participation in research

Engagement of stakeholders in extension research began in the 1990s and became a trend in Australia in the 2000s (papers presented at APEN conference 2001 and Apen forum 2003) and is a strong demand in the Brazilian regions studied. R,D&E organisations can take advantage of this. A valuable result from the strategy is that during my report back of results to stakeholders, a farmer told me that he and other farmers had held a meeting to encourage and support research. They would welcome research if the researchers followed the strategy that I applied and if they had effective participation in the different stages of research. That implies a demand for closer involvement of farmers and other stakeholders in research. A new model of systems research to address this demand offers new prospects for reducing gaps between theory and practice. It also seems to be a worthwhile initiative to include stakeholders from production communities in R&D teams, since they can provide useful insights for the application of existing technologies to their regions, or in their development.

8.3.8 Farmers and other stakeholders want R,D&E people as partners in off-farm issues

While participants in the individual and group interviews wanted to participate effectively in research, they also included R,D&E people as desirable partners in off-farm issues such as Industry Policy. The demand for participation of
R,D&E people in such issues could be observed in suggestions such as feasible credit interest associated with technical advice (Alto Jacuí, Brazil), extension people from processors visiting farmers more frequently to identify the different issues (Australia) and more help of Embrapa to plan the dairy industry directions (Alto Jacuí, Brazil). R,D&E people not have been trained to play the role of dairy industry managers. However, it was mainly extension agents who could be found playing this role in the three regions studied and this subject reinforces the need for more studies in community development.

8.4 Main implications of the study

8.4.1 The need for a different approach to stakeholders and holistic views of production communities

The study shows in the individual interviews that stakeholders label R,D&E people as technologists (see Appendix 7.1). By changing that image to permit considerations about several other issues that influences the decisions of farmers and the production community, R,D&E can benefit by acquiring a more holistic picture of the community and a better evaluation of the importance of technology innovations for the production community. Changing the image can bring other benefits, namely, facilitating the involvement and engagement of a variety of stakeholders and the identification of the communication network. The identification of the community network of communication should be highly considered in a study which has the aim of obtaining a holistic view of a production community.

8.4.2 The need for research and extension teams

The need to organise combined research and extension teams in R,D&E organisations has already been mentioned by authors such as Cowan, Guerin, and Paine in 1995, 1999 and 2002. This study, through comments of stakeholders demanding a more holistic view of production systems on the part of researchers, reinforced the need for diversified research teams, such as one that a DPI Queensland group organised to study five farm systems (Andrews 2002). Research and extension are intended to act in this way, but this seldom
happens and is diversified teams are constantly raised as a necessary link. Research and extension teams can enlarge their roles from those of deliverers of technologies to those of innovation managers involving intrinsic knowledge from stakeholders, when stakeholders are attracted as active participants. Policies like dollar – for – dollar funding may encourage the development of this kind of team.

The involvement of extension staff and stakeholders in research organisations’ projects can guide not only the design of R,D&E activities, but also when research is trialled and when the results are ready to be demonstrated to the people in the production communities.

8.5 Key findings related to the regions studied

8.5.1 Priorities

If a new R,D&E program for the three regions had to be created, it should stress Communication, Finance and Farm Management as these were cited as priorities in the three regions, both in the individual and group interviews (see Chapters 5 and 6). Pasture should also be included because it was listed, as was Farm Management, as a potential technology to be developed in balance with a strong interactive program to enhance the communication of the findings.

8.5.2 People issues

In the three regions studied, family is paramount as the first forum for discussing dairy technologies, followed by R,D&E people (see Appendix 7.1). R,D&E people should consider that most of the time, technologies are presented only to a fraction of the decision-making people of the farm, the farmers. The message has to be strong enough to convince the farmers, so that in their turn, they will advance enough arguments to convince the families as well. R,D&E should improve family participation in its actions. Unfortunately this goes against the trend of group advice where usually only one member of the farm family is involved.
8.5.3 R,D&E

Farmers see R,D&E organizations with technical eyes (see Chapter 1 and Appendix 7.1). Maybe the integration of research organizations with the production community is in their minds, but not expressed in the ways participants see the purpose of R,D&E organisations. However, farmers showed that they would like to interact more with R,D&E people in the farm. A farmer said:

‘I would like to see people from R,D&E coming to my farm, seeing what we are doing, and discussing about what to do, instead of staying in their offices.’

8.6 Limitations of the strategy

In the design of a study similar to this, it is necessary to evaluate the time available for the study since the strategy tested is time consuming; it is necessary to spend about two months working exclusively in one region from obtaining trust to have an ample description and discussion of the priorities of the region. The strategy also demands more than recently-graduated staff; it needs people who have an open view of what a farming community is in order to ascertain what the general needs and priorities of the people in the production community are.

The sampling methods, purposive sampling and snowball technique, worked as expected to identify the communication network; however it is necessary to set boundaries to the number of issues to be discussed, and to the number of stakeholders those who really exchange information and ideas and exert influence in the production community should be the focus, to be involved, to avoid becoming lost in too much data with little information.

The number and objectives of questions should be revised; some questions about the identification of the interviewees as well as their perceptions of R,D&E mission or services can be removed from the interviews to reduce the time
spent in each interview. On the other hand, this should be done carefully since those questions provide a brake between more challenging questions and easier-to-answer questions providing a smooth flow of the interview.

The Feedback to stakeholders of the FGM report in order to obtain further contributions from them did not work as expected. It helped to validate the findings but it seems that the participants did not read the report carefully. It seems that they do act in the way they described in the interviews, ‘do not read much printed material’. However, my report back to the regions, particularly in Brazil, commanded more interest than my first visit when I presented the study objectives. This reinforces the need for direct contact of R,D&E with stakeholders.

### 8.7 Suggestions for future practice and research

The first suggestion with a practical objective is that research organisations have a researcher or extension person to specialise in making first contacts with stakeholders and organisations and working with them to develop the identification of regional needs. This person must be good at building relationships and able to see the industry in broad terms. The second suggestion is related to the time required to develop the study. The involvement of local students of agricultural colleges and regional universities with an experienced researcher to develop studies of a similar nature or related to production technologies can increase trust in the research and extension team, increase the interest of young people in agricultural industries, introduce students to science and increase the capacity to write more articles.

In terms of future research, it would be important to study which groups of stakeholders have more or less influence on the directions of a production community, either in terms of industry policy, industry structure, industry initiatives and R,D&E demands. Agricultural researchers should also study the boundaries of involvement of people in production communities in order to save time and not become lost in data. Since this study indicates that, for farmers, family concerns are paramount and family is the first forum for discussing
production technologies initiatives, researchers aiming to improve the participation of farmers should study the influence of the family members on dairy business.

It would also be important to study alternative ways to communicate research findings based on stakeholders’ suggestions; those suggestions should be enriched by communication theory principles to compose an effective way to deliver R,D&E results. Studies should be done on the basic format of a message for farmers, taking into consideration that it should be simple, that farmers have to transmit the information to their families, that the message should be enough to enable discussion in the family environment, and that a source to solve doubts should be provided. Labour studies should also be carried out since this was considered a great deal among stakeholders. The studies could be in terms of increase productivity of labour as well as studies in ergonomics.

### 8.8 Final words

This study has argued that agricultural R,D&E organisations should expand the involvement of stakeholders in the design of their activities to improve the design of R,D&E programs so that they meet industry needs comprehensively by involving a broad range of stakeholders in order to increase their understanding of regional production systems holistically. Current Australian and Brazilian dairy R,D&E organisations initiatives are effective in many ways but still are criticised and show room for improvement. This improvement can be achieved by involving a diversity of stakeholders who can offer a more holistic view of the regional dairy industry and provide a sense of the relative importance of production technologies and other needs for a production region.

Deeper contact with the farming system and production community in day-to-day relationships is very useful in changing the image of a researcher as someone who wants to talk only about production technologies. In this study, this type of contact also returned trust, real thoughts and involvement of stakeholders, particularly from farmers.
The use of in-depth interviews with group interviews brought different and complementary results. The first showed more farm concerns and the second pointed to a wider set of priorities. This combination of interview types can give to R,D&E researchers the opportunity to understand the broad scenario of an industry and region before selecting specific activities. In this study, a variety of stakeholders was engaged, including, importantly R,D&E people (two-way engagement). Local knowledge was accessed, a holistic picture of the dairy industry in the regions obtained, and priorities for R,D&E were identified. In addition, the priorities identified partially match with the present research projects in Embrapa Dairy and Dairy Australia, but provide directions for additional studies that are needed by stakeholders, such as more studies on improving labour productivity or making the labour less hard for farmers. For myself, the study has been an opportunity to enrich and clarify my way of seeing extension and production communities, and a preview of my future studies and challenges as a researcher of a dairy research organisation.
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Appendices

Appendix 1.1 - Trends that affect the dairy industry environment

In both Australia and Brazil there are rapid changes occurring in the dairy industry macro environment. These changes are sometimes not noticed in the microenvironment of the farm, due to the labour intensive nature of family farms, and the traditionally weak links between production and marketing. Trends are signs of changes in the external environment that need to be discussed in a cooperative framework, to plan integrated activities for the dairy community as a whole and to demand activities from Research, Development and Extension (R,D&E). Present trends include:

- *The World Trade Organisation (WTO) is slowly facilitating a free global market* – this is likely to lead to reduced subsidies or dumping of milk product (Milkpoint 2000; Carvalho 2002a). Australia and Brazil are following this trend and deregulating their markets, and share the common goal of reducing subsidies for dairy exporters in the northern hemisphere.
- *In the long run, countries with low cost milk systems tend to increase exports* – Countries that have high production costs tend to reduce production until there is very little surplus for export (Fonseca 2001).
- *There is continuing demand for dairy products with low price and high quality.* Australia and Brazil are preparing the dairy industry for price and quality competitiveness in the international market (Dairypage 2001; ADC 2000).
- *Higher production of milk per farm*
- *Environmental consciousness is placing pressure upon production systems* - All farmers face increased requirements for the control of chemical residues and the sustainable management of natural resources (MA 1999).
- *Demand for organic products is increasing* – There is an opportunity for some farmers to use old technologies that produce milk products suited to the organic market (Milkpoint 2002a, 2003).
- *An increasing diversification of milk products* – The variety of products is increasing and gaining market acceptance (Wegener 1993), and this trend will influence the requirements for raw milk quality.
- *Supermarkets applying pressure to reduce milk price* – In countries like Australia and Brazil, the supermarket organisations are gaining greater market share, and are able to influence milk price to processors and farmers (Alves 2002; Chamberlain 2001a; Carvalho 2002b).
- *Intensification on farm to reduce costs* - Low prices for milk force actions to improve the productivity of labour, land and cows (Hoekema 2000), and this usually means a greater volume of production from present farms. Price incentives often encourage this trend (Milkpoint 2001a).
- *Decreasing number of farmers* – A long term trend, hastened by the combined effects of deregulation of the market and increasing quality requirements (ADC 2002; Milkpoint 2001b, 2002b).
- *Higher participation of specialised consultants in farmer decision making* – There is a decreasing number of Extension agents and farmers often pay for a range of specialised services (Ban 2000).
- *Higher participation by farmers in industry decisions* – Farmers are organized in a way which enables them to have input to R,D&E (SDP 1999),
Appendices

- **Joint decisions on R,D&E activities with Government and the private sector** – An increasing proportion of R,D&E funds come from industry levies or private investment (AFFA 2002; ADC 2000; Chamberlain 2001b), as governments are reducing resources to R,D&E (Ban 2000).
- **Change of R,D&E focus from education to learning** - Consistent with greater industry involvement in R,D&E and increased need for farmers to make decisions based on multiple sources of information (Coutts 2000).
- **Women’s participation in management decisions** (Fambis 2003; Fenasoja 2002; Boletim Pecuário 2003).
Appendix 1.2 - Embrapa Dairy Cattle Home page – www.cnpgl.embrapa.br

Embrapa - Brazilian Agricultural Research Corporation
The Brazilian Agricultural Research Corporation - Embrapa, of the Agriculture and Food Supply Ministry, created in 1973, has the institutional mission to provide solutions for sustainable development of the Brazilian agribusiness by generation, adaptation and communication of knowledge and technologies for social benefit. With its 8,660 employees, including 2,063 Research scientists with M.Sc. (52%) and Ph.D. (47%) degrees, the Embrapa’s R&D program covers the main agricultural Brazilian products and all the Brazilian ecological conditions through the National Agricultural Research System, with participation of its 37 research centres, and several regional research organizations, universities and other public and private institutions acting in a cooperative network under its coordination.

Embrapa Dairy Cattle Research Center
The National Dairy Cattle Research Center – Embrapa Dairy Cattle was established in 1976 as one of the corporation’s units devoted to a specific commodity. In line with the Embrapa’s Master Plan, its institutional mission is to provide solutions for sustainable development of the Brazilian dairy agribusiness, with emphasis on the primary sector, by generation, adaptation and communication of knowledge and technologies for social benefit. Among the total 295 employees, there are 60 research scientists, 175 technicians and 60 administrative personnel. Most of the scientific staff have more than 15 years of experience in research and post-graduate study in all relevant issues concerned with dairy cattle production systems. Embrapa Dairy Cattle has three main physical facilities: the headquarters, in the Federal University of Juiz de Fora’s campus, Minas Gerais State, with 8,500 m2 of buildings; Coronel Pacheco Experimental Station, 40 km from Juiz de Fora, with a total area of 1,050 ha; and Santa Mônica Experimental Station, 150 km from Juiz de Fora, in Valença, Rio de Janeiro State, with total area of 1,800 ha.

Embrapa Dairy Activities
In the headquarters, modern laboratories are installed for basic research and assistance to advanced studies on embryo transfer, in vitro fecundation, molecular genetics, gene mapping and parasite resistance. The laboratories are also all equipped with intranet/internet and interactive videoconference systems. In the experimental stations 2,000 cattle are kept, including Zebu, Holstein and their crossbred offspring, with nearly 500 dairy cows yielding more than 2 million litres of milk per year. In the Coronel Pacheco Station, besides the analytical research facilities, two experimental dairy cattle systems – one based on tropical pastures and the other in confinement – have been used as demonstration units for the Centre’s technologies. In order to enhance its transfer capacity by means of technological courses and trainee programs, adequate training structure is also available, especially for extension agents, technical assistants, technicians and students. Embrapa Dairy have created three regional offices of integration at North, South and Center-West of the country to identify demands for research and maintain a strong relation with the different production systems. Over the last 25 years, a large set of technological information, products and services has been offered by the Center in order to improve the current performance of dairy production systems in the tropics. Some examples are: sugarcane-urea mixture for feeding dairy heifers and cows during the dry season; rotational grazing with tropical forages; Pioneiro®, a new elephant-grass cultivar for grazing; winter grasses for dairy cow feeding; early weaning; raising methods for calves and young heifers; Papilomax®, an ointment against cattle wart; milking care and milk quality; integrated control of parasites in dairy cattle; manure management in confinement systems; computerized systems for dairy farm monitoring and administration; standard accountancy to calculate the milk price from 1987 till 1991; and milk production systems based on pastures and on confinement.

1 5479 litres/day or 15.6 litres/cow/day with about 70% of the cows milking

251
Appendix 3.1 - Setting the scene of the regions studied

<table>
<thead>
<tr>
<th>Farmer interviews</th>
<th>Australia 56%</th>
<th>Brazil – Santa Rosa 48%</th>
<th>Brazil – Alto Jacui 61%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>83% over 41 and 97% over 31 years old</td>
<td>57% over 41 and 93% over 31 years old</td>
<td>67% over 41 and 89% over 31 years old</td>
</tr>
<tr>
<td><strong>Years in dairy</strong></td>
<td>Of 32 interviewees 66% had more than 21 years and 93% had more than 10 years in the dairy</td>
<td>Of 34 interviewees 21% had more than 21 years and 79% had more than 10 years</td>
<td>Of 41 interviewees 39% had more than 21 years and 80% had more than 10 years</td>
</tr>
<tr>
<td><strong>Major income</strong></td>
<td>Of 20 farmers only 2 had incomes from urban areas and 9 from other farm sources, usually related to dairy</td>
<td>Of 20 farmers no one had urban income, and 18 had incomes from other sources (mainly soy bean, corn, pig)</td>
<td>Of 27 farmers no one had urban income, and 23 had incomes from other sources (mainly soy bean, corn, pig)</td>
</tr>
<tr>
<td><strong>Farm size</strong></td>
<td>Of 20 farms, 90% had more than 100ha</td>
<td>Of 20 farms only 5% (1 farm) had more than 100ha. 85% had more than 20ha</td>
<td>Of 27 farms only 11% (3 farms) had more than 100ha. 100% had more than 20ha</td>
</tr>
<tr>
<td><strong>Milk production</strong></td>
<td>Of 20 farms 100% had more than 1400 litres a day</td>
<td>Of 20 farms no one had more than 1000 litres a day and no one less than 100. 45% produce more than 300 litres a day.</td>
<td>Of 27 farms 22% had more than 1000 litres/day; no one had less than 100. 74% produce more than 300 litres a day.</td>
</tr>
<tr>
<td><strong>Number of cows</strong></td>
<td>In 19 farms no one had less than 100 cows, 74% had more than 150 cows</td>
<td>In 20 farms no one had less than 10 cows, 75% have 10 – 29 cows and no one had more than 50 cows</td>
<td>In 27 farms no one had less than 10 cows, 55% had more than 30 cows</td>
</tr>
<tr>
<td><strong>Milking cows</strong></td>
<td>Of 19 farms, 89% had more than 80% of cows milking, 83% is good %</td>
<td>Of 20, 65% had more than 80% of cows milking</td>
<td>Of 27, 82% had more than 80% of cows milking</td>
</tr>
<tr>
<td><strong>Milk/cow/day</strong></td>
<td>In 20 farms no one had cows producing less than 9.9 l/day, 60% produce more than 16 l/day.</td>
<td>In 20 farms no one had cows producing less than 9.9 l/day. 60% produce more than 16 l/day</td>
<td>In 27 farms no one had cows producing less than 9.9 l/day. 63% produce more than 16 l/day</td>
</tr>
<tr>
<td><strong>People involved</strong></td>
<td>In 20 farms, wife participated in 45% of the labour force, son &amp; daughter 45%, other from family 20% and only in 30% cases the farmer was working</td>
<td>In 20 farms, wife participated in 70% of the labour force, son &amp; daughter 50%, others from family 38% and 0% of farms had the farmer working alone</td>
<td>In 27 farms, wife participated in 85% of the labour force, son &amp; daughter 63%, others from family 30% and 4% of farms had the farmer working alone</td>
</tr>
<tr>
<td><strong>Employees</strong></td>
<td>Of 20 farms, 14 had casual or permanent and 6 no employees</td>
<td>Of 20 farms, 5 had casual or permanent and 15 no employees</td>
<td>Of 27 farms, 12 had casual or permanent and 15 no employees</td>
</tr>
</tbody>
</table>
Appendix 3.2 - Milk production, milked cows, productivity per cow in Brazil


<table>
<thead>
<tr>
<th>Year</th>
<th>Milk production (millions/year)</th>
<th>Milked cows (thousands of head)</th>
<th>Productivity (litres/cow/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>11.162</td>
<td>16.513</td>
<td>676</td>
</tr>
<tr>
<td>1981</td>
<td>11.324</td>
<td>16.492</td>
<td>687</td>
</tr>
<tr>
<td>1982</td>
<td>11.461</td>
<td>16.387</td>
<td>700</td>
</tr>
<tr>
<td>1983</td>
<td>11.463</td>
<td>16.276</td>
<td>704</td>
</tr>
<tr>
<td>1984</td>
<td>11.933</td>
<td>16.743</td>
<td>713</td>
</tr>
<tr>
<td>1985</td>
<td>12.078</td>
<td>16.890</td>
<td>715</td>
</tr>
<tr>
<td>1986</td>
<td>12.492</td>
<td>17.330</td>
<td>721</td>
</tr>
<tr>
<td>1987</td>
<td>12.996</td>
<td>17.774</td>
<td>731</td>
</tr>
<tr>
<td>1988</td>
<td>13.522</td>
<td>18.054</td>
<td>749</td>
</tr>
<tr>
<td>1990</td>
<td>14.484</td>
<td>19.072</td>
<td>760</td>
</tr>
<tr>
<td>1992</td>
<td>15.784</td>
<td>20.476</td>
<td>771</td>
</tr>
<tr>
<td>1993</td>
<td>15.591</td>
<td>20.023</td>
<td>779</td>
</tr>
<tr>
<td>1994</td>
<td>15.784</td>
<td>20.068</td>
<td>787</td>
</tr>
<tr>
<td>1995</td>
<td>16.474</td>
<td>20.579</td>
<td>800</td>
</tr>
<tr>
<td>1996</td>
<td>18.515</td>
<td>16.273</td>
<td>1.138</td>
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<tr>
<td>1997</td>
<td>18.666</td>
<td>17.048</td>
<td>1.095</td>
</tr>
<tr>
<td>1998</td>
<td>18.694</td>
<td>17.280</td>
<td>1.082</td>
</tr>
<tr>
<td>1999</td>
<td>19.070</td>
<td>17.395</td>
<td>1.096</td>
</tr>
<tr>
<td>2000</td>
<td>19.767</td>
<td>17.885</td>
<td>1.105</td>
</tr>
<tr>
<td>2001</td>
<td>20.510</td>
<td>18.194</td>
<td>1.127</td>
</tr>
<tr>
<td>2002</td>
<td>21.643</td>
<td>19.005</td>
<td>1.139</td>
</tr>
<tr>
<td>2003(1)</td>
<td>22.595</td>
<td>19.195</td>
<td>1.177</td>
</tr>
</tbody>
</table>

(1) Prepared by R.ZOCCAL, Embrapa Dairy

Source: IBGE (Censo Agropecuário e Pesquisa da Pecuária Municipal)
Appendix 4.1 - Funding and research providers

Dairy Australia (after 2003) ex Dairy Research and Development Corporation
Dairy Australia is the Research management arm of the Australian dairy industry. It seeks to enhance the competitive position and sustainable prosperity of the Australian dairy industry by funding Research and Development (R&D), and learning processes. It does not conduct R&D itself but supports organizations - such as departments of agriculture, universities, CSIRO and, in some cases, farmer groups in scientific, social and economic projects. The organization focuses on achieving deliverable outcomes for the dairy industry and the community.

Tropical Dairy Research Centre
The TDRC provides a professional service with projects developed under seven program areas. These programs have the aim of enhance farm profitability and enable farmers to manage their farms in a sustainable manner. The technical programs are: Information and Extension, Feed Systems Management, Animal Management, Milk and Processing, Farm Business Management, Catchment Management, Human Resource Management. The Research, development, extension, education and training meet the needs of clients of TDRC, including farmers and milk processors, governments, agribusiness and international agencies.

CAPES
Coordination for Enhance of Graduated Professionals Foundation, is a government entity linked to the Ministry of Education – MEC. It was created in 1951 and changed to a Foundation in 1992. During the years CAPES has subsided the Ministry of Education with policies of post-graduation providing scholarships in specific areas where there is the needs for qualifications helping mainly the education at university. Is the only agency for scholarship that maintains an evaluation of the education quality of the universities.

University of Queensland
The University of Queensland is a leader among Australia's 38 universities, recognized internationally as a premier research institution. It is one of only three Australian members of the elite Universitas 21 - a global alliance of 20 universities committed to quality enhancement through international benchmarking. In 1998 the University of Queensland was declared the Good Universities Guide's Australian University of the Year.

Embrapa - Brazilian Agricultural Research Corporation
The Brazilian Agricultural Research Corporation - Embrapa, of the Agriculture and Food Supply Ministry, created in 1973, has the institutional mission to provide solutions for sustainable development of the Brazilian agribusiness by generation, adaptation and communication of knowledge and technologies for social benefit. With its 8,619 employees, including 2,221 research scientists, the Embrapa’s R&D program covers the main agricultural Brazilian products.

Elegê Foods
Elegê Foods is the forth largest Brazilian dairy processor with and annual processing production of 711 million litres.
### Appendix 4.2 - Main issues of the study

<table>
<thead>
<tr>
<th>Main issues</th>
<th>Description of the main issue</th>
</tr>
</thead>
</table>
| Setting the scene | Study areas – Cities, regional profile, industry profile/organisation
Interviewees - Identification of the interviewee (gender, age); years in the dairy industry; major income of farms; farm size, milk production, number of cows (total, milking, and milk/cow/day), people involved, and employees. |
| Integration of R,D&E with the community and farmers | Do you know what is (Name of R,D&E organizations)? Do you participate in those organizations meetings? Do you know their purpose? With whom do you discuss dairy technological issues first? Where do you do it? What is your main source of information? Are you a member of dairy organizations? Do dairy industry stakeholders work together to reach their common goals? and How can we encourage the introduction of good ideas in the community? |
| Why the farmer chose dairy and what the farmer’s personal goals are | What made you select the dairy business? What are your goals in the dairy business? What are your personal goals? and Will you stay in the dairy industry? |
| Dairy Good, Bad things and Potentials | What are the good and bad things that contribute to profitability of dairy business? and for the industry? What has potential to work well? |
| Sub-systems of concern for a farm | After showing trends of the dairy industry in the world and particularly in Australia and Brazil the following question was asked, Which are the subsystems of a dairy farm that you consider of high concern? |
| Priorities for region | If you were a manager of an R&D or Extension organisation, what issues would you work on first? If the answer was too vague (e.g. nutrition) I asked: Can you be more specific? Any other issues? |
| FGM issues | What are the strengths and weaknesses of this region for dairy? Named, discussed, and converged in FGM through virtual investment |
Appendix 4.3 - Quantitative and Qualitative basic dairy data collection from the dairy region

- Informal collection in preliminary action carried out in meetings with the R,D&E people of the region.
- Objective: Obtain available quantitative and qualitative data from the dairy regions studied.

<table>
<thead>
<tr>
<th>ITEM and DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region boundaries, Cities:</td>
</tr>
<tr>
<td>( ) n. of farmers ( ) n. of dairy farmers ( ) Herd size (cows)</td>
</tr>
<tr>
<td>Activities (crops, industries, tourism): Dairy,</td>
</tr>
<tr>
<td>Number of stakeholders (estimation): ( )Input market, ( )R,D&amp;E people, ( )Processors, ( )Credit</td>
</tr>
<tr>
<td>Number of farmers ( ) Do you have the address? Can I have a copy?</td>
</tr>
<tr>
<td>( ) Production of the region litres/day, ( ) n. processors ( ) Processor's names:</td>
</tr>
<tr>
<td>Milk price variation: ( ) summer, ( ) autumn, ( ) winter, ( ) spring</td>
</tr>
<tr>
<td>Main breeds ( ) Holstein ( ) Jersey ( ) Schwyz ( ) others:</td>
</tr>
<tr>
<td>Main production system (%):</td>
</tr>
<tr>
<td>( ) pasture ( ) pasture + concentrate ( ) pasture + concentrate + silage/hay ( ) feed lots</td>
</tr>
<tr>
<td>Main pasture: Tropical - ( ) Green/Gatton panic ( ) Rhodes ( ) Setaria ( ) Kikuyu ( ) other;</td>
</tr>
<tr>
<td>Temperate – ( ) Ryegrass annual ( ) perennial ( ) other:</td>
</tr>
<tr>
<td>Main weed problems:</td>
</tr>
<tr>
<td>Main Crops used to feed cows</td>
</tr>
<tr>
<td>Main silage used to feed cows</td>
</tr>
<tr>
<td>Number of R,D&amp;E people for dairy: ( ) Vet, ( ) Research, ( ) Extension ( ) Other: total:</td>
</tr>
<tr>
<td>Do you have names and addresses?</td>
</tr>
<tr>
<td>Sources of credit for farmers:</td>
</tr>
<tr>
<td>What is the common reaction among farmers about deregulation and what do they suggest?</td>
</tr>
<tr>
<td>Social meetings not for work: ( ) church ( ) club ( ) Other:</td>
</tr>
<tr>
<td>Social meetings for work:</td>
</tr>
<tr>
<td>Educational available level: Primary education High school Uni Tafe Agricultural education</td>
</tr>
<tr>
<td>political issues for dairy at the region: weak medium strong</td>
</tr>
</tbody>
</table>
Appendix 4.4 - Semi structured interview (proforma)

The University of Queensland
School of Natural and Rural Systems Management
Sponsors: Embrapa, Capes, TDRC, SDP

Sergio Rustichelli Teixeira
Supervisors: Helen Ross, Tom Cowan, Shankar Chamala

Presentations

➢ Of myself – Card; Of the study - Have you had the chance to read the mail?;
➢ Ethics
➢ I would like to reinforce the anonymity of your opinion, please feel free to speak.
➢ I am not good in English. I may miss your points in taking notes; can I please record this meeting?
➢ Data presented: 1st Brazilian data, 2nd More than developing research, I’m taking the opportunity to learn about other dairy realities. I'm observing many similarities with dairy in Brazil (Tables and pictures in magazines)

Identification of the interviewee

<table>
<thead>
<tr>
<th>Name:</th>
<th>Date:</th>
<th>Gender:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age: ( ) &lt; 30 ( ) 30 - 40 ( ) 41 - 50 ( ) 51 - 60 ( ) &gt; 60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Code:</td>
<td>District, county:</td>
<td></td>
</tr>
<tr>
<td>Phone/Fax:</td>
<td>e-mail:</td>
<td></td>
</tr>
</tbody>
</table>

Questions

➢ How many years have you been in the dairy industry?
➢ What is your major income:
   ( ) dairy only ( ) dairy & other farm: ( ) dairy & urban:
➢ What is the size of your farm: _______________ha or ________________acres
➢ What is the production of your farm: _______________/years _______________/day
➢ How many cows you have all together:
➢ How many milking:
➢ People involved:
   ( ) wife ( ) son ( ) daughter ( ) farmer ( ) other:
➢ Employees:
   ( ) number of permanent, ( ) number of casual ( ) volunteers
➢ What is the relation of your business with the dairy industry?
➢ Do you regular deal with dairy issues? Yes / No How?
➢ Do you know what is? DRDC, TDRC, SDP, SRTs, Embrapa, Co-operative technical advice service, Emater
➢ Do you participate in SRTs meetings? Yes / No
➢ Do you know the country or regional R,D&E organisations purpose? Yes / No
➢ What is it?
➢ Are you a member of any dairy industry organisations? Yes / No Which?
Appendices

What made you select the dairy business?
( ) money ( ) lifestyle ( ) heritage ( ) other:
What are your goals in your dairy business in the near future? expand, improve productivity, no change, leave
What are your personal / family goals?
Do you feel the members of the dairy industry work together to reach their common goals? Yes/No If No why?
Do you intend staying in the dairy industry for long term? Yes/No
Tell me 1 or 2 technologies/practices/things/ideas you have DONE that contribute to the profitability of your dairy farm. Tell me about things that didn't work well? (To make this question I made hands movements explaining the question)
And what has the dairy industry done that has contributed to its profitability? (To make this question I made arms movements explaining that it was broader than dairy farm, What wrong things has been done?
Have you an idea of technologies / practices that have POTENTIAL to work well in the future? for your dairy business and for the dairy industry.
HOW can dairy communities encourage the introduction of some good ideas?
Can you order these CARDS to show me WITH WHOM you discuss dairy technological issues first?
( ) farm retailers ( ) farmers ( ) R,D&E people ( ) processors ( ) family ( ) discussion groups ( ) other:
Can you order these CARDS to show me WHERE do you ask for advice about technical issues?
( ) research station ( ) R&E events ( ) farm input market ( ) visiting farms ( ) extension agent ( ) other:
Can you order these CARDS to show your most important SOURCE of information from where you learn or hear about technical issues?
( ) papers ( ) R,D&E people ( ) consultants/vet ( ) farmers ( ) lecture ( ) books
( ) Internet ( ) other:
HOW do R&E people contact you?
( ) mail ( ) phone ( ) personally ( ) e-mail ( ) other
I've been reading about trends in the dairy industry and I'll read some to you, then I'll read about sub-systems in your farm. Which two or three sub-systems are the ones of higher concern?
If you were a manager of an R,D&E agency what priority problems / issues would you work first? Can you be more specific? (I made this second question when the answer were to vague)
What people (individuals) are encouraging the uptake of technologies / practices / ideas?
Who are the persons you consult to discuss your agricultural and dairy issues and could help in this study?
Are there any other issues that you would like to suggest for the development of your dairy community?

Thanks for your time, the data I collect is confidential.
Appendices

Appendix 4.5 - Letters to participants

The University of Queensland
Letter to the participants (Interviews)

Brisbane           __ / __ / 2001
Dear Sir/Madam

My name is Sergio Teixeira. I'm a Brazilian scientific researcher of EMBRAPA (Brazilian National Dairy Cattle Research Corporation) doing a Ph.D. research thesis in Agricultural Extension at the University of Queensland, in Brisbane, Australia.

Research objective - Develop a strategy to identify the technological needs of dairy farmers' community involving main stakeholders that exert some influence in the dairy industry. The strategy is based on the Subtropical Dairy Program. If the strategy produce good results it will be used to help R,D&E corporations in Australia and Brazil to design activities that better fit production systems needs.

Interview objective - I am contacting you as one of the select dairy farmers. The objective is to discuss and identify dairy industry needs of the far north coast of NSW region in an individual one-hour Interview. This is the first step of the strategy. Your opinion will be grouped with others to be discussed in a Focus Group Meeting.

I would be very grateful if you could assist me in my research. I'll be soon getting in touch with you to ask if you agree to participate and to make arrangements, as well as determine day, hour, and place for the interview. If you have any queries, or if you want to contact me, please feel free to phone me (07 33657407) or write an e-mail (s807121@student.uq.edu.au).

Yours sincerely

Sergio Rustichelli Teixeira
The University of Queensland – School of Natural and Rural Systems Management
Advisors: Professors Helen Ross and Tom Cowan, Dr. Shankariah Chamala
Dear Sir/Madam

My name is Sergio Teixeira. I'm a Brazilian scientific researcher of EMBRAPA (Brazilian National Dairy Cattle Research Corporation) doing a Ph.D. research thesis in Agricultural Extension at the University of Queensland, in Brisbane, Australia. I would be very grateful if you could assist me in my research.

Research objective - Develop a strategy to identify the technological needs of dairy farmers’ community involving main stakeholders that exert some influence in the dairy industry. The strategy is based on the Subtropical Dairy Program. If the strategy produce good results it will be used to help R,D&E corporations in Australia and Brazil to design activities that better fit production systems needs.

Objective of the meeting - I am contacting you as one of the key stakeholders of the dairy industry. I would like to invite you for a two hours FOCUS GROUP MEETING, to discuss the results of the Semi-Structured interviews that we carried out, in which you might have taken part. The expected result is to converge the opinions prioritising the technological needs of the region, identified at the Semi-Structured interviews. The document from this meeting will return to you for a final analysis before presentation to R,D&E corporations.

The details of the meeting are as follows:
Date: 
Time: 
Venue: 

I would be very grateful if you could assist me in my research. I'll be soon getting in touch with you to ask if you agree to participate and to make arrangements, as well as determine day, hour, and place for the interview. If you have any queries, or if you want to contact me, please feel free to phone me (07 33657407) or write an e-mail (s807121@student.uq.edu.au).

Yours sincerely

Sergio Rustichelli Teixeira
The University of Queensland – School of Natural and Rural Systems Management
Supervisors: Professors Helen Ross and Tom Cowan, Dr. Shankariah Chamala
Appendices

The University of Queensland
Focus Group Meeting List

Thanks for coming to our Focus Group Meeting. This is part of the process for gathering data for my research for a Ph.D. thesis. I need to tape-record the discussions of this meeting. I need to have your consent to do so, therefore would you please sign the list of participants below. By signing the list, I will assume that your permission has been given. If you do not agree, please do not sign the list and talk to me about alternative arrangements. Confidentiality of information is assured, as this list will be kept with me at my locked office at UQ, and no names will be shown in any written publication or disclosed to any other person or institution.

Thank you for your cooperation

List of participants
Date: ____/____/____
Place: ____________________

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>Signature</th>
</tr>
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<tbody>
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This study adheres to the guidelines of the ethical review process of the University of Queensland. You are, of course, free to discuss your participation in this study with project staff (07 33657407). If you would like to speak to an officer of the University not involved in the study, you may contact the Ethics Officer on 07 3365 3924. I am sure that you will be satisfied in attending this meeting. If you have any queries or if you want to contact me, please feel free to write an e-mail to s807121@student.uq.edu.au

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Porto Alegre, __ / __ / 2001
Senhor (a)

Meu nome é Sérgio Rustichelli Teixeira. Sou pesquisador da EMBRAPA Gado de Leite fazendo doutorado em Extensão Rural na Universidade de Queensland na Austrália.

**Objetivo da pesquisa** - Desenvolver uma estratégia para identificar as necessidades tecnológicas de comunidades leiteiras. Esta estratégia ajudará as organizações de R,D&E a desenvolver ações com forte relações com as necessidades identificadas junto aos sistemas de produção dentro um processo participativo.

**Objetivo de entrevista** - Estamos contatando com pessoas do setor leiteiro de Santa Rosa com o objetivo de discutir e levantar idéias sobre as necessidades do setor para esta região. Será uma entrevista individual de uma hora de duração. Sua opinião será codificada quando os dados forem usados em uma Reunião de Grupo Focal.

Eu estarei entrando em contato com você para saber se concorda com a entrevista assim como para marcar o melhor dia, hora, e lugar para a entrevista. Agradeço sua cooperação para esta pesquisa em benefício de sua comunidade.

Este estudo segue as diretrizes do processo ético da Universidade de Queensland. Sinta-se livre para discutir sua participação neste estudo junto a Elegê Alimentos ou comigo no telefone + 61 7 3365 7407. Caso você queira falar com uma pessoa da Universidade não envolvida no estudo, você pode contatar os membros do Comitê de ética em + 61 7 3365 3924.

Sinceramente

Sérgio Rustichelli Teixeira
A Universidade de Queensland–Escola de Administração de Sistemas Natural e Rural
Supervisors: Professors Helen Ross and Tom Cowan, Dr. Shankariah Chamala
Porto Alegre, __ / __ / 2001
Sr.(a)

Meu nome é Sérgio Rustichelli Teixeira. Sou pesquisador da EMBRAPA Gado de Leite fazendo doutorado em Extensão Rural na Universidade de Queensland na Austrália.

**Objetivo da pesquisa** - Desenvolver uma Estratégia para identificar as necessidades tecnológicas de comunidades leiteiras. Esta estratégia ajudará as organizações de R,D&E a desenvolver ações com forte relações com as necessidades identificadas junto aos sistemas de produção dentro um processo participativo.

**Objetivo da reunião** - Estou contatando com pessoas fundamentais na indústria de leiteria para desenvolvimento da pesquisa citada acima. Gostaria de convidá-lo para uma REUNIÃO DE GRUPO FOCAL de duas horas para discutir os resultados da Coleta de Dados e Entrevistas que conduzimos e das quais deve ter participado. O resultado esperado da reunião é convergir as opiniões sobre prioridades tecnológicas da região, identificadas nas entrevistas. O documento desta reunião voltará a você para uma análise final antes de apresentação para organizações de R,D&E.

Os detalhes da reunião são:
- Data:
- Tempo:
- Jurisdição:

Este estudo segue as diretrizes do processo ético da Universidade de Queensland. Sinta-se livre para discutir sua participação neste estudo junto a LG alimentos ou comigo no telefone + 61 7 3365 7407. Caso você queira falar com uma pessoa da Universidade não envolvida no estudo, você pode contatar os membros do Comitê de ética em + 61 7 3365 3924.

Sinceramente

Sérgio Rustichelli Teixeira
Universidade de Queensland–Escola de Administração de Sistemas Naturais Rurais
Supervisors: Professors Helen Ross and Tom Cowan, Dr. Shankariah Chamala
Universidade de Queensland
Lista de participantes Focus Group Meeting

Muito obrigado por comparecer à nossa reunião. O trabalho de hoje é parte do processo de coleta de dados para a minha pesquisa para a tese de doutorado. Como está estabelecido na metodologia de pesquisa, preciso gravar as discussões desta reunião. Para fazer isso, preciso do seu consentimento, portanto, por gentileza assine a lista de participantes abaixo. Ao assinar a lista, eu assumo que seu consentimento foi dado. Se você não concorda em ser gravado, por favor não assine a lista e converse comigo sobre as alternativas. A confidencialidade das informações desta reunião estão assegurados, já que os dados serão arquivados comigo em meu escritório na Universidade de Queensland e nenhum nome aparecerá em qualquer publicação escrita ou será aberta a qualquer outra pessoa ou instituição.

Muito obrigado pela sua colaboração

Lista de participantes
Data: ___/___/___
Local: ____________________

<table>
<thead>
<tr>
<th>Nome</th>
<th>Instituição</th>
<th>Assinatura</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

Este estudo segue as diretrizes do processo ético da Universidade de Queensland. Sinta-se livre para discutir sua participação neste estudo junto a LG alimentos ou comigo no telefone. Caso você queira falar com uma pessoa da Universidade não envolvida no estudo, você pode contatar os membros do Comitê de ética em ++ 61 7 3365 3924.
To Whom It May Concern

I would like to introduce Sergio Teixeira who, as part of his Ph.D. thesis is examining current methods of identifying the issues that affect the dairy industry.

Sergio wishes to survey a number of dairy industry members in the subtropics, in order to identify current RD&E priorities, as well as to test a new system that will allow the ongoing identification of industry needs.

I would ask you to support Sergio’s work, as the outcomes of this project will be of assistance to Subtropical Dairy, ensuring the ongoing development of R&D projects that are practical and focused on real industry needs.

Yours sincerely

Philip Chamberlain
Program Manager
Appendices

Appendix 4.6 – Summary of data from the individual interviews, presented during the FGMs in the three regions

- Number of interviews,
- Region consulted,
- Why farmers chose to work in the dairy industry
- Major income of farmers
- Age distribution of participating farmers
- Years in the dairy industry?
- Will you stay in the dairy?
- Farmers’ goals for themselves and for the dairy farm business
- Positive and negative things that happened in the dairy farm business and in the dairy industry as a whole
- Potential things for the regional dairy business and dairy industry as a whole
- If you were an R,D&E organisation manager what would you do first?
Appendix 4.7 - Ethical issues

Application Form for Ethical Clearance for
Research Involving Human Participants (Items)

Please insert the relevant Committee name:
Behavioural & Social Sciences Ethical Review Committee (BSSERC)

**Project Title:** Participatory approach for the identification of dairy industry needs in the design of Research, Development & Extension activities: Australian and Brazilian case studies

**Principal Investigator:** Sergio Rustichelli Teixeira
**Staff No*/Student No*: 38071218

**Co Investigators:** Professor Helen Ross (School of Natural and Rural System Management - NRSM), Professor Tom Cowan (School of Animal Science), Dr. Shankariah Chamala (NRSM)

**Supervisor/s:** same investigators

**Department/s:** School of Natural Rural System Management

**Contact Details of Principal Investigator:**
- **Phone:** 3365 7407
- **Fax:** 3365 9016
- **E-mail:** s807121@student.uq.edu.au

**Funding Body/Degree Enrolled:** Capes, Embrapa, TDRC & UQ

**If Project Funded - What year/period?** 2000 – 2004

**Project Location:** Australia/Queensland and Brazil/R.G. Sul

**Project Duration:** 4 years

**Does This Submission Relate To A Previous Protocol?** (similar or an amendment)

**YES/NO**

**Does This Submission Hold Other Ethical Clearance?**

**YES/NO**

**PLEASE ANSWER ALL OF THE FOLLOWING QUESTIONS:**

1) **Who Are The Participants?**:
Farmers, Processors, R,D&E people, Input market, Credit system of dairy industry in Australia and Brazil

2) **Participant Recruitment Details**:
Sample criteria to select stakeholders based characteristics of participation and involvement on the dairy industry. Participants are asked if they want to participate through letter of invitation or telephone contact of extension people.

3) **In 'Every-day/Lay Language' Please Provide a Summary of the project**:
The R, D&E challenge is to help the agricultural industries to identify their priorities and design activities to meet the technological needs for dairy industry sustainable development. However, the linkage and cooperation between R&D and E is not working properly to improve the communication with the people in the production. Australian public/private and Brazilian public R&D organisations have initiatives for more effective interaction with regional production systems aiming the identification of realistic technological needs to guide the designing of the R&D activities, but there are points on involvement of stakeholders to be improved. This research was developed to improve dairy research’ participatory approaches by preparing and testing a strategy to improve the researcher understanding of small regions, get trust from stakeholders and involve a broad range of stakeholders to identify a comprehensive set of priorities for a dairy region and specifically to design of R,D&E activities. The research methodology has purposive sampling, snowball technique, semi-structured interviews, content analysis and Focus Group Meetings.

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4) Please Explain Briefly The Validity And Benefit Of The Project:
- For R,D&E a strategy that will help to develop/adapt objective/realistic technologies/practices with lower risk of non-adoption
- For the community a convergent identification of real priorities to design R,D&E action,

5) a) What Is/Are The Specific Aim(s) Of The Project:
- Develop a strategy that can help R,D&E people in the understanding of the farms and community realities,
- Involve individual and group participation of a broader consultation of stakeholders of a dairy community to obtain a comprehensive set of their priorities and demands to R,D&E,
- Compare the opinions of different groups of stakeholders,
- Compare the results of this study with the DRDC and Embrapa Dairy strategies to evidence the importance of complement their present strategies.

5 b) Please Provide Details To Help The Committee Understand What You See As The Scientific Merit Of The Proposed Project: Provided as annex in the documentation

6) Give Full Details Of The Research Plan: See Schedule of field research in the Appendix 4

7) Give Details Of The Ethical Considerations Attached To The Proposed Project: See letters to participants Appendix 4

8) How Will Informed Consent Be Obtained From Participants? See item 7

9) Provide Details Of Procedures For Establishing Confidentiality And Protecting Privacy Of Participants: It will be informed about the confidentiality of data and it will be kept on safe place during and after the study

10) Provide Details Of Data Security and Storage: Coding questionnaire, tapes and computer, together with data kept at UQ office will warrantee safety

11) In What Form Will The Data Be Collected:
   (i) Identified ☐ (ii) Potentially Identifiable ☐ (iii) De-Identified ☐

12) In What Form Will The Data Be Accessed: accessed through codes

13) Give Details Of How Feedback Will Be Available To Participants: At the focus group meeting, final report of the study, and document to R,D&E organization managers to select new activities

14) Does The Project Involve Any Of The Following Procedures? If YES, Give Details
   a) The use of drugs
   b) Any invasive procedures (eg., blood sampling)
   c) The possibility of physical stress/distress, discomfort
   d) The possibility of psychological/mental stress/distress, discomfort
   e) Deception of/withholding information from, participant at ANY stage of the project
   f) Access to data held by a Commonwealth Department or Agency
   g) Access to data by bodies or people other than the investigators (eg., Medical Records)
   h) Participant involvement by any "Vulnerable Groups"

15) Please Indicate What You Think Is The Level Of Risk For Perspective Participants Against The Scale Below:
   - Extreme Risk
   - High Risk
   - Some Risk
   - Minimal Risk
   - 1.1.1.1 No Foreseeable Added Risk Above the Risks of Everyday Living

16) Please Provide Details To Assist The Committee As To Why You Indicated The Level Of Risk To Perspective Participants In The Question Above(Q.15): No names will be recorded in the data, if case studies are written & analyses aggregated the participants will be kept anonymous.

17) How Has The Possibility Of Withdrawal From The Project Been Addressed?: Volunteers participants can withdrawal any time

18) a) Is This Project Receiving Financial Support To Conduct The Research? Yes
18 b) If Yes, From What Source(s)? Capes, Embrapa, and TDRC

18 c) Who Will Be Administering The Budget? Sergio Rustichelli Teixeira

18 d) Please Provide Details Of The Budget Distribution? AUD$ 2264 for North Coast of NSW, AUD$ 1406 for Santa Rosa and AUD$ 1406 for Alto Jacuí

18 e) Provide Details Of Any Other “In Kind” Support For The Project Or Direct Or Indirect Payment To Any Investigator

18 f) Please Provide Details Of Participant Reimbursement For Their Involvement In The Project.

19) In Undertaking This Research Do Any 'Conflict Of Interest' Issues Arise?

20) Is The Project A Multi-Centre Or Site Project?

Note: The Principal Ethics Committee is the Institutional Ethics Committee from where the budget is to be administered.

21) Some Projects May Involve Permits From National Parks & Wildlife In Relation To Collection Of Data And Native Title Issues. How Have You Addressed This Issue:

22) The Project May Relate To, Or Involve, Aboriginal & Torres Strait Islander People, What Additional Measures Have Been Used To Address This Aspect Of The Project?:

refer to NHMRC Statement section 9 http://www.uq.edu.au/research/services/human/aboriginal.html

ATTACHMENTS:

1) Consent Form Yes/No item 7
2) Information Sheet Yes/No item 7

Note: for External Use - forms should be released on letterhead and contain University Ethical Paragraph.

Refer to Guidelines at:- http://www.uq.edu.au/research/services/human/paragraphs.html

3) Questionnaire Yes/No

Note: please attach ONLY those developed or adapted specifically for this project

4) Indemnity (primarily for Clinical trials & Contract work) Yes/No


5) Gatekeepers Yes/No

Note: A 'Gatekeeper' is a letter of Authority and Recognition from an Organisation of ANY type involved with the research on the project

6) References Yes/No

7) Clinical Trial Notification Form (CTN) Yes/No

(primarily for Clinical trials) refer to Guidelines:- http://www.uq.edu.au/research/services/human/trials.html

8) Other - Please Specify No

We/I, the undersigned researcher(s) have considered the ethical issues in relation to this project and agree to abide by The University of Queensland’s ‘Guidelines for Ethical Review of Research Involving Humans - 2000’

It is understood that this includes the reporting and monitoring roles associated with the approval by the University of Queensland.

Signature of Principal Investigator: ______________________________

Date: / / .

Signature of Supervisor (if applicable): ______________________________

Date: / / .

An Original and 12 copies should be submitted to the: Ethics Officer
The Office of Research and Postgraduate Studies - Cumbrae-Stewart Bldg (72)
St Lucia  Q  4072
Ph: (07) 3365 3924; Fax: (07) 3365 4455
Email: l.martin@research.uq.edu.au

General information for submissions, including meeting dates and details of the review process, can be found on our webpage:
http://www.uq.edu.au/research/services/human/
Appendix 5.1 - Why dairy? and farmers personal goals

<table>
<thead>
<tr>
<th>Setting the Scene</th>
<th>Australia</th>
<th>Brazil – Santa Rosa</th>
<th>Brazil – Alto Jacuí</th>
</tr>
</thead>
<tbody>
<tr>
<td>What made you select the dairy business?</td>
<td>Life style (15) and heritage (14) were the preferences for 20 farmers.</td>
<td>19 out of 20 farmers selected money. Life style had 6 mentions and heritage only 4 showing that dairy is not a heritage family business.</td>
<td>23 out of 27 farmers selected money. Life style had 9 mentions and heritage only 3 showing that dairy is not a heritage family business.</td>
</tr>
<tr>
<td>What are your goals in the dairy?</td>
<td>Of 20 farmers 16 selected improve productivity and 9 expand.</td>
<td>Of 20 farmers 18 selected improve productivity and 16 expand.</td>
<td>Of 27 farmers, 13 selected improve productivity and 10 expand.</td>
</tr>
<tr>
<td>What are your personal goals?</td>
<td>From 9 farmers, 8 selected family, mainly kids, and 6 business in terms of sound business for the family, and 4 good life style.</td>
<td>From 20 farmers, 22 opinions were related to family, mainly opportunity and study for kids, 3 production, and 5 others found hard to define if they will stay in agriculture.</td>
<td>From 27 farmers, 17 opinions were related to family, mainly opportunity and study for kids, 8 production and 2 gave other opinions like stability.</td>
</tr>
<tr>
<td>Will you stay in dairy?</td>
<td>17 Yes, 3 No</td>
<td>All 20</td>
<td>15 Yes, 1 No and 11 depends</td>
</tr>
</tbody>
</table>

Appendix 5.2 - What “good” and “bad” things happened to farm business

<table>
<thead>
<tr>
<th>Main codes cited</th>
<th>Percentage of people’s opinion per code in the three cases</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Australia</td>
<td>Brazil – Santa Rosa</td>
</tr>
<tr>
<td>Pasture/soil/irrigation</td>
<td>Good</td>
<td>Not good</td>
</tr>
<tr>
<td>Nutrition</td>
<td>56</td>
<td>83</td>
</tr>
<tr>
<td>Genetics</td>
<td>42</td>
<td>✓</td>
</tr>
<tr>
<td>Farm management</td>
<td>19</td>
<td>✓</td>
</tr>
<tr>
<td>Labour</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Industry policy</td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

Observation: The percentage does not sum to 100% because each interviewee could give more than one opinion. For things that did not work well the percentages have not been calculated because not everyone gave an opinion (in Australia less than 70% of interviewees gave their opinion). Ticks indicate where comments were concentrated.

Appendix 5.3 - Potential to develop activities for the farm business

<table>
<thead>
<tr>
<th>Main cited frames</th>
<th>Australia</th>
<th>Brazil – Santa Rosa</th>
<th>Brazil – Alto Jacuí</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pasture/soil/irrigation</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Nutrition</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Genetics</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Farm management</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Labour</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Observation: Because 17% of interviewees in Australia did not give opinions the table presents only the codes used, instead of percentage of people who mentioned the item.
Appendices

Appendix 6.1 - What are the strengths and weaknesses of your region for dairy?

<table>
<thead>
<tr>
<th>Codes</th>
<th>Australia</th>
<th>Brazil St Rosa</th>
<th>Brazil A. Jacui</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strength</td>
<td>Weakness</td>
<td>Strength</td>
<td>Weakness</td>
</tr>
<tr>
<td>Health &amp; Hygiene</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pasture/soil/Irrigation</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Nutrition</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Genetics / Breeds</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Reproduction</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Herd management</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Farm Management</td>
<td>0</td>
<td>1</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Milk Quality</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Nat. resources/Envir.</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>L – Labour</td>
<td>0</td>
<td>5</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>F$ - Finance</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Cr – Credit</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Personal Development</td>
<td>0</td>
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<td>1</td>
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<tr>
<td>Communication/Train./Edu</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Organisation/union</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Technical Advice</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Research &amp; Development</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Motivation</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Marketing</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Industry policy and Price</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Industry structure</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

271
Appendix 6.2 - Content analysis of Focus Group Meetings: imaginary $100,000 priority destination of financial resources

Figures show the total investment in each priority in hundreds of thousands of currency, words describe the priority identified earlier in the meetings, against which imaginary investment were made.

<table>
<thead>
<tr>
<th>Codes &amp; priorities</th>
<th>Australia - 11 stakeholders only 8 invested</th>
<th>Brazil - St Rosa - 10 stakeholders</th>
<th>Brazil - Alto Jacui - 12 stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health &amp; Hygiene</td>
<td>15 - Research &amp; Extension in cattle ticks (See R&amp;D)</td>
<td>10 - Planning of the industry and of the activity as a whole-IP</td>
<td>83 - Invest in forage that can help the structure of the soil</td>
</tr>
<tr>
<td>Pasture</td>
<td>10 - Research for grasses that produce all year round (See R&amp;D)</td>
<td>10 - Help farmers to define their best potential activities</td>
<td>0 - Evaluation of alternatives for fitton, produce on pasture basis</td>
</tr>
<tr>
<td></td>
<td>10 - Management of tropical pasture for high stocking rate</td>
<td>0 - Define production scale together with capacity for that scale</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>50 - Professionalise the farmers through courses - C</td>
<td></td>
</tr>
<tr>
<td>Heart Management</td>
<td>45 - Skills to manager larger herds</td>
<td>20 - Stimulate farmers to set goals</td>
<td>0 - Research to deal better with mud</td>
</tr>
<tr>
<td>Farm Management</td>
<td>15 - Orientation for farm succession planning (See L)</td>
<td>10 - Planning of the industry and of the activity as a whole-IP</td>
<td>0 - Set plans for the farm</td>
</tr>
<tr>
<td></td>
<td>60 - Optimal farming system for more profitable milk production</td>
<td>10 - Help farmers to define their best potential activities</td>
<td>17.5 - Discussion and standardisation of technical information and administration (see C)</td>
</tr>
<tr>
<td></td>
<td>0 - Productive advances e.g. stocking rate</td>
<td>0 - Define production scale together with capacity for that scale</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>50 - Professionalise the farmers through courses - C</td>
<td></td>
</tr>
<tr>
<td>Milk Quality</td>
<td>0 - Milk quality &amp; marketing (see Mk)</td>
<td>100 - Payment of milk on quality policy</td>
<td></td>
</tr>
<tr>
<td>Natural Resources</td>
<td>20 - Water use efficiency</td>
<td>50 - Mechanise the dairy to increase labour productivity considering the production scale</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 - Sustainab. / impact of farming system on environment</td>
<td>10 - Practice the control of production cost according to scale</td>
<td>287 - Stimulate farm cost management through simple tools</td>
</tr>
<tr>
<td>Labour</td>
<td>10 - Time saving for farmers</td>
<td>120 - Financing with attractive interest even for larger farmers</td>
<td>47 - Policy of credit with feasible interest to renew farms attached to technical attendance (see TA)</td>
</tr>
<tr>
<td></td>
<td>15 - Orientation for farm succession planning (See FM)</td>
<td>0 - Train person to deal with mechanical milking (See MM)</td>
<td></td>
</tr>
<tr>
<td>Finance</td>
<td>70 - Partial budgeting</td>
<td>50 - Professionalise the farmers through courses - FM</td>
<td>36.5 - Define goals for the integrating different stakeholders of the industry and discussion of technical issues (see O)</td>
</tr>
<tr>
<td></td>
<td>140 - Orientation in money managem. and financial analysis</td>
<td>0 - Address information to farmers respecting the busy periods of the year</td>
<td>180 - Training of technicians and farmers</td>
</tr>
<tr>
<td>Credit</td>
<td>120 - Financing with attractive interest even for larger farmers</td>
<td>20 - Give larger support to those who seek technical advice</td>
<td>17.5 - Discussion and standardisation of technical information and administration (see A)</td>
</tr>
<tr>
<td>Communication,</td>
<td>235 - Organise farm walks &amp; focus groups as a strategy for learning opportunity</td>
<td>36.5 - Define goals for integrating different actors of the industry and discussion of technical issues (see C)</td>
<td></td>
</tr>
<tr>
<td>Training &amp; Education</td>
<td>10 - Easy access to information e.g. extension packages, web links</td>
<td>10 - Mobilization of the cooperatives, other dairy stakeholders not only to demand price</td>
<td>47 - Policy of credit with feasible interest to renew farms attached to technical attendance (see F)</td>
</tr>
<tr>
<td></td>
<td>15 - Training / skills for change / alternative to group process (O)</td>
<td>60 - Stimulate association - Association of producing of...</td>
<td>55 - Systemic R,D&amp;E, see the farm as a whole (See RD)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 - Groups of production</td>
<td></td>
</tr>
<tr>
<td>Organisation</td>
<td>15 - Training / skills for change / alternative to group process (See C)</td>
<td>63 - Coordinated activities, identify leaders that could work on motivation, price, research, etc. Starting point for other activities (see Mo, Pr)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>25 - Farm to deal only with heifers to free space in farms that deal only with cows. Pay fair price for the grown heifers</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>36.5- Define goals for integrating different actors of the industry and discussion of technical issues (see C)</td>
<td></td>
</tr>
<tr>
<td>Technical Advice</td>
<td>20 - Give larger support to those who seek technical advice</td>
<td>47 - Policy of credit with feasible interest to renew farms attached to technical attendance (see F)</td>
<td></td>
</tr>
<tr>
<td>R&amp;D</td>
<td>15 - Research &amp; Extension in cattle ticks (See R&amp;D)</td>
<td>150 - Units of validation of technologies for the region</td>
<td>55 - Systemic R,D&amp;E, see the farm as a whole (See RD)</td>
</tr>
<tr>
<td>Motivation</td>
<td>120 - Value the farmer and his/her self-esteem</td>
<td>0 - Unit for research at region</td>
<td></td>
</tr>
<tr>
<td>Marketing</td>
<td>0 - Milk quality &amp; marketing (see Q)</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td></td>
<td>60 - Create/improve a sustainable image of dairy in urban areas (water, soil, livestock preserved by farmers)</td>
<td>55 - Systemic R,D&amp;E, see the farm as a whole (See TA)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>40 - Attracting new investments to farms</td>
<td>0 - Marketting for Elegê dairy products, showing positive scenes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 - To value the dairy products showing the pleasure side</td>
<td></td>
</tr>
<tr>
<td>Industry Policy</td>
<td>230 – Establish guaranteed price for the year, demand % of the market price</td>
<td>140 - To value the dairy products showing the pleasure side with financial support of every chain</td>
<td>80 - Minimum price policy with price announced previously</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 - Planning of the industry and of the activity as a whole-IP</td>
<td></td>
</tr>
</tbody>
</table>
### Setting the Scene

<table>
<thead>
<tr>
<th>Country</th>
<th>Background and Objectives</th>
<th>Membership and Participation</th>
<th>Information Sources</th>
<th>Engagement and Perspectives</th>
<th>Agreement and Expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Australia</strong></td>
<td>There is not good association of R&amp;D org with the dairy community. Most people do not know the objective of SDP and SRT.</td>
<td>All farmers participate in cooperative extension meetings</td>
<td>17 out of 20 farmers consult papers/books/internet as main source followed by R&amp;E/Consultants (6) and only one named other farmers.</td>
<td>Of 16 farmers opinions the main ideas were Communication, (4), discussion groups (4), Ideas/experiments in farm (3), work together (2), education, common voice, and have a fellow like Sergio come and talk to us.</td>
<td>Of 27 farmers 7 selected farm trials with positive and negative points, followed by field days (4), meeting with ice breakers (3). Other ideas were motivation, primary school visits, small groups’ discussion, farm walks, and show future of dairy industry.</td>
</tr>
<tr>
<td><strong>Brazil – Santa Rosa</strong></td>
<td>All stakeholders know the Cooperative Extension service and Embrapa Wheat (285km away), but only 24 out of 42 know/heard about Embrapa Dairy (about 1700 km far).</td>
<td>All farmers participate in cooperative extension meetings</td>
<td>10 out of 20 farmers mentioned lecture followed by R&amp;E (6) and only one, farmers and farmers groups.</td>
<td>Of 20 farmers 5 selected community discussion, 4 technical meeting with help to farmers to express ideas, and 6 farm trials with positive and negative points. Other opinions were visit farms, persistency, work together (2), and work on self esteem.</td>
<td>Of 22 other stakeholders 8 select association/union. Other ideas were benchmark, farmers groups (4 each). Some others were cost info, better approach with Embrapa, leaders, global view of dairy industry, individual advice, tech trips, and agricultural council.</td>
</tr>
<tr>
<td><strong>Brazil – Alto Jacuí</strong></td>
<td>All stakeholders know the Cooperative Extension service and Embrapa Wheat (285km away), 42 out of 46 know/heard about Embrapa Dairy (about 1500 km away).</td>
<td>All farmers participate in cooperative extension meetings</td>
<td>8 out of 21 farmers mentioned lecture, 8 mentioned R&amp;E people, and 4 papers as main sources of information.</td>
<td>Of 21 farmers only 5 related R&amp;D&amp;E to integration, the others were related to production (alternatives, improvements, higher production).</td>
<td>From 19 other stakeholders the ideas were media, farm trials with farm lecture, show costs and +/- parts of an idea (3), field days, motivation, participatory management, trips, benchmark, pilot trials, small groups discussions, prize for good farmers.</td>
</tr>
</tbody>
</table>

### Member of dairy association?

- Of 20 farmers 16 were.
- Of 20 farmers 11 were.
- Of 26 farmers 25 were.

### Participate in R&E meetings

- Of 36 persons 26 do not participate.
- All farmers participate in cooperative extension meetings
- All farmers participate in cooperative extension meetings

### Where farmers make first discussions of dairy technical issues

- Of 20 farmers 14 discuss dairy technical issues first in the family
- Of 20 farmers 19 discuss dairy technical issues first in the family, for all of them R&E people are the second forum.
- Of 21 farmers 18 discuss dairy technical issues first in the family, for 14 of them R&E people are the second forum.

### Where you do it?

- For 20 farmers 8 discuss in groups, followed by farms (4) and then research station, and retailers.
- For 20 farmers 12 in the farm, followed by visiting farms (4) and then R&E events/station, input market (retailers).
- For 21 farmers 17 in the farm, followed by R&E events (4).

### Main source of information (They could give more than 1 opinion)

- 17 out of 20 farmers consult papers/books/internet as main source followed by R&E/Consultants (6) and only one named other farmers.
- 10 out of 20 farmers mentioned lecture followed by R&E (6) and only one, farmers and farmers groups.
- 8 out of 21 farmers mentioned lecture, 8 mentioned R&E people, and 4 papers as main sources of information.

### How to encourage the introduction of good ideas? (They could give more than 1 opinion)

- Of 16 farmers opinions the main ideas were Communication, (4), discussion groups (4), Ideas/experiments in farm (3), work together (2), education, common voice, and have a fellow like Sergio come and talk to us.
- Of 20 farmers 5 selected community discussion, 4 technical meeting with help to farmers to express ideas, and 6 farm trials with positive and negative points. Other opinions were visit farms, persistency, work together (2), and work on self esteem.
- Of 22 other stakeholders 8 select association/union. Other ideas were benchmark, farmers groups (4 each). Some others were cost info, better approach with Embrapa, leaders, global view of dairy industry, individual advice, tech trips, and agricultural council.

### Does dairy industry work together to reach their common goals?

- In 36 interviews 18 Yes and 17 No. The major reasons for No were: different interests (8), not after deregulation (6), and partially happens (5). 11 persons prefer not to comment.
- In 42 interviews 13 Yes and 29 No. The major reasons for No were: individualism (11), partiality (10), disorganised (7). Some others were unfair price share, lack of policies and of convergence.
- In 46 interviews 8 Yes and 37 No. The major reasons for No were: partiality (16), unfair price share (7), individualism (5), and lack of industry definition (4). Others were power of stakeholders, lack of holistic view of industry and of convergent organisation.
# Appendix 8 - Glossary

<table>
<thead>
<tr>
<th>Word</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Action research</strong></td>
<td>A form of social research which aims at better insight into the problems by learning from the experience gained in an attempt to solve the problems. Action research has dual aims: action, to bring about change in some community or organisation or program; and research, to increase understanding on the part of the researcher or the client or both. Action research has four general and cyclic stages of planning, acting, observing and reflecting on an issue.</td>
</tr>
<tr>
<td><strong>Adoption</strong></td>
<td>Refers to the stage in which a technology is selected for use by an individual or an organisation (Carr, 2000)</td>
</tr>
<tr>
<td><strong>Aesthetic</strong></td>
<td>Concerned with beauty or the appreciation of beauty (Oxford Paperback Dictionary)</td>
</tr>
<tr>
<td><strong>Anthropology</strong></td>
<td>The study of the races, physical and mental characteristics, distribution, social relationship, etc. (Webster new twenty century dictionary unabridged, 1983)</td>
</tr>
<tr>
<td><strong>Approach</strong></td>
<td>The way you act in a situation.</td>
</tr>
<tr>
<td><strong>Authority</strong></td>
<td>When you accept something as being true just because someone in a position of authority says it is true or because it is in an authoritative publication, you are using authority as a basis of knowledge. Relying on the wisdom of authorities is a quick, simple, and cheap way to learn something.</td>
</tr>
<tr>
<td><strong>Cartesianism</strong></td>
<td>A belief in duality of mind and body. Pertaining to or characteristic of Descartes and his philosophy. (The New Oxford English Dictionary 1993)</td>
</tr>
<tr>
<td><strong>Case study</strong></td>
<td>Case study is a method of analysis used when the phenomenon under study is not readily distinguishable from its context, such as community organisation (Yin, 2003)</td>
</tr>
<tr>
<td><strong>Cognitive</strong></td>
<td>Based on the process of obtaining knowledge through thought, experience, and the senses</td>
</tr>
<tr>
<td><strong>Communication</strong></td>
<td>Social interaction through messages; the process of sending and receiving messages through channels which establishes common meaning between a source and a receiver</td>
</tr>
<tr>
<td><strong>Communication network</strong></td>
<td>Is defined in this study as the network that people in a region develop while communicating, discussing and planning their business or social relationships</td>
</tr>
<tr>
<td><strong>Community</strong></td>
<td>The “Macmillan student encyclopaedia of sociology” defines <em>community</em> as a set of social relationships, which takes place wholly, or mostly, within a bounded local territory. Studies of community tend to concentrate on rural areas. A group of people who occupied by geographical area; people who were together engaged in economic and political activities and who essentially constituted a self-governing social unit with some common values and experiencing feelings of belonging to one another.</td>
</tr>
<tr>
<td><strong>Community development</strong></td>
<td>A process during which people in the small community first thoroughly discuss and define their wants, and then plan and act together to satisfy them. A social process by which human beings can become more competent to live with and gain some control over local aspects of a frustrating and changing world (Chamala, 2000).</td>
</tr>
<tr>
<td><strong>Conceputal Model</strong></td>
<td>Constructivist theory is a general framework for instruction based upon the study of cognition and has roots in philosophy, psychology, sociology, and education. Much of the theory is linked to child development research. Many regard Constructivism as a meta-theory, in that it encompasses a number of cognitive and other theories of learning where the learner selects and transforms information, constructs hypotheses, and makes decisions, relying on a cognitive structure to do so. While it is important to understand Constructivism, it is equally important to understand the implications this view of learning has for teaching and teacher professional development. Constructivist’s central idea is that human learning is constructed and that learners build new knowledge upon the foundation of previous learning. This view of learning sharply contrasts with one in which learning is the passive transmission of information from one individual to another, a view in which reception, not construction, is key.</td>
</tr>
<tr>
<td><strong>Corporate</strong></td>
<td>Belonging to a corporation, or a group of people, collective, joint (The New Oxford English Dictionary 1993)</td>
</tr>
<tr>
<td><strong>Dairy environment</strong></td>
<td>It is the totality of things that are related or influence the dairy industry</td>
</tr>
<tr>
<td><strong>DF</strong></td>
<td>Distrito Federal. The capital territory in Brazil</td>
</tr>
<tr>
<td><strong>Descriptive case study</strong></td>
<td>Presents a complete description of a phenomenon within its context (Yin, 2003)</td>
</tr>
<tr>
<td><strong>Dialectic</strong></td>
<td>The art of investigating or debating the truth of opinions (Soanes, 2001)</td>
</tr>
<tr>
<td><strong>Diffusion</strong></td>
<td>Related to the way which innovations spread among the members of a social system (Ban, 1996)</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th><strong>Appendices</strong></th>
</tr>
</thead>
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<td><strong>Education</strong></td>
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<tr>
<td><strong>Epistemology</strong></td>
</tr>
<tr>
<td><strong>Epistemological question</strong></td>
</tr>
<tr>
<td><strong>Explanatory case study</strong></td>
</tr>
<tr>
<td><strong>Exploratory case study</strong></td>
</tr>
</tbody>
</table>
| **Extension** | Agricultural extension has changed with time and in relation to social environment; according to different authors, there are different definitions: Farquhar 1962 - "... a service or system which assists farm people through education procedures in improving farming methods and techniques, increasing production efficiency and income, bettering their levels of living, and lifting the social and educational standards of rural life". Walker 1982 "... To educate farmers in the principles and practices of improved management systems". Röling 1988 "... a professional communication intervention deployed by an institution to induce change in voluntary behaviours with a presumed public or collective utility". Ban [1996 #1] "A form of conscious social influence. The conscious information to help people form sound opinions and make good decisions."
| **Extension agent/officer** | A person whose main task is to give extension assistance or to manage an extension organisation at the field level (Ban, 1996).
| **Feedback** | The process in which knowledge of the surroundings or of the consequences of action of a system lead to adjustments of future activities, seen in the light of achieving a certain goal (Ban & Hawkins 1996). |
| **Field Research** | Is more like an umbrella of activity beneath which any technique may be used for gaining the desired knowledge and for processes of thinking about this information (Neuman, 1999). |
| **Generalist** | A person who collects knowledge in various (specialized) areas in order to apply this knowledge (Ban, 1996). |
| **Globalise** | Develop or operate worldwide |
| **Goal** | The end towards which activities are directed (Ban & Hawkins 1996). |
| **Holistic** | From 'whole', studying a system (farm, farming system, organization) as a whole, because it cannot be understood properly by only studying its elements without understanding how these elements are interrelated (Ban & Hawkins 1996). |
| **Ideology** | A type of explanation of the social world. |
| **Information** | The pattern people impose on the phenomena they are able to observe. This implies an interpretation of these phenomena to make them useful for reaching a certain goal by reducing the uncertainty in the consequences of action (Ban & Hawkins 1996). |
| **Innovation** | Ideas, methods or objects regarded as new by an individual, but which is not always the result of recent research (Ban & Hawkins 1996). |
| **Knowledge** | Knowing about; contains an element of the concept insight. Knowledge is to be considered the vision of an explanation for the world in which we live, and knowledge is relative in the sense that the vision can differ between people and amongst other because of differences in experience (Ban & Hawkins 1996). |
| **Learning** | Acquiring or improving the ability to perform a behavioural pattern through experience and practice (Ban & Hawkins 1996). |
| **Mass media** | Communication media, which reach a large audience through printed matter or electronic methods, such as radio, television, films, newspapers, posters and books (Ban & Hawkins 1996). |
| **Mental Model** | A physical or social picture that a person creates about his/her surroundings. |
| **Methods** | Mechanics for data collection and information exchange (Cornwall et al., 1994.) |
| **Methodology** | Shapes and informs the processes of research (Cornwall et al., 1994.) |
| **Mission** | Is the statement that most companies/organisations make about their objectives |
| **Model** | A simplified, schematic reproduction of a pattern of discovered or suspected relationships between certain phenomena. A model always is created and described with a certain goal in mind and from a certain point of view (Ban & Hawkins 1996). |
| **Motivation** | The internal state which stimulates a person to carry out certain activities (Ban & Hawkins 1996). |
Needs
The condition in which a person experiences a lack of something and strives to overcome this lack.

Ontology
Philosophy concerned with the nature of being

Ontological question
What is the form and nature of reality and, therefore, what is there that can be known about it?

Opinion leader
A person who has a relatively large influence on the opinions of others in the group to which he or she belongs (Ban & Hawkins 1996).

Organisation
A formal group with an explicit goal, rules, procedures and a clear division of task with set right and duties.

Outsider
A person who does not belong to a particular group

Paradigm
A world view or general perspective; a theoretical approach; a general way of seeing the world

Participation
A process during which individuals, groups and organisations are consulted about or have the opportunity to become actively involved in a project or program of activity.

Partnership
Formal or informal arrangements to work together to some joint purpose.

Policy
A form of directed action which indicates as possible what one wants to achieve, how one wants to do it and how much time will be taken to achieve the set goals (Ban & Hawkins 1996).

Positivism
A system that accepts only observable phenomena and positive facts as sources of knowledge. According to Encyclopaedia of Social Work, 19th edition (2000), in positivist theory the mind of humans was characterized by three progressive stages of knowledge: theological, metaphysical, and positivistic. A society passes through these three levels of knowledge as well, arriving at the highest stage, which is the scientific.

Problem
A situation in which a person who has a goal does not know how to reach that goal.

Process
A related group of tasks that together create a result of value to a customer or steps to convert input to outputs.

Production community
A group of neighbouring production areas with similar characteristics

Production technologies
Production technologies in this study are the ones related to production of milk in a farm, such as pasture, nutrition, genetics, reproduction

Quasi-statistics
Refers to the use of simple numerical results that can be readily derived from the data (Adereth 1967)

Reductionism
A principle of analysing complex things into simple constituents (The New Oxford Dictionary)

Renaissance
The period that brought a system that accepts only observable phenomena and positive facts as sources of knowledge (Edwards, 2000)

Role
The complex of expectations with regard to the behaviour of individuals in a certain social position.

Scepticism
The philosophical doctrine that the truth of all knowledge must always be in question and that inquiry must be a process of doubting (Webster New Twentieth Century Dictionary unabridged, 1983)

Science
Science is a social institution and a way to produce knowledge. It has not always been around; it is a human invention. What people call modern science begun with the Age of Reason or Enlightenment, between the 1600s and 1800s. Science refers to both a system for producing knowledge and the knowledge produced from that system (Neuman, 1999).

Semiotics
The science of signs and meanings (Fiske, 1990)

Social theory
A system of interconnected abstractions or ideas that condense and organise knowledge about the social world. (Neuman, 1999).

Sociology
A science which studies the culture and structure of societies and their influence on changes in these societies (Ban & Hawkins 1996).

Stakeholders
People and organisations who can influence a certain issue or who are affected in any way by what is done and how it is done (Ban & Hawkins 1996)

A person entrusted with the stakes of two or more persons betting against one another and charged with the duty of delivering the stakes to the winner (Webster's International Dictionary)

Individuais and groups that have an involvement or an investment in the company’s decisions and in its social and economic exchanges (Chamala, 1999)

People or institutions which are likely to be affected by a proposed intervention or those which can affect the outcomes of the intervention (World Bank 1997 – cited in (Chamala, 1999)

A translation to Portuguese could be: atores ou interessados, na forma simplificada

Strategy
A way to achieve clearly specified goals with a combination of means and in a certain time period (Ban & Hawkins 1996).
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainable</td>
<td>Capacity to stay in the market considering social, technological, operational, financial and environmental aspects</td>
</tr>
<tr>
<td>Sustainable development</td>
<td>A process whereby future generations receive as much capital, social and natural resources per capita as the current generation has available.</td>
</tr>
<tr>
<td>Synergy</td>
<td>Cooperation among people who, following their own interests and seeking their own goals, produce benefits for their society. When the combination of two or more people, efforts or things working together produce a better outcome than the individual effort.</td>
</tr>
<tr>
<td>Theory</td>
<td>A set of hypotheses related by logical arguments to explain a wide variety of connected phenomena in general terms.</td>
</tr>
<tr>
<td>Tradition</td>
<td>Is a special case of authority – the authority of the past. Tradition means you accept something as being true because “it’s the way things have always been” (Neuman, 1999).</td>
</tr>
</tbody>
</table>