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Ensayo

FOOD SAFETY REGULATIONS: SOURCE OF COMPETITIVENESS FOR THE FUTURE DEVELOPMENT OF THE CHILEAN BEEF EXPORTS SECTOR

REGULACIONES DE SEGURIDAD DE LOS ALIMENTOS: FUENTE DE COMPETITIVIDAD PARA EL FUTURO DESARROLLO DEL SECTOR DE EXPORTACIÓN DE CARNE BOVINA CHILENA

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ABSTRACT

The purpose of this essay is to contribute to a reflective analysis about the international requirements in food safety and to determine the role that the Chilean food safety regulations should perform for the future development of their beef exports sector. The specific objectives are to present a general diagnosis about the efficiency, quality, and food safety of the Chilean beef production; to analyze Chilean policies and regulations on animal health and food safety; to study the food safety requirements of the main markets such as the United States, the European Union and Japan; to investigate Chile's fulfillment of these requirements; and to determine food safety policy implications for Chilean beef exports. Considering how animal health and food safety concerns affect the international trade of bovine meat products and the context of the current trade relationships between Chile and these markets, the main conclusion of this study is that the Chilean food safety and animal health regulations must be improved, principally, in the application of proper hygiene and manufacturing practices, the implementation of traceability systems, and in residue control and quality assurance programs based on the Hazard Analysis Critical Control Point system.

Keywords: Chilean beef exports sector, food safety and animal health regulations.

RESUMEN

El propósito de este ensayo es contribuir a un análisis reflexivo acerca de las exigencias internacionales en seguridad de los alimentos y determinar el rol que deberían desempeñar las regulaciones chilenas en esta materia para el futuro desarrollo de su sector de exportación de carne bovina. Los objetivos específicos son presentar un diagnóstico general acerca de la eficiencia, calidad y seguridad de los alimentos de la producción de carne bovina chilena, analizar las políticas y regulaciones chilenas sobre salud animal y seguridad de los alimentos, estudiar los requerimientos en seguridad de los alimentos de los principales mercados tales como los Estados Unidos, la Unión Europea y Japón, investigar el cumplimiento de Chile con relación a estos requerimientos y determinar las implicaciones de políticas en seguridad de los alimentos para las exportaciones de carne bovina chilena. Considerando cómo las preocupaciones sobre la salud animal y la seguridad de los alimentos afectan el comercio internacional de productos de carne bovina y el contexto de las actuales relaciones comerciales entre Chile y estos mercados, la conclusión principal de este estudio es que las regula-

ciones chilenas sobre seguridad de los alimentos y salud animal deben ser mejoradas, principalmente, en el uso de buenas prácticas de higiene y de fabricación, implantación de sistemas de trazabilidad, programas de control de residuos y de garantía de calidad basados en el sistema de Análisis de Riesgo en los Puntos Críticos de Control.

PALABRAS CLAVES: Sector de exportación de carne bovina chilena, regulaciones de seguridad de los alimentos y salud animal.

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INTRODUCTION

In the past decade, dramatic changes have occurred in global meat consumption patterns. The factors reshaping worldwide demand include changes in income, lifestyles, household size, government regulations, and opinions about the relationship between meat consumption and health. In fact, the consumer taste for meat products in developed countries is undergoing major shifts in safety concerns. Nevertheless, the demand for meat should became strong in the long run, due to trade liberalization, increase of income levels in numerous developing and industrializing countries and growing demand for better-balanced diets that include meat. Thus, the meat industry worldwide will eventually experience dynamic changes with technological advances giving a significant boost to production. At the same time, with economic development occurring in many areas of the world, the meat industry gets an important opportunity to make a larger contribution to world food needs, improving many aspects such as domestic food policies, regulatory systems and guidelines that encourage a safe production and distribution, and high quality meat products (International Policy Council (IPC) on Agricultural, Food and Trade, 1998). It is important since production and consumption of food is essential to any society, and can have economic, social and environmental consequences. Controversial issue such as *Bovine Spongiform Encephalopathy* (BSE) in Canada, United States and Europe, the outbreaks of *E. coli* in Japan and United States, and of *Foot and mouth disease* in Taiwan, have fuelled consumer concerns about food safety, and the official reactions are having important ramifications for international trade, for instance, prohibition or trade barriers to import meat products from countries with these diseases and outbreaks. Other important consumer issues that require attention are dealing with animal health, biotechnology, animal welfare, and environmental concerns given that they impact directly the beef trade. Considering these issues, the IPC on agriculture, food and trade has proposed policy reforms to increase the international trade in meat products and ensure a high quality, reliable and safe meat supply capable of responding to the changing market (Buzby, 2001).

THE CURRENT CHILEAN FOOD SAFETY SITUATION

First of all, the Chilean beef production has a privileged trade position taking into account that the Chilean government has achieved free trade agreements with the European Union, United States, South Korea, Mexico and Canada (Bórquez, 2002). Nowadays, Chile has a true possibility to negotiate a free trade agreement with Japan given the analysis made by the two countries in a bilateral meeting carried out in the framework of the Asia - Pacific Economic Coop-

eration Forum (APEC, 2004). And given the interest of Japan in importing Chilean meat products, it constitutes a challenge for all the actors of the Chilean beef chain. Secondly, Chile has a big potential to increase its beef exports since the Chilean animal health situation is being free of *Foot and mouth disease* without vaccination, *and of BSE* with an official certification by Office International des Epizooties since 1981 (Food and Veterinary Office (FVO), 2000: 9). Moreover, Chile has efficient domestic transportation and communication systems, prudent fiscal policies, a stringent financial sector and the most stable and open economy in Latin America. All these are key factors for the current good image of Chile and its strategies of development. In terms of quality control, the Chilean Agricultural and Livestock Service (Servicio Agrícola y Ganadero, SAG) started in 1981 a *Quality Assurance System* (QAS) called PABCO (Project of Animal Premises under Official Control) that includes basically the use of *Good Livestock Practices* (GLP). It has been a good initiative but it will also need to develop guides to *Good Manufacturing Practices*. (GMP), *Good Hygiene Practices* (GHP) (Meza and Corvalán, 2002) and it should also continue improving its Residue Control Programme (RCP), certified in June 27, 2003. On the other hand, Chile has animal health and phytosanitary requirements to restrict or prevent some beef imports. Even though Chile is a member of the World Trade Organization (WTO), Chilean labelling and grading regulations have restricted U.S. beef exports. Chile does not permit U.S. beef in consumer cuts to enter the market without being graded to Chilean grading standards. However, Chile does not satisfy its internal beef demand due to factors such as the use of double purpose cattle in beef production (almost 80% of the total produced in Chile), insufficient incorporation of modern technology, high operation cost, little association among producers and in general, among all the members of production. Due to the aforementioned factors, Chile imports bovine meat mainly from MERCOSUR countries, of inferior quality (colour, texture, less % fat, among others factors) and lower prices. Chilean beef exports are low, due to low production and to the lack of modern slaughtering plants with certification of international quality which is needed to compete on the markets (Cordeu *et al.*, 2001). Nevertheless, some exceptions exist as *Carnes Ñuble S.A.*, slaughtering plant of Bío-Bío region, Chile. This company has invested in modern technology and developed safe process, obtaining residual control programme certification. In general, this sector presents a heterogeneous slaughter and refrigeration industry in term of quality, hygiene conditions, production level and food safety[1]. The principal problems found are deficiencies in the evisceration causing fecal contamination; hyper-chlorinated water used before and after evisceration for washing carcasses[2] and on the whole, the producers do not have modern production technologies and some prohibited substances in feed (FVO, 2000). Additionally, the current QAS is insufficient in training and hygienic controls, and actually there is a deficient application and inspection of Chilean Meat Law for classifying meat quality grade. Therefore, the Chilean beef sector needs to improve its sanitary controls and food safety aspects in production and slaughter process, elaborating food safety regulations, applying efficiently a residue control programme for hazardous drugs and chemicals use in production and feeding, implementing GMP and QAS for producers and also investing

[1] Food safety definition: a suitable product which when consumed orally either by a human or an animal does not cause health risk to consumer (USDA).

[2] Carcasses: dead body of an animal especially slaughtered for food, which includes bones, muscle and fat. But exclude blood, viscera and head.

resources to improve sanitary standards along the whole beef chain, beginning with the animal production and developing traceability system (specifically in appropriate animal identification and control of movements). In fact, the SAG has implemented a traceability system for livestock, which will begin to operate as of January, 2005 (ODEPA, 2004). In conclusion, the transparency of the Chilean food safety requirements to harmonize national standards and to develop trade relationships is crucial, since better informed consumers are able to take right decision in order to improve food safety problems.

Finally, all these changes would allow the Chilean beef sector to satisfy international food safety concerns and achieve the appropriate certification to be able to export to demanding markets, which pay more attractive prices and where Chilean beef cannot compete by volume but it could compete by quality, taking advantage of its good sanitary conditions.

FOOD SAFETY REGULATIONS IN MAJOR MARKETS

The major markets considered in this article are United States, Europe Union and Japan based in the following approaches: meat volumes imported by these markets, quality requirements, and the existence of trade agreements between these countries and Chile that facilitate the beef export process.

In the particular case of the *United States Beef Market*, it has around 100 millions of bovine livestock's head, equivalent to eleven millions of tons. The ten main companies produce 100.000 heads per day, 30% more than the annual production of Bio-Bio region, Chile (ODEPA, 2002). In general, the consumer purchase decisions are based on factors such as quality related to taste, flavour, juiciness, softness and uniformity of the cuts, hygiene and security[3]; value perception, price, nutrition, calories and cholesterol.

The institutions of the United States responsible for the food safety are principally the Food and Drug Administration (FDA), the United States Department of Agriculture (USDA), and the Environmental Protection Agency (EPA). The food safety system is based on strong science-based laws and industry's legal responsibility to produce safe foods.

In general, the United States food safety philosophy implies that the risk assessment framework should help to identify how a regulation can provide the greatest benefits (high safety) for the lowest costs and help to understand the magnitude of the problem faced, to determine an appropriate risk management response. The USDA and the FDA have used this approach in the design of their most recent regulations. Regarding risk management, the inspection programmes are obligatory to guarantee to the consumer that the meat is hygienically processed, coming from healthy animals, without harmful residues and honestly labelled for appropriate human consumption. It has established reasonable requirements and standards in food production to protect against contamination, for instance, GMP concerning personnel, buildings and facilities, equipment and product process controls. In 1996, the USDA mandated the use of *Hazard Analysis and Critical Control Point* (HACCP[4]) systems, in order to reduce microbial pathogens in meat and poultry. The use of HACCP reflects a growing awareness in prevention and control of hazards before they reach the consumer (USDA y FSIS, 1999). As a result, all

[3] Hygiene and security mean basically free of residues such as: trace of hormones, antibiotics, pesticides, heavy metals and other non-natural products.

[4] Hazard Analysis and Critical Control Points, prevention risk systems (technique for physical, chemical and biological).

meat food products offered for entry into the United States are subject to the regulations of USDA and must be inspected by the Animal and Plant Health Inspection Service (APHIS) and the Food Safety and Inspection Services (FSIS) previous to release by US customs.

In particular, the USDA and the APHIS restrict the access of meat products coming from countries with focuses of *Foot and mouth disease* (Unnevehr & Roberts, 2002).

Additionally, the FSIS prevent diseased animals from entering the food supply and examine carcasses for visible defects that can affect safety and quality. It inspects products during processing, handling, and packaging to ensure that they are safe and truthfully labelled. FSIS under the Federal Meat Inspection Act (FMIA) inspects all meat sold in interstate and foreign trade, including imported products. The FMIA requires healthy and hygienically processed animals, with traceability code and residue control certification, uniformity of the cuts and high fat content meat, especially infiltrated.

The *European Union's food policy* is built on high food safety standards, which serve to protect and promote the health of consumers, being the European food chain one of the safest in the world. Food safety measures have always formed part of the body of European legislation. However, with the increasing integration of national economies within the single market, developments in farming, food processing, new handling and distribution systems require a new approach of European Union food policy. To overcome this, in January 2000, the European Commission adopted a White Paper on Food Safety, which proposes more coordinated and integrated approach to food safety with the objective of achieving the highest possible level of health protection (Commission of the European Communities, 2000). In fact, for European Authority, it is essential since all European Union beef products be labelled with the following information: country of animal's birth, fattening, slaughter and establishment number of slaughterhouse, cutting and approval number of cutting plants, and reference number linking the meat to an animal or group of animals. The meats must be free of residues such as chemical substances, antibiotics, heavy metals or noxious substance. Hence, it requires effective registration, control, tracing and identification procedures, with a reliable and transparent monitoring system. The authorized countries should be free at least twelve months of *Foot and mouth disease, exotic virus, bovine pest and BSE* and should also guarantee vaccination against other illnesses *(Brucellosis, Tuberculosis)*. This White Paper makes proposals specifically designed to promote the health and welfare of animals only in so far as food safety policy is directly concerned. Therefore, European Union market requires a greater transparency at all levels of food safety, being indispensable traceability number reference, residue control certification, sanitary and hygiene inspection at the producer and slaughter levels. It also is necessary to be a member of the Office International des Epizooties, and have systems in place for rapid detection, reporting and confirmation of List A OIE diseases. Chile at the moment complies with the last requirement, but it needs to develop an official traceability system and to improve sanitary and hygiene aspects specifically at the slaughter level. However, Chile has enormous opportunities because EU meat classification is similar to Chilean carcass classification, due to both markets appreciation of lean meats.

The *Japanese beef market* has historically been the largest beef importing country in the world in terms of value and second (behind the U.S.) in terms of volume. In 1999, Japan accounted for 13% of world beef import volume and 17% of world beef import value. To satisfy its meat requirements Japan needs 5.3 million tons approximately,

importing 40%, mainly from United States and Australia (Obtained at: http://www.epa.go.jp/2000/g).

Japanese consumers are sophisticated, highly conscious of food quality and safety, and willing to pay for attributes they believe as a high-quality and safe product (Clemens, 2003). For example, 97% of total bovine meats imported by Japan are cuts without bone. The United States Meat Export Federation estimates that U.S. choice beef falls about midway in the quality spectrum for the Japanese market due to strict quality requirements in terms of food safety and specifications of meat products. Nevertheless, this market is an attractive business for beef export due to its high prices (Reed and Iswariyardi, 2000). Regarding Chile, it has achieved an important step for trading Japan, because in May 2002, Chile signed a trade agreement with Japan and a sanitary agreement with China. It will allow Chile to access to this demanding and attractive market. In addition, Chile already exports pork and poultry meat to the Japanese market. During 2003, Japan occupied the fourth place as a commercial partner of Chile and the second place for the Chilean exports and during this year Japan was the third country for the Chilean beef export with 10% of total exports (Moya, 2004). Moreover, today Chile has a real option to get a free trade agreement with Japan due to the advanced agreements achieved between these two economies.

The requirements and standards in this country are set by the Japanese Ministry of Health, Labour, and Welfare (MHLW) and cover all types of foods. In general, Japanese importation process presents two important laws, Food Sanitation and Control of infectious illness in domestic animals. The first one is to protect the people from health hazards that may be caused by eating or drinking, and to help improve and promote public health. The law prohibits the production, importation, or sale of unsanitary foods and those markets not complying with the prescribed standards such as food additives or detrimental substances, packages containing harmful substances. The second one is to avoid the buds and the dissemination of animal illnesses. This law divides the world in four categories based on the degree of contamination with these illnesses. These categories are 0, 1, 2 and 3 indicating the risk of the area. Thus, to be considered category 0 is equivalent to be an area of zero risk for animal illnesses. Chile is classified as category 0; therefore Chile is allowed to export to Japan (Hamamoto, 2001). In general, Japan has similar requirements as European Union and United States markets, being its biggest demand the animal health. In fact, this market will be rigorous with the recently traceability implementation system (december 2003), covering farm to slaughterhouse and from slaughterhouse to processors, distributors, and retailers that will start by december 2004 involving the whole chain from farms until retailers. Furthermore, the animals should neither be fed with chemical substances nor be subject to residual-leaving drug use in the meats. The meat and their products should also not contain residuals of antibiotics synthesized chemically. For that reason, documentation to certify that the trimming process was carried out in a hygienic way and according to the laws of the country exporter is indispensable (Japan External Trade Organization (JETRO), 2004). The Japanese market also requires animals with high weight, high content of fat (35%), high degree of marbling and uniformity of cuts; however, Chilean bovine meat does not comply to these standards of quality; specifically, in content of fat.

EXPORT POSSIBILITIES FOR THE CHILEAN BEEF SECTOR

The international scenario and the current situation of Chile represent a real export possibility for the Chilean beef (especially from Bio-Bio region), competing mainly in quality. The most important advantage is the good animal health of the Chilean beef sector allowing its access to the most demanding markets, which pay higher prices than the domestic market. Besides, the trade agreements reached with important markets, the good international image of Chile and the possibility of using regional ports facilities are also important competitive advantages for this sector. For instance, Chile has potential opportunities in the United States market due to the free-trade agreement reached between both countries by the end of 2002 allowing Chile a quota of 1,000 tons per year of bovine meat, with an annual increment of 10% until the year 2006. After that, its access to the American market will be without quota and with tariff zero being it an important opportunity for the Chilean beef. However, to classify as Prime or Choice and get a better price, the Chilean beef must increase the content of fat by producing animals with more weight and with concentrate as a substitute of pasture.

Concerning European Union market, Chile also has enormous possibilities due to factors such as the trade agreement reached in 2002, which allows reaching the Hilton quota[5] of 1,000 tons with tariff zero and with an annual increment of 10% in the quota. This quota is equivalent to the 10% of the total of animal slaughtered in Chile. It allows exporting US$10 million in bovine meat by the year 2005. These opportunities are enhanced specifically for *Carnes Ñuble S.A.* (slaughtering plant of the Bio-Bio region, Chile), since it already complies with most of the demanded standards, being necessary to improve some aspects to be more competitive. For instance, this slaughtering plant was the first Chilean company in obtaining the certification for its quality assurance system and residue control programme by the SAG, allowing *Carnes Ñuble S.A.* to export beef to Europe. Specifically, in June11, 2003 this company exported 11 tons of bovine meat to Germany (Moya, 2003). Finally, the European Union carcass classification is similar to the Chilean classification and both markets value highly lean meats offering an attractive price for Chilean meat exports.

Regarding the Japanese market, Chile has two possibilities:

1. *Meat differentiation*- the Japanese importers buy specific brands; since brand positioning is necessary to differentiate the product. Therefore, Chile should invest resources in adding value to its meat and implementing a marketing strategy in Japan, based on Chile's own advantages, for instance, healthier and a more natural production, remarking its hormones, preservatives and diseases free beef.
2. *Producing beef with pasture* and finished with grain- because the pasture production is the most natural way to feed, however, applying only this option does not achieve a good animal growth and nor a good price levels. Hence, a mix production would be a great option because Japanese market is willing to pay more for this product since the animal growth finished with grain could achieve the proposed weight and a high level of fat, (covering as well as infiltration).

In general, the three markets offer superior prices for fine cuts, compared with the price

[5] Hilton quota is the most important system for placing selective meats in the European market, including special cuts of meat and rigorous sanitary and quality controls.

currently paid in Chile. However, United States and Japanese markets require animals with higher weight, fat content and degree of marbling, and also uniformity in the cuts. To achieve these requirements, the animals should be feed with grain for some months in a more intensive and expensive production system. On the other hand, European Union represents the less risky market because it does not require high fat levels and its classification system for beef is similar to Chilean classification.

CONCLUSIONS

The gap in the food safety outcomes among countries are essentially due to evident differences in risk perceptions, available market information, incidence of risks in production, and traditional methods of food processing and preparation. Therefore, a food safety standard in markets such as United States, Japan and European Union may improve the welfare in Chile. However, the tensions between consumer protection and consumer gains from trade will not be fully resolved by economic evaluation of policies. One obvious complication is that different consumer risk perceptions will lead to different valuations of risk reduction. Nonetheless, the consistent use of a transparent normative framework that accounts for the benefits as well as the potential costs of imports and exports could not only reduce the number of food safety-related trade disputes, but also improve the allocation of resources to achieve foodborne risk reductions (Roberts, 1998, Roberts & Unnevehr 2002, Henson & Loader, 1999).

Considering that the key competitive factor for Chilean beef exports sector is the excellent animal health situation, it is crucial to invest more resources to continue improving its sanitary standards along the whole beef chain, beginning with the animal production and the slaughterhouse, principally, with an effective plan of contingency and a constant control and eradication program for the OIE List A diseases. On the other hand, the world tendencies must be considered by the Chilean beef sector, in terms of consumer's preferences and international food safety regulations concerning meat products, such as regulation on important diseases (e.g. *Foot and mouth disease and BSE*), and on the production, packaging, transport process, good hygienic and manufacture practices among others. Thereby, Chile could be able to compete in the international market and aspire to develop an exports strategy based on quality of the bovine meat, achieving higher prices for its beef exports.

Therefore, choosing this export strategy, Chile should lead the efforts, from public and private sectors to accomplish successfully the international requirements for beef exports. In the short term, the government should improve the food safety regulations and control procedures to guarantee the desired product. The producers should also improve their production level, meat quality, process and facilities. Particularly, most of the slaughterhouses need to comply with requirements such as GHP, GMP and RCP to get better hygiene and food safety in its productive process. Moreover, the whole industry must invest in traceability system at least from farms to slaughterhouses, QAS and harmless processes (risk-free, on-toxic), packaging, labelling, and an appropriate distribution system to establish markets and define channels, incorporating modern trade technologies and marketing strategies to adapt in a better way to the consumers' preference changes and to the food safety international requirements. In the long term, Chile should implement a HACCP system based on risk prevention for the feedlot, cattle farm and slaughtering plant; since HACCP risk prevention utilize management control measures and monitoring system to ensure the public that the beef production

is safe for consumption allowing achieve an increasing and stable position in the demanding markets.

BIBLIOGRAPHY

APEC (2004) Japan and Chile initiate new study aimed at the implementation of a free trade agreement. Available on the web: http://www.apec 2004.cl/noticia_detalle.asp

BÓRQUEZ H (2002) Acuerdos comerciales, oportunidades para la ganadería bovina Chilena. Seminario internacional: adaptación de los sistemas productivos para la exportación de carne bovina. Organizado por PDP Carnes Ñuble S.A., CORFO y Universidad de Concepción, Chillán.

BUZBY J (2001) Effects of food safety perceptions on food demand and global trade. REGMI, A (ed) Changing structure of global food consumption and trade. Washington: Economic Research Service/ USDA, pp 55-66. Available on the web: http://www.ers.usda.gov/publications/

CLEMENS R (2003) Meat traceability and consumer assurance in Japan. Midwest Agribusiness Trade Research and Information Center, MATRIC 5:1-26. Available on the web: http:// www.matric.iastate.edu

CORDEU J, CAÑAS R, MARET M and SEPÚLVEDA N (2001) Carne bovina en los países del MERCOSUR y Chile. Taller FAO y Universidad Mayor. Available on the web: http://www.rlc. fao.org/prior/comagric/pdf/discusion.pdf

COMMISSION OF THE EUROPEAN COMMUNITIES (2000) White paper on food safety. Brussels. Available on the web:

http://europa.eu.int/comm/dgs/health_consumer/ library/pub06_en.pdf

FOOD AND VETERINARY OFFICE (2000) Final report of a mission carried out in Chile from 24 to 28 January 2000 for the purpose of evaluating its veterinary services and animal health situation. European Commission Health & Consumer Protection. Food and Veterinary Office (FVO) DG (SANCO)/1021/2000- MR-FINAL: 1-21. Available on the web:

http://europa.eu.int/comm/food/fs/inspections/vi/ reports/chile/vi_rep_chil_1021-2000_en.pdf

HAMAMOTO T (2001) Japan food and agricultural import regulations and standards country report. Foreign Agricultural Service /USDA. GAIN Report #JA1072:1-16. <http://www.fas.usda.gov/ gainfiles/200109/125681836.pdf>

HENSON S, Loader R (1999), Impact of sanitary and phytosanitary standards on developing countries and the role of the SPS agreement. Agribusiness 15:355-369.

IPC (1998), Reforming global meat policy and regulations. International Policy Council on Agricultural, Food and Trade 8: 1-37.

JETRO (2004), Guide to the JAS system for agricultural and forest products. Available on the web: http://www.jetro.go.jp/en/market/regulations/

MEZA A, CORVALÁN A (2002) PABCO, Requisitos sanitarios y de inocuidad en predios y animales para mercados externos. Seminario internacional: adaptación de los sistemas productivos para la exportación de carne bovina. Organizado por PDP Carnes Ñuble S.A., CORFO y Universidad de Concepción. Chillán.

MOYA J (2004) Producción de carne. ODEPA (Ganado y carnes) december 16, 2004. Available on the web: http://www.odepa.gob.cl/base-datos/

MOYA J (2003) El mercado de la carne bovina. ODEPA (Ganado y carnes) october 14, 2003. Available on the web: http://www.odepa.gob.cl

ODEPA (2002) Panorama de la Agricultura Chilena. Ministerio de Agricultura. Registro de propiedad intelectual Nº 130726. ISBN: 956-7244-18-9.

ODEPA (2004) El sistema de identificación individual de bovinos es un tema prioritario para el 2004. Ganado y Carnes. Available on the web: http:// www.odepa.gob.cl/base-datos/

REED M, ISWARIYARDI A (2000) Competitive forces in the Japanese beef market. Economic Planning Agency of Japan. Available on the web: http://www.epa.go.jp/2000/g/

ROBERTS D (1998) Preliminary assessment of the effects of the WTO agreement on sanitary and phytosanitary trade regulations. Journal of International Economic Law 1(3): 377-405.

ROBERTS D, UNNEVEHR L (2002) Trends in food safety regulations and their imports on trade disputes. Available on the web: http://www.igpa. uillinois.edu/publications/pdf/SPS.pdf

UNNEVEHR L, ROBERTS, T (2002) Food safety incentives in a changing world food system. Journal of Food Control 13(2): 73-76.

USDA y FSIS (1999) Generic HACCP model for raw, ground meat and poultry products. Available on the web:http://www.fsis.usda.gov/index.htm