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**International Agricultural Trade under Regulatory
Asymmetry: An Economic Analysis of SME Export
Behavior**

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“ The study of economics does not seem to require any specialized gifts of an unusually high order. Is it not, intellectually regarded, a very easy subject compared with the higher branches of philosophy and pure science? Yet good, or even competent, economists are the rarest of birds. An easy subject, at which very few excel! The paradox finds its explanation, perhaps, in that the master-economist must possess a rare combination of gifts. He must reach a high standard in several different directions and must combine talents not often found together. He must be mathematician, historian, statesman, philosopher—in some degree. He must understand symbols and speak in words. He must contemplate the particular in terms of the general, and touch abstract and concrete in the same flight of thought. He must study the present in the light of the past for the purposes of the future. No part of man's nature or his institutions must lie entirely outside his regard. He must be purposeful and disinterested in a simultaneous mood; as aloof and incorruptible as an artist, yet sometimes as near the earth as a politician.”

John Maynard Keynes, *Essays in Biography*, 1933

To my family and friends, and especially to my wife Karin,
who has always encouraged me to pursue my goals.

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Introduction

In his 1824 essay on Mitford's History of Greece, English politician and historian Thomas Babington Macaulay noted that "free trade, one of the greatest blessings which a government can confer on a people, is in almost every country unpopular. It may be well doubted, whether a liberal policy with regard to our commercial relations, would find any support from a Parliament elected by universal suffrage" (Macaulay, 1854). This incisive observation on the realities of trade politics is no less relevant today as political necessity continues to frequently overshadow economic reasoning; it also presents a clear challenge to the economic profession (Irwin, 2005).

Economists are trained to understand and explain efficient allocation of resources. Adam Smith and David Ricardo were early pioneers in pointing out the inefficiencies of the English Corn Laws. Even Karl Marx once remarked that "the protectionist system is nothing but a means of establishing large-scale industry in any given country" (Marx, 1848). Today, to varying degrees, economists are equally attuned to inefficiencies in both domestic and international markets. Yet, notwithstanding the widespread use of sophisticated analytical and economic modeling techniques, modern day economists sometimes struggle to communicate, and effectively convince policy makers and the wider public to embrace efficient solutions that ameliorate societal welfare. In today's policy environment, a Pareto optimal solution, that is a solution making at least one individual better off without making anyone else worse off, is a very rare find. More often than not, policy makers operate in a world of second best solutions, where at least some individuals must be made worse off to make others better off.

Economics is about trade-offs. While international trade may aspire to bring "win-win" optimal solutions that improve efficient allocation of resources across large geographic areas,

very often in practice there are “winners” and “losers,” at least in the short run. Consider a situation where a customs tariff is reduced or eliminated. A producer in the domestic market needs to find a way to reduce prices to remain competitive with the foreign supplier, or else potentially face the prospect of going out of business. Although society as a whole may be significantly better off as a result of the tariff reduction, the domestic producer clearly is not. The producer will need to make some adjustment to stay in business, or perhaps more likely, will dedicate resources to try to reverse the decision to reduce the tariff. As Macaulay observed in 1854, politics can easily trump arguments in favor of free trade. The domestic producer has a voice, a vote, and an opportunity to lobby his or her locally elected representative. The foreign supplier, and indeed broader society, will need to be very well organized to effectively counteract the political weight of a disgruntled domestic producer who is fighting for survival.

This, in essence, is also the contemporary challenge of globalization posited by Thomas Friedman in his popular book, *The Lexus and the Olive Tree* - prosperity and development within an increasingly integrated international system contrasting the values of local culture and tradition (Friedman, 1999). The debate over globalization, which has at times even escalated into violence, often centers on issues of food and agriculture. In 1999, the Confédération Paysanne, led by José Bové, poignantly delivered the anti-globalization message by vandalizing a McDonald’s fast-food franchise in the French town of Millau. Bové also participated in the anti-World Trade Organization demonstrations in Seattle, and was later involved in the destruction of fields planted with genetically modified maize. The clash over globalization is commonly characterized as an existential struggle between small local farmers and large scale industrial agriculture. It is not just a matter of fast food versus slow food, or the presumed

stewardship of organic agriculture versus the perceived environmental risk of biotechnology, it is also fundamentally a question of participation or exclusion from the international trading system.

For the large scale multinational corporation, the increasing interdependence and economic integration of countries seem to deliver rather obvious benefits. Large corporations generally have the economies of scale and scope to produce at low cost and distribute large volumes efficiently wherever there is a market. But, where does this leave the small and medium sized agricultural enterprise? What role can the small and medium sized enterprise (SME) play in 21st century agriculture, and how can it effectively compete in the global market place? Some believe that the SME is the panacea, the proverbial “white knight in shining armor,” offering a healthier and more socially appealing alternative to the “poisonous food produced by the profiteering impersonal agro-industrial complex.” Michael Pollan, perhaps one of the most vocal critics of “laboratory-based industrial agriculture,” notes that “eating is an agricultural act. It is also an ecological act, and a political act, too. Though much has been done to obscure this simple fact, how and what we eat determines to a great extent the use we make of the world – and what is to become of it. To eat with a fuller consciousness of all that is at stake might sound like a burden, but in practice few things in life can afford quite as much satisfaction. By comparison, the pleasures of eating industrially, which is to say eating in ignorance, are fleeting (Pollan, 2007). In similar vein, the Sustainable Agriculture, Food and Environment (S.A.F.E.) Alliance has denounced globalization and industrialization of agriculture suggesting that “specialized production for sale to distant markets breeds dependency and vulnerability.” In 1994, the S.A.F.E. Alliance popularized the concept of “food miles,” drawing attention to the carbon footprint and fuel energy costs of shipping agricultural commodities over long distances (Paxton, 1994).

However, not all globalization skeptics are opposed to international trade; and indeed, some are more inclined to focus primarily on mitigating harmful effects, rather than dismissing trade altogether. The “Fair Trade” movement, for example, which began in the 1950s and 1960s with non-governmental organizations like Ten Thousand Villages and Oxfam, is dedicated to improving the terms of trade for both producers and consumers. The FAIRTRADE certification mark, which in 2010 accounted for more than €4.3 billion in global sales, offers consumers the opportunity to purchase products that meet certain labor, environmental and trade standards, while at the same time guaranteeing a fair price to the producer (Fairtrade International, 2011).

Governments can also play a critical role in safeguarding the interests of small local producers by imposing conditions on trading partners to correct trade externalities. Trade agreements can incorporate measures to uphold labor and environmental standards, intellectual property rights, geographic indications and other rules of origin. Such policies enable small producers to distinguish their products, and escape the trap of undifferentiated commodities that trade primarily on the basis of low cost and price (Giovannucci et. al, 2009).

The question of SME participation in international agricultural trade is the central theme of this dissertation. Chapter 1 reviews the significance of international agricultural trade and the factors that have contributed to its most recent expansion. Within this context, Chapter 1 also considers the role of the agricultural SME, and the opportunities and challenges it faces when trading internationally. Chapter 2 introduces the assumption that regulatory differences between countries are a barrier to trade, particularly for the SMEs that lack resources and expertise to easily adapt to new regulatory environments. This chapter examines how the formation of national regulations creates asymmetry, and how non-governmental and intergovernmental efforts are striving to ameliorate the regulatory pathways to facilitate the international exchange

of food and agricultural products. Chapter 3 outlines the economic theory underpinning a firm's decision to export, and develops a decisional model for understanding small firm behavior when facing regulatory asymmetry. Chapter 4 presents a case study of a small Indian firm that is seeking to export litchi fruit to various international markets. The firm faces a specific problem of regulatory asymmetry, and must therefore decide whether to sell locally, regionally or internationally. The firm's export decision is analyzed using @Risk software to simulate the expected values of each decision alternative. The concluding section discusses the results and offers suggestions for further research.

The Small and Medium Sized Enterprise in International Agricultural Trade

Over the last three decades, international agricultural trade has grown significantly, from \$298 billion in 1980 to well over \$1.3 trillion in 2010 (WTO, 2011). This expansion, however, marks only the most recent chapter in a long history of agricultural commerce. For centuries, agricultural trade has been at the heart of economic life. Early hunter-gatherers from the Neolithic period bartered agricultural commodities, reaping the benefits of labor specialization. With the spread of Sumerian civilization, around 5500 B.C, agricultural trade became better organized to serve growing populations in urban centers. Irrigation techniques enabled large-scale intensive mono-cropping cultivation, and marketable surplus could be stored or transported along the Tigris and Euphrates Shatt al-Arab waterway reaching into the Persian Gulf. The later expansion of trading routes across Mesopotamia and the Mediterranean further enabled the long distance movement of valuable agricultural commodities like timber and wine (Oppenheim, 1967 and Demirdjian, 2009).

Agricultural trade extends across all continents, and its significance goes well beyond the simple movement of products from surplus to deficit areas. In the 15th century, the search for silk and spice trading routes led to important geographical discoveries, linking people, cultures and languages. Agricultural trade led to the establishment of the modern corporation, with the English and Dutch East India Companies emerging as precursors to present-day multinationals. High expectations of profitable exchange in agricultural and other raw commodities lured nations into a colonial chase for territorial acquisition. Agricultural trade also brought the unfortunate subjugation, even slavery, of native peoples to support the increasing demand for commodities like cotton, rubber and sugar. And at the same time, trade expanded culinary experiences,

launching appetites for novel foods like noodles from China, and potatoes and maize from the Americas (Schwartz, 2010).

Mindful of this long history, it is salutary to recall some of the factors that have contributed to the most recent expansion of agricultural trade. Technological innovation undoubtedly played a central role in propelling a significant shift in volume, scope and participation in agricultural trade. Mechanization, the gradual conversion from horse power to steam, oil and electric power, radically transformed the character of agricultural production. In the United States, the number of on-farm animals (primarily horses and mules) fell from 25 million in 1915 to under 5 million in 1955. During this same period, the number of tractors increased from 20 thousand to 4.5 million. Across agriculture, labor productivity increased almost 50 fold, prompting a mass exodus of labor from agriculture to other sectors of the economy (Gardner, 2002). Changes in European agriculture, although somewhat different from the American experience, have been equally dramatic. The Organization for Economic Cooperation and Development (OECD) estimates that in the decade between 1986 and 1996, the number of full time farmers in the 12 member states of the European Economic Community fell by roughly 25 percent; during this same period, the number of farms declined by 20 percent (OECD, 1998).

While the development of large scale farming has been slower outside the Australian and American continents, the productivity of global agriculture has nonetheless increased dramatically as more farms have gained access to pesticides and fertilizers, and have adopted improved animal and plant genetics. In India, the “Green Revolution,” which focused primarily on wheat and rice production in the Punjab, set the foundation for a considerable leap in grain production, doubling from 51 million tons in 1950 to 108 million tons in 1970 (Ray, 2007). As

the world's population now surpasses 7 billion, and nearly one out of every seven people in the world today remains undernourished, most economic development experts believe that the contemporary problem of food insecurity has more to do with “affordability” and “accessibility,” than food “availability” (G-20 L’Aquila Joint Statement on Global Food Security, 2009).

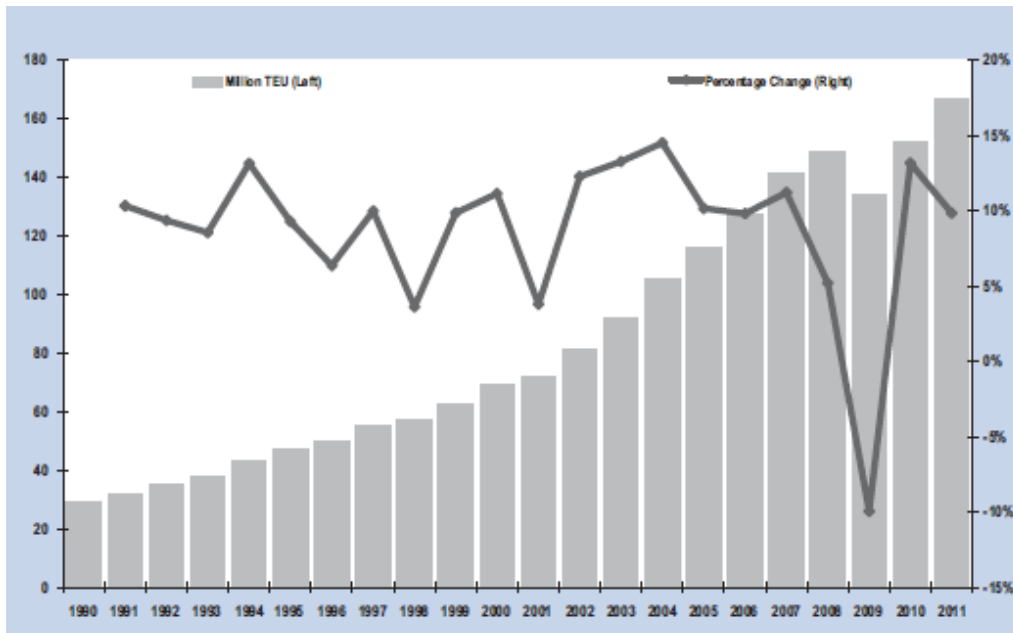
Accessibility to food produced in geographically dispersed areas is a relatively recent phenomenon. Prior to mechanization, the distance range for transporting grain overland was approximately 20 miles. In the 15th century, 20 miles represented the upper limit for a one-day walk to the market. In the 19th century, German economist Johann von Thünen determined that a standard wagon load of grain, drawn by two horses and driven by two farm workers, could travel about 230 miles on a flat road before the humans and animals would consume all the grain, assuming this was their only source of energy. In practice, even when using a horse drawn wagon, the upper limit for transporting grain profitably over land still remained around 20 miles. First, the shipper would need to keep sufficient reserves for the return trip; secondly, the poor conditions of 19th century roads across hilly terrain often increased the energy requirements for animal power; and finally, the shipper would need to have a sufficient quantity of grain to sell to make the trip worthwhile (Schwartz, 2010).

Rising food demand from growing and affluent urban populations has provided an important stimulus for developing efficient farm-to-fork linkages over longer distances. Technological improvements in transportation, storage, preservation, processing, not to mention the extraordinary advances in information management, have radically transformed the food pathways from the farm gate to the consumer. As noted by August Lösch, the spatial margins of profitability, or the marginal returns of production and transportation decisions within a geographic space, largely shape the content and flow of trade within the marketplace. So for

example, when transportation costs are high, it may be more profitable to ship deboned meat cuts rather than whole or half meat carcasses. Similarly, it may be more profitable to use local maize production for animal feed, and subsequently ship value-added processed poultry or pork products rather than the bulk commodity (Lösch, 1967).

The first refrigerated ocean cargo shipments date back to 1882, but the revolution of containerized shipping in the 1950's and 1960's made the process of transporting perishable goods over longer distances more affordable. Multimodal networks using truck, rail, ship and air links have substantially reduced transit times and demurrage costs. In 1956, the average cost of loading cargo on a ship was \$5.86 per ton; but by 1975, the cost of loading a standardized shipping container had fallen to \$0.16 per ton. As a result, over the last two decades, the volume of containerized shipping has grown at an average annual rate of about 10 per cent, surpassing 160 million twenty-foot equivalent units (TEU) in 2011 (Figure 1, UNCTAD, 2011).

Figure 1 - Global Container Trade 1990-2011



Source: Drewry Shipping Consultants, *Container Market Review and Forecast 2008/09*; and Clarkson Research Services, *Container Intelligence Monthly*, May 2011.

Note: The data for 2011 were obtained by applying growth rates forecasted by Clarkson Research Services in *Container Intelligence Monthly*, May 2011.

Along with the many technological improvements that have enabled producers to ship almost anything anywhere, there have been other significant developments that have contributed to an unprecedented global expansion of agricultural trade. Liberalization of retail rules, primarily in terms of development zoning, operating hours and ownership, has broadened the scope of consumer access, bringing both large scale single-destination shopping and “around-the-clock” 24 hour convenience. Since 1994, the size of a typical U.S. supermarket has increased by more than 30 percent, reaching 4.273 square meters, and carrying more than 38.000 food items in 2010. Larger supercenters, which also carry non-food items like clothing, electronics and household wares, often surpass 15.000 square meters, carrying more than 60.000 food stock-keeping units (SKUs) (Food Marketing Institute, 2011).

The food retail revolution is by no means only confined to the United States. In Latin America, the supermarket share of retail sales is above 50 percent. In Europe, according to a competitiveness study sponsored by the European Commission, approximately one-third of non-specialized food retailers account for 86 percent of total turnover, with an average turnover per enterprise exceeding €3 million a year (European Commission, 2007). Supermarket News, an industry trade magazine specializing in food distribution, reported that in 2011, the top 25 global food retailing companies had more than 91.000 stores in 75 countries, collectively accounting for almost \$2 trillion in sales (Table 1). Food retail businesses are also just beginning to discover the full potential of e-commerce. As the internet increasingly connects businesses directly to consumers, the process of internationalization appears to be largely a problem of minimizing logistical costs. Logistical cost constraints may indeed explain why Peapod, the largest online food retailer in the United States (owned by the Dutch company, Ahold), has only 350,000 customers in 15 high value metropolitan areas (www.supermarketnews.com, 2012).

Table 1 - Top 25 Global Retailers 2011

Company	Country of Origin	Sales in \$ Billion	Number of Stores	Countries of Operation
		421,8	8.970	Argentina, Brazil, Canada, Chile, China, Costa Rica, El Salvador, Guatemala, Honduras, India, Japan, Mexico, Nicaragua, Puerto Rico, United Kingdom, United States
		123,2	15.937	Argentina, Bahrain, Belgium, Brazil, Bulgaria, China, Colombia, Cyprus, Dominican Republic, Egypt, France, French Polynesia, Greece, Guadeloupe, Indonesia, Iran, Italy, Jordan, Kuwait, Malaysia, Martinique, Morocco, New Caledonia, Oman, Pakistan, Poland, Portugal, Qatar, Reunion, Romania, Saudi Arabia, Singapore, Spain, Taiwan, Thailand, Tunisia, Turkey, United Arab Emirates
		95,8	2.131	Austria, Belgium, Bulgaria, China, Croatia, Czech Republic, Denmark, France, Germany, Greece, Hungary, India, Italy, Japan, Kazakhstan, Luxembourg, Moldova, Morocco, the Netherlands, Pakistan, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom, Vietnam
		95,2	5.380	China, Czech Republic, Hungary, India, Ireland, Japan, Malaysia, Poland, Slovakia, South Korea, Thailand, Turkey, United Kingdom, United States
		82,4	10.000	Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom
		90,4	3.624	United States

		77,9	540	Australia, Canada, Japan, Mexico, Puerto Rico, South Korea, Taiwan, United Kingdom, United States
		74,7	15.445	Austria, Bulgaria, Croatia, Czech Republic, France, Germany, Hungary, Italy, Poland, Romania, Russia, Slovakia, Switzerland, Ukraine
		71	9.500	Australia, Austria, Belgium, Denmark, France, Germany, Greece, Hungary, Ireland, Luxembourg, the Netherlands, Poland, Portugal, Slovenia, Spain, Switzerland, United Kingdom, United States
		67,4	1.750	United States
		61,3	15.072	Germany
		58,3	39.100	Australia, Canada, China, Denmark, Hong Kong, Indonesia, Japan, Malaysia, Mexico, Norway, Singapore, South Korea, Sweden, Taiwan, Thailand, United States
		55,2	2.964	Angola, China, France, Hungary, Italy, Luxembourg, Poland, Portugal, Romania, Russia, Spain
		54,6	3.199	Australia, India, New Zealand
		51	12.183	Australia, Canada, China, Denmark, Hong Kong, Indonesia, Japan, Malaysia, Mexico, Norway, Singapore, South Korea, Sweden, Taiwan, Thailand, United States
 ITM Intermarché		49,2	2.000	Belgium, Bosnia-Herzegovina, France, Poland, Portugal, Romania, Serbia
		43,7	638	France, Italy, Poland, Portugal, Reunion, Slovenia, Spain

		41,6	2.970	Belgium, Czech Republic, Estonia, Latvia, Lithuania, the Netherlands, Norway, Portugal, Slovakia, Sweden, United States
		41,1	1.694	Canada, Mexico, United States
		41	11.663	Argentina, Brazil, Colombia, France, Madagascar, Mauritius, Mayotte, Reunion, Thailand, Uruguay, Vietnam
		38,9	2.800	Belgium, Cyprus, Greece, Indonesia, Luxembourg, Romania, Slovenia, United States
		37,5	2.394	United States
		32,3	2.200	Australia, New Zealand
		31	1.027	Canada
		30,1	872	United Kingdom

Source: www.supermarketnews.com and www.foodretailworld.com/LeadingRetailers.htm

With the global retail revolution taking hold, there are growing concerns over the market power of retailers and their ability to influence prices charged to the consumers and prices paid to suppliers. As supermarket chains become larger, and presumably more geographically dispersed, there may be tendencies toward developing natural oligopolies and oligopsonies. However, recent studies of retail behavior in the EU and the U.S. have shown that prices across retailers in a given region exhibit wide dispersion and low correlation; moreover, retail price changes do not appear to be strongly connected to price changes at the farm commodity level,

suggesting that procurement costs may only play a relatively minor role in retail pricing decisions. Sexton, Zhang and Chalfant observed that the transmission of farm price changes to retail is a) delayed, b) incomplete, and c) asymmetric, leading them to conclude that retail purchasing and sale strategies may be more oriented toward minimizing price volatility. Retailers generally seem to place great importance to cost minimizing strategies, including vertical coordination, centralized procurement, reliability of supply, contracting for quality standards and charging stocking fees (which is tantamount to renting retail shelving space). It should be noted that these factors also tend to place SMEs at a competitive disadvantage, as the volumes and marketing infrastructures of SMEs are relatively limited, and are typically not as well developed as those employed by larger firms (Sexton, 2010).

Technological advances and the corresponding evolution in market structure have undoubtedly had a profound impact in the way food is produced, stored, transported and sold to the consumer. The wider availability of food has also given hope that food prices would remain affordable, or at least not deviate significantly from the “Law of One Price.” W. Stanley Jevons noted that “in the same open market, at any moment, there cannot be two prices for the same kind of article” (Jevons, 1888). Jevons was assuming that in an integrated market, the opportunity for arbitrage would generally mean that prices for an identical good will tend to converge when taking into account transportation and other transaction costs. Price differences would encourage the transfer of undervalued assets to positions of higher expected return. With the assumption of perfect information and zero transaction costs, arbitrage would lead to price equalization over the long term.

However, in practice, the law of one price has generally eluded international agricultural commodity markets as national agricultural policies have often acted to protect and insulate

agricultural producers from foreign competition. Modern governance of international trade is a product of the so-called “Bretton Woods system.” In July 1944, delegates from 44 countries convened in Bretton Woods, New Hampshire to endorse a framework for international economic cooperation, with the intent of avoiding a repetition of the disastrous policies of exchange control and protectionism that had contributed to economic depression and two world wars. The Bretton Woods Conference created the International Monetary Fund (IMF) to oversee exchange rates, and the International Bank for Reconstruction and Development (IBRD), or World Bank, to provide long-term loans for postwar reconstruction and economic development. Negotiations for the creation of an international trade organization (ITO) proved to be substantially more difficult, and so in 1947, the contracting parties agreed to a “temporary solution,” creating the General Agreement on Tariffs and Trade (GATT) (Hoekman and Kostecki, 2001).

The objectives of the GATT were to establish an orderly and transparent framework to enable the expansion of international trade through the gradual reduction of trade barriers. The Agreement contained certain underlying principles and provisions, including:

- a) **Most-Favored-Nation (MFN) Treatment** - This was a fundamental principle, enshrined in Article 1 of the GATT, requiring each contracting party to provide to all other contracting parties the same conditions of trade as the most favorable terms extended to any other contracting party. In other words, each signatory country was required to treat all signatories in the same way as it would treat its "most-favored" trading partner.
- b) **Reciprocity** - Each contracting party had a right to access to markets of other trading partners on a MFN basis, and at the same time also had an obligation to reciprocate with trade concessions on a MFN basis.

- c) **Transparency** – The GATT stipulated that all contracting parties had an obligation to officially notify other parties before implementing a rate of duty or before imposing a new or more burdensome requirement on imports. In the effort to harmonize the system of import protection, the GATT advocated replacing non-tariff trade barriers with a "tariff-only" regime.
- d) **Tariff binding and reduction** – In 1947, tariffs were the main form of trade protection, and as a result early GATT trade negotiating rounds focused primarily on tariff binding and reduction. However, with the start of the Kennedy Round in 1963, attention began to shift toward non-tariff trade restrictions and to the problem of trade in agricultural products (Table 2).

For most of the post-World War II period leading up to the Uruguay Round, agricultural trade had been accorded special status, which generally meant exempting agriculture from the disciplines of the GATT (Article 11:2c). During this period, agricultural producing countries like the United States and the European Communities resorted to the use of tariffs, quantitative import controls and export subsidies to stabilize domestic producer prices. By 1986, the level of domestic support to agricultural producers in OECD countries had reached close to 60 percent of the total value of production. Aside from the onerous economic burden this imposed on consumers and taxpayers, domestic subsidy programs generated large surpluses that could only be disposed of in the world market through the use of export subsidies, a practice which often ended up depressing world market prices. As the United States and Europe struggled to capture global market share, many developing countries became increasingly dependent on cheap food imports, which ultimately served as an economic disincentive to agricultural development (OECD, 1998).

Table 2 – Trade Negotiations under GATT/WTO 1947-2011

Negotiating Round	Period	Countries	Subject	Outcome
Geneva I	7 months beginning in April 1946	23	Tariffs	Signing of GATT, concessions on 45,000 tariff lines affecting \$10 billion of trade
Annecy	5 months beginning in April 1949	29	Tariffs	Accession of 9 countries, concessions on 5,000 tariff lines
Torquay	8 months beginning in September 1950	32	Tariffs	Accession of 4 countries, Concessions on 8,700 tariff lines – 25 percent reduction from 1948 levels
Geneva II	5 months beginning in January 1956	33	Tariffs	Japan accession, tariff reductions worth \$2.5 billion
Dillon	11 months beginning in September 1960	39	Tariffs	Concessions on 4,400 tariff lines worth \$4.9 billion
Kennedy	37 months beginning in May 1964	74	Tariffs and anti-dumping measures	Average tariffs reduced by 35 percent worth \$40 billion, commitment to reduce domestic support, agreement on anti-dumping
Tokyo	74 months beginning in September 1973	99	Tariffs, procurement and special and differential treatment	Commitment to reduce or eliminate non-tariff measures, tariff reductions worth \$300 billion dollars
Uruguay	87 months beginning in September 1986	124	Tariffs, rules of origin and dispute settlement	Creation of World Trade Organization, average tariffs reduced by one-third, agriculture, textiles and clothing subject to trading rules, new agreements on services and intellectual property
Doha	Still ongoing beginning in November 2001	153	Domestic support, market access, export subsidies and special safeguards	

Source: WTO, 2012; Hoekman and Kostecki, 2001

In 1986, trade officials from 117 countries gathered in Punta del Este to officially launch the eighth and final GATT negotiating round, known as the GATT Uruguay Round. The Ministerial Declaration at the time noted that “the contracting parties agree that there is an urgent need to bring more discipline and predictability to world agricultural trade by correcting and preventing restrictions and distortions including those related to structural surpluses so as to reduce the uncertainty, imbalances and instability in world agricultural markets. Negotiations shall aim to achieve greater liberalization of trade in agriculture and bring all measures affecting import access and export competition under strengthened and more operationally effective GATT rules and disciplines, taking into account the general principles governing the negotiations, by:

- (i) Improving market access through, *inter alia*, the reduction of import barriers;
- (ii) Improving the competitive environment by increasing discipline on the use of all direct and indirect subsidies and other measures affecting directly or indirectly agricultural trade, including the phased reduction of their negative effects and dealing with their causes;
- (iii) Minimizing the adverse effects that sanitary and phytosanitary regulations and barriers can have on trade in agriculture, taking into account the relevant international agreements.”

During the first two years of GATT Uruguay Round agricultural negotiations, discussions floundered as major differences between the United States and the European Communities persisted. The United States had been seeking complete liberalization of trade in agriculture, and was particularly interested in the rapid and unconditional elimination of export subsidies. Europe, on the other hand, was more concerned with achieving stability and equilibrium in world

agricultural markets, and was therefore emphasizing a “rebalancing” of agricultural protection in sectors like cereals, sugar and dairy products. As the United States and Europe accounted for approximately 40 percent of international agricultural trade at that time, it was abundantly clear that the fate of the GATT Uruguay Round hinged on bringing the two sides together. Beginning in 1991, European Agricultural Commissioner, Ray MacSharry, initiated internal discussions on a far-reaching reform of the European Common Agricultural Policy (CAP). Deteriorating market conditions and a sharp increase in agricultural stocks and budgetary expenditures had led Commissioner MacSharry to announce that he would “have no choice but to propose a price package involving price cuts and volume controls, without compensation.” “We have 20 million tons of cereals in intervention and that is predicted to rise to 30 million tons. We have almost one million tons of dairy products in stock. We have, too, 750,000 tons of beef in intervention which is rising at the rate of 15,000 to 20,000 tons a week. As no markets can be found for these products, they are being stored at taxpayers' expense. And we have run short of storage space” (European Commission, 1991).

The main thrust of the MacSharry CAP reform package was in the areas of cereals, oilseeds, protein crops, tobacco, milk, beef and sheepmeat, which together accounted for up to 75 percent of the value of agricultural production subject to the European common market organizations. The MacSharry reforms reduced the level of price support, and at the same time introduced “set-aside” payments to withdraw land from production, payments to limit stock levels, and measures to encourage retirement and a forestation. Reforms of the European oilseed sector in particular proved to be very helpful in resolving a longstanding dispute with the United States, and thus helped to break the impasse in the GATT Uruguay Round negotiations. The

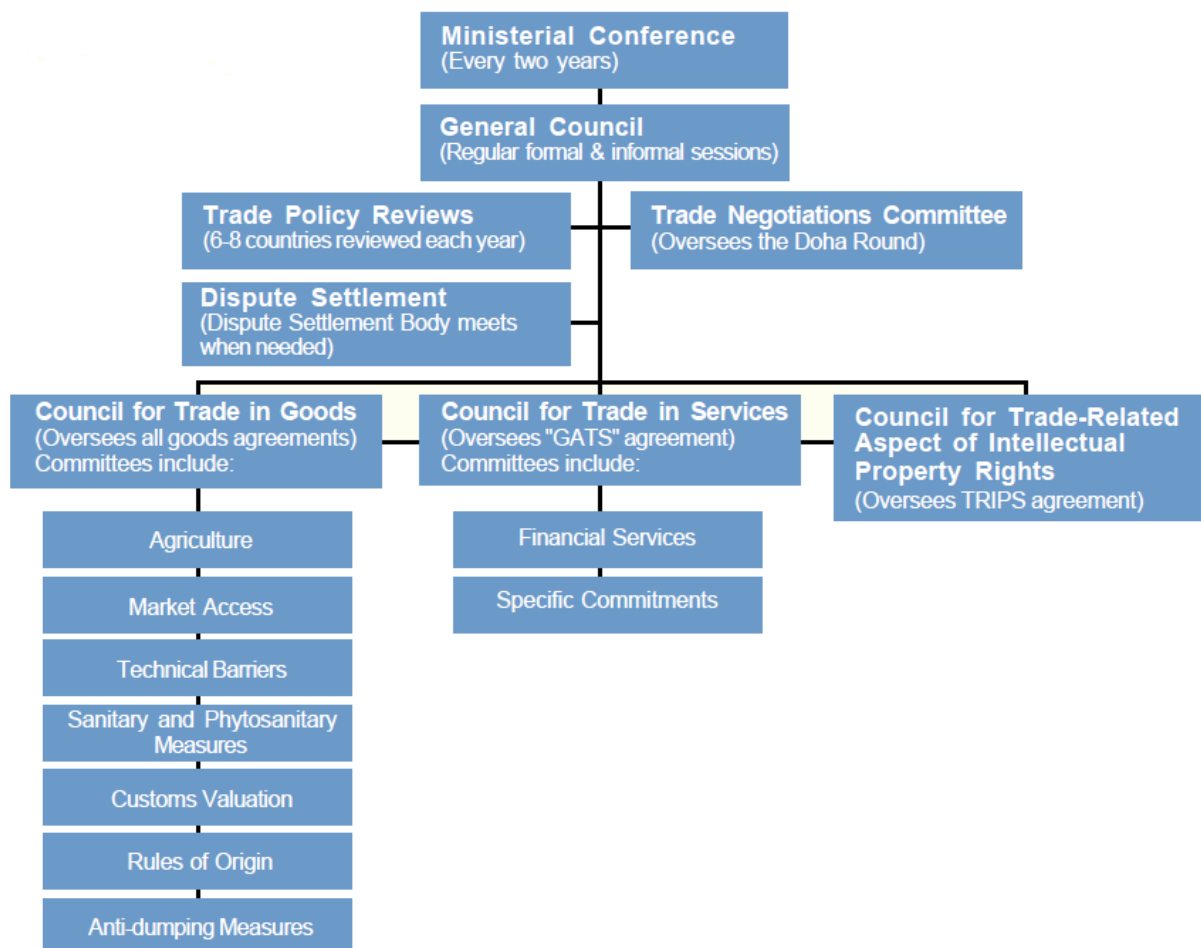
Uruguay Round formally concluded with the Marrakesh Declaration on April 15th, 1994 (McMahon, 2006).

It was a historic achievement. The Agreement on Agriculture (AoA) was the product of monumental effort to strengthen rules and reduce distortions in agricultural trade. In particular, Article 4 prohibited members from “resorting to the use of any measures which had been required to be converted into ordinary customs duties.” This was an explicit reference to non-tariff barriers (NTBs), such as import quotas, variable levies and other measures used to isolate domestic producers from world price effects, and which therefore magnify instability on the international market. NTBs were converted into tariffs, and industrial countries agreed to an average reduction of 36 percent over 6 years (developing countries agreed to a 24 percent reduction). Article 6 provided for a 20 percent decrease in domestic production support by the year 2000, measured against the Aggregate Measure of Support (AMS) 1986-88 base period. Article 9 reduced budgetary expenditures on export subsidies by 36 percent over six years, while the total volume of subsidized exports would decrease by 21 percent (for developing countries, the reduction was 24 percent and 16 percent respectively) (Matsushita, 2003).

One the most significant achievements of the GATT Uruguay Round was the creation of the World Trade Organization (WTO), a permanent institutional structure that would oversee trade relations among member countries. Within this structure, signatory countries became “members” of an organization with a permanent secretariat, and were no longer simply “contracting parties” as they had been in the GATT. At its apex, the WTO is currently governed by member country trade ministers who are committed to meet in a Ministerial Conference at least once every two years. Operationally, the trade ministers are represented by permanent ambassadors or delegates who gather in regular General Council meetings in Geneva. The

General Council is further subdivided into working level committees. As will be noted in chapter 2, many agricultural regulatory issues often fall within the purview of the Technical Barriers to Trade (TBT) and Sanitary and Phytosanitary (SPS) committees. These committees provide implementation oversight to the WTO SPS and TBT Agreements which entered into effect on January 1, 1995 (Figure 2, WTO 2012). Decisions in the WTO are by consensus; however, the Agreement also created a Dispute Settlement Body (DSB), which has the authority to set up panels, adopt panel reports, scrutinize implementation of recommendations and authorize retaliatory measures whenever a losing party fails to follow panel recommendations.

Figure 2 – Structure of the World Trade Organization



Source: WTO 2012

After the failure of WTO Ministerial Conference in Seattle in December 1999, marred by the anti-globalization protests, the 4th WTO Ministerial Conference which gathered in Doha in November 2001 had a markedly different tone. In the aftermath of the September 11, 2001 terrorist attacks in the United States, the Republican Bush Administration appeared determined to send a very clear signal that the terrorist attacks would not undermine the U.S. resolve to progressively open world markets. Many other WTO members shared a similar sentiment, and indicated a flexibility and willingness to negotiate that had been absent during the Seattle WTO Ministerial. The result was a very bold statement launching a new round of trade negotiations that would place economic development and poverty alleviation at the center of the agenda.

The Doha Development Agenda (DDA) recognizes the role that international trade can play in promoting economic development, and specifically in addressing the needs of least-developed countries, which often face structural difficulties in participating in the global economy. The DDA commits the WTO membership to address the marginalization of least-developed countries, and help them integrate more effectively into the multilateral trading system. Building on the achievements of the GATT Uruguay Round Agreement, the DDA aims to achieve “substantial improvements in market access; reductions of, with a view to phasing out, all forms of export subsidies; and substantial reductions in trade-distorting domestic support.” At the same time, the membership agreed “that special and differential treatment for developing countries shall be an integral part of all elements of the negotiations and shall be embodied in the schedules of concessions and commitments and as appropriate in the rules and disciplines to be negotiated, so as to be operationally effective and to enable developing countries to effectively take account of their development needs, including food security and rural development” (WTO, 2001).

The DDA also set ambitious goals to integrate “environmental measures on market access, especially in relation to developing countries, in particular the least-developed among them, and those situations in which the elimination or reduction of trade restrictions and distortions would benefit trade, the environment and development.” In addition, the WTO membership agreed “to negotiate the establishment of a multilateral system of notification and registration of geographical indications for wines and spirits....” Given the stated priorities and scope of the DDA negotiations, one can easily see a strong political desire to bring greater focus on the trade interests of SMEs.

At the same time, the very broad ambition of the DDA has meant that after more than a decade since Doha Ministerial, a final DDA agreement is not yet on the horizon. On December 17, 2011, WTO Director General Pascal Lamy addressed the 8th WTO Ministerial Conference in Geneva by saying: “The DDA – declared dead so many times, lambasted as a negotiation of the past, decried as a failure – is all the more important today, with an ever deeper crisis looming, than it was in the past. You have taken a first step in this Conference, in recognizing that there is an impasse, and a need to more fully explore different negotiating approaches, compatible with the principles of inclusiveness, transparency, bottom up of our work. Now there is a need to do exactly that: start exploring those approaches, Go back to business. In doing this, you will show that you care about the multilateral trading system, that you care about the WTO, that you are willing to help finding solutions to the economic crisis” (WTO, 2011).

But even as the multilateral DDA discussions have stalled, there has been considerable interest and effort to pursue regional trading arrangements via customs unions and free trade areas (FTAs). In 1990, there were officially 27 FTAs reported to the GATT. This number has steadily increased to 511 (counting goods and services separately), and of these, 319 are

currently in force (as of 15 January 2012). More than 90 percent of the WTO membership participates in some form of FTA; the four oldest and largest groupings, the European Union (EU), the North American Free Trade Agreement (NAFTA), the Mercado Común del Sur (MERCOSUR) and the Association of Southeast Asian Nations (ASEAN) together account for almost 60 percent of world trade.

While there is some debate over the question of whether FTAs are “building blocks” or “stumbling blocks” on the path to global free trade, one should note that the original GATT treaty recognized that countries would from time to time seek to deepen relationships with a specific subset of trading partners. Article XXIV of the GATT Agreement notes that “the provisions of this Agreement shall not prevent, as between the territories of contracting parties, the formation of a customs union or of a free-trade area or the adoption of an interim agreement necessary for the formation of a customs union or of a free-trade area; provided that:

(a) with respect to a customs union, or an interim agreement leading to a formation of a customs union, the duties and other regulations of commerce imposed at the institution of any such union or interim agreement in respect of trade with contracting parties not parties to such union or agreement shall not on the whole be higher or more restrictive than the general incidence of the duties and regulations of commerce applicable in the constituent territories prior to the formation of such union or the adoption of such interim agreement, as the case may be;

(b) with respect to a free-trade area, or an interim agreement leading to the formation of a free-trade area, the duties and other regulations of commerce maintained in each of the constituent territories and applicable at the formation of such free-trade area or the adoption of such interim agreement to the trade of contracting parties not included in

such area or not parties to such agreement shall not be higher or more restrictive than the corresponding duties and other regulations of commerce existing in the same constituent territories prior to the formation of the free-trade area, or interim agreement as the case may be; and

(c) any interim agreement referred to in subparagraphs (a) and (b) shall include a plan and schedule for the formation of such a customs union or of such a free-trade area within a reasonable length of time.” (GATT, 1994)

In other words, countries are free to form a customs union or an FTA as long as the common external tariff is no higher than a weighted average of the tariffs before the union or the agreement was formed.

There are many compelling reasons for why country might choose to pursue an FTA or customs union. As the DDA negotiations have shown, multilateral arrangements can be mindboggling puzzle: how does one ever balance the interests of more than 150 different countries? One wonders if there can ever be convergence between countries as different as Sweden, Brazil, Japan, Tonga and Mexico. With fewer participants at the negotiating table, some believe that it is somewhat easier to conclude FTAs, customs unions or bilateral trade and investment treaties (BITs). Conversely, others have argued that the multilateral approach is much more efficient in delivering meaningful outcomes, as larger negotiations tend to dilute the power of parochial interests (Yarbrough, 1987). Multilateral agreements are typically also a lot easier to implement and administer. The United Nations Conference on Trade and Development (UNCTAD) reports that at the end of 2009, there were 2.750 BITs in force. The EU Foreign Trade Association calculates that it would take another 7.500 BITs to link every WTO member with every other WTO member - a prospect that would obviously be inefficient and

fundamentally unmanageable. Yet, the fact remains that geographic proximity is still perhaps the strongest driving force to bind countries into deeper trading relationships. The EU, NAFTA, MERCOSUR and ASEAN are all built around regional efforts to achieve economic integration. Other elements like culture, religion, language, history also play a role in encouraging countries to trade with each other, as does the compatibility of social and economic systems.

With the proliferation of regional and bilateral trade arrangements, it is clear that governments around the world are not just simply waiting around for a successful conclusion to the DDA negotiations; but are rather eagerly seeking to develop pathways to increase SME participation in international trade. The global economic crisis which began in 2008, compounded by mounting pressure to reduce public expenditures, particularly in the area of agricultural support programs, is undoubtedly influencing politicians to promote SME trade as a way to create jobs and raise incomes. On January 27, 2010, U.S. President Barack Obama delivered his annual State of the Union address, noting that “the true engine of job creation in this country will always be America's businesses. But government can create the conditions necessary for businesses to expand and hire more workers. We should start where most new jobs do -- in small businesses, companies that begin when an entrepreneur takes a chance on a dream, or a worker decides it's time she became her own boss. Through sheer grit and determination, these companies have weathered the recession and they're ready to grow.....We need to export more of our goods. Because the more products we make and sell to other countries, the more jobs we support right here in America. So tonight, we set a new goal: We will double our exports over the next five years, an increase that will support two million jobs in America. To help meet this goal, we're launching a National Export Initiative that will help farmers and small

businesses increase their exports, and reform export controls consistent with national security” (Obama, 2010).

Two days after President Obama’s speech, Japanese Prime Minister Yukio Hatoyama delivered a similar message to the 174th Session of the Diet: “Small and medium enterprises sustaining the regional economies are a source of vitality for the Japanese economy. In addition to ensuring that the cash flow of these companies is secure, we will formulate an "SME Charter" and carve out new prospects under which ambitious SMEs will bolster the growth of the Japanese economy.” (Hatoyama, 2010) Also on January 29th, speaking at the World Economic Forum in Davos, Brazilian President Luiz Inácio da Silva noted that “historically, Brazilian leaders have governed in favor of only one third of the country’s people. The rest of the population, for them, was a heavy, inconvenient burden....To bring the weak and the needy into the economy was not only morally correct. It was also politically indispensable and economically sound....I would like to stress that the best policy for development is the fight against poverty.....This means broadening opportunities, increasing productivity, expanding markets and strengthening the economy. It means changing mentalities and relationships. It means creating factories of jobs and citizenship....it is the small individuals who are building the giant economy of Brazil” (Lula da Silva, 2010). In India, Prime Minister Dr. Manmohan Singh announced: “Our Government attaches the highest priority to the development of MSME sector. This was the reason why we had created a separate Ministry for Micro, Small and Medium Enterprises in the year 2004” (Singh, 2009)

In his 2010 European State of the Union address to the European Parliament in Strasbourg, President of the European Commission José Manuel Durão Barroso, emphasized that “growth must be based on our companies' competitiveness. We should continue to make life

easier for our Small and Medium-Sized Enterprises. They provide two out of every three private sector jobs. Among their main concerns are innovation and red tape. We are working on both. Only 8% of Europe's 20 million SMEs engage in cross-border trade, still fewer in cross-border investment. And even with the internet, over a third of consumers lack the confidence to make cross-border purchases.” (Barroso, 2010) Dutch minister for Development Cooperation Agnes van Ardenne, has been even more direct in saying that “globalization is a threat, but also a huge opportunity for small and medium-sized enterprises. The market is increasingly dynamic. New business models are evolving. It’s not about countries or companies competing against each other any longer, with bilateral agreements protecting their markets. Increasingly, it is a matter of networks competing against other networks. The opportunities for SMEs depend particularly on their ability to integrate their business relations into smart business networks” (van Ardenne, 2006).

Despite the high level political interest in supporting the development of SMEs, data limitations often make it very difficult to understand the evolution of this sector, particularly within the context of international trade. Aside from the obvious cost and logistical difficulties of collecting reliable information and data from privately held firms, government policies are only just now beginning to become more sensitized to the needs of SMEs. The OECD has been at the forefront of recent policy work on SME participation in global value chains. In June 2000, the OECD convened a Ministerial Conference on “Enhancing SME Competitiveness.” Representatives from 52 countries gathered in Bologna to discuss innovative policy solutions and initiatives for improving the business environment for SMEs. The Bologna Charter on SME policies recognized “the central role played by SMEs in national innovation systems, and the importance of improved access to information, financing and networking in facilitating the

innovation process,” and recommended “coordination between governments, and regional and international organizations as regards industrial development programs and initiatives aimed at supporting the growth of SMEs in transition and developing countries be improved.” Significantly, the Charter called for “improved access to information, financial and technological resources and new markets” (OECD, 2001).

Although there is no universal definition of a SME, the most commonly used definitions seem to draw on criteria such as number of employees and revenue. A 1971 British Report of the Committee of Inquiry on Small Firms (the often cited “Bolton Report”) defined SMEs on the basis of number of employees, revenue and certain essential characteristics such as share of the market, independence and owner management. Welsh and White (1981) emphasized the resource limitations of SMEs, while Kotey (1999) noted the informal management style of the decision makers. In the EU, firms with 9 employees or less are classified as micro firms. Small firms have 10 to 99 employees, while medium firms have 100 to 499 employees. The estimated number of enterprises, employment and gross value added for the EU-27 are shown in Table 3.

Table 3 – 2010 Est. Number of Enterprises, Employment and Gross Value Added in EU-27

	Micro	Small	Medium	Large	Total
Enterprises					
Number	19.198.539	1.378.401	219.252	43.034	20.839.226
%	92,1	6,6	1,1	0.2	100
Employment					
Number	38.905.519	26.605.166	21,950,107	43.257.098	130.717.890
%	29,8	20,4	16,8	33.1	100
Gross Value Added					
EUR Million	1.293.391	1.132.202	1.067.387	2.485.457	5.978.437
%	21,6	18,9	17,9	41,6	100

Source: Eurostat / National Statistics Offices of Member States / Cambridge Econometrics

In the United States, the classification of “small” and “medium” sized enterprise varies according to whether firm is in the manufacturing, agricultural or service sector (Table 4). Within the service sector, most SMEs have less than \$7 million in annual revenues. However, the Small Business Administration (SBA) has recognized that there are small service firms that generate high revenues, and for this reason the SBA has developed an additional classification for SMEs generating higher revenue.

Table 4 – U.S. Definitions of Small and Medium Sized Enterprises

	Manufacturing and non-exporting services firms ^a	Exporting services firms ^b		Farms
		Most	High value ^c	
Number of employees	< 500	< 500	< 500	< 500 ^d
Revenue	Not applicable	≤ \$7 million	≤ \$25 million	< \$250,000
Defining institution	SBA Advocacy ^e	SBA / SBA Advocacy ^f	SBA / SBA Advocacy ^f	USDA
Data source	U.S. Census	ORBIS	ORBIS	USDA

^a Includes exporting and nonexporting manufacturing firms and nonexporting services firms.

^b Selected on the basis of size and export potential, and includes wholesale trade services; professional, scientific, and technical services; and finance and insurance services.

^c Computer services was the only sector in this category.

^d This threshold was imposed by Commission staff to partially harmonize definitions across sectors; it was not imposed by the defining institution.

^e SBA Advocacy from Census data.

^f Revenue parameters established by SBA; employee number established by SBA Advocacy for research purposes.

Table 5 provides the 2009 estimated number of enterprises, employment and annual payroll in the United States. It is worth noting that in both the U.S. and in the EU-27, SMEs account for more than 99 percent of total population of enterprises, and almost 50 percent or more of total

employment. This pattern holds true throughout OECD countries: SMEs account for approximately 50 percent of local and national GDP, 30 percent of exports and 10 percent of Foreign Direct Investment” (OECD, 2001). In many non-OECD countries, SMEs and small entrepreneurs play an even greater role in generating of employment and income, and driving growth and innovation (USITC 2010).

Table 5 – 2009 Number of Enterprises, Employment and Annual Payroll in the U.S.

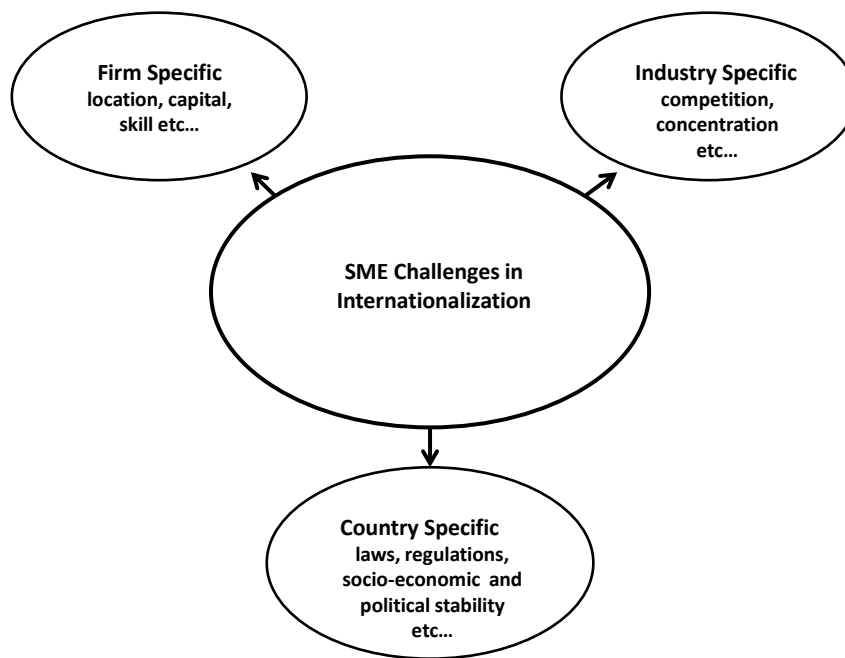
	Micro	Small	Medium	Large	Total
Enterprises					
Number	4.560.021	1.106.450	83.326	17.509	5.767.306
%	79	19,2	1,4	0,3	100
Employment					
Number	12.547.020	27.581.229	16.153.254	58.228.123	114.509.626
%	11	24	14,1	50,8	100
Annual Payroll					
\$ Million	432.631	997.375	654.812	2.770.726	4.855.545
%	8,9	20,5	13,5	57	100

Source: U.S. Census Bureau Statistics of U.S. Businesses

Notwithstanding the almost universal recognition that SMEs can make significant contributions to job creation and economic growth, the question of “internationalization,” or SME participation in the international market, is somewhat less certain. Bernard and Jensen (1995, 1999) examined the characteristics of U.S. manufacturing firms engaged in international trade. They subsequently also studied firms Canada, Colombia, France, Mexico, Morocco, Spain and Taiwan, and found that exporting firms generally tend to be larger and more productive than non-exporting firms. Also, once a firm exports, it will tend to continue exporting, suggesting that there may be large sunk costs in establishing the initial linkages to the

foreign market. In a study of small Colombian knitted fabric producers, Das, Roberts and Tybout (2007) estimated that the cost of entering a foreign market is approximately \$400,000. Todd and Rajshekhar (2007) identified three broad categories of factors hindering SME internationalization; their typology is summarized in Figure 4.

Figure 3 – SME Challenges in Internationalization



Firm specific factors like location, available capital, training, research and development, managerial skill etc.... are constraints that are internally unique to the firm. Most SMEs have limited access to financial capital. Obtaining a loan can be a challenge as bankers are often too risk averse to extend large loans to small businesses. As a result, SMEs tend to be “resource poor,” and are thus constrained from actively participating in the international market, and typically end up focusing more on core business and expertise, rather than taking the time to explore new market opportunities. Outside the firm structure, industry specific constraints, such as competition, firm concentration and the opportunity to differentiate, can also hinder the

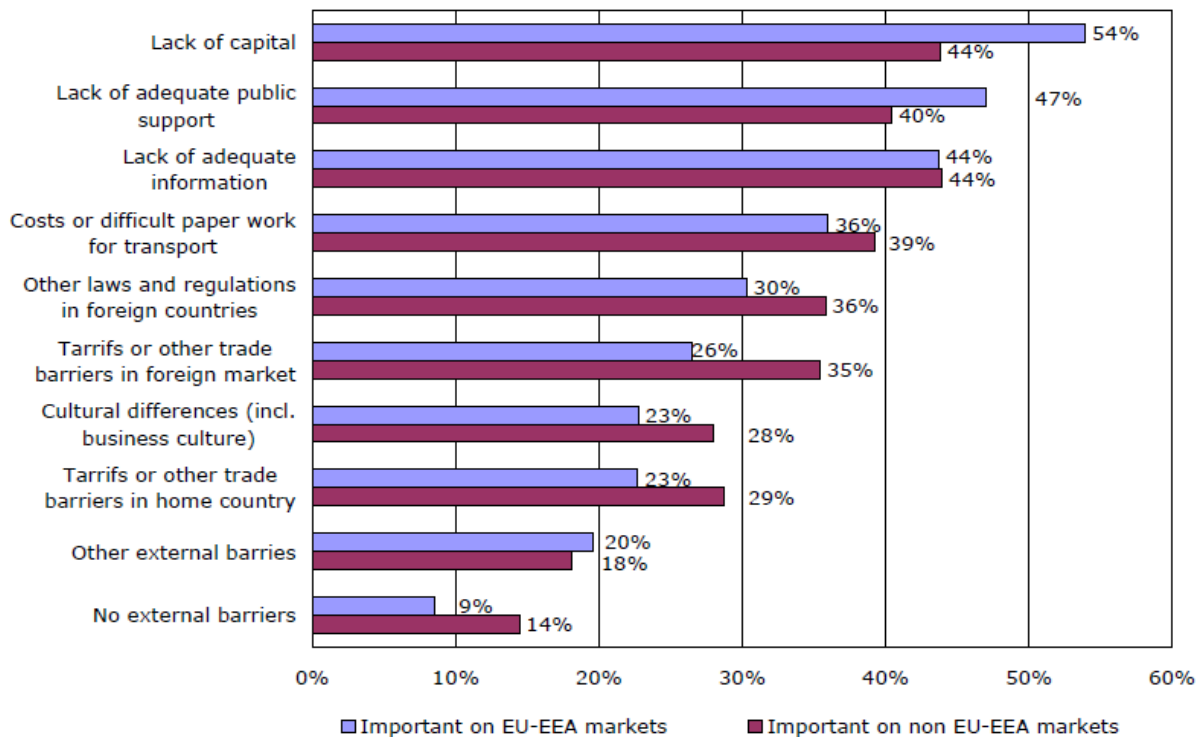
internationalization of SMEs. While individual firms can exert some influence at the industry level (for example by actively participating in consortia or associations), the single SME generally lacks sufficient clout to influence the direction of an entire industry. When there are many foreign or domestic firms producing close substitutes, the SME is likely to be a “price taker,” and so product pricing will tend move toward the theoretic level of perfect competition, thus reducing the profit incentive to export to distant markets.

Country specific factors can potentially become an even greater constraint to the internationalization of SMEs. Doole and Lowe (2004) propose a “SLEPT” approach to understand the influence of Social, Legal, Economic, Political and Technological factors that can adversely affect the marketing plan of a firm seeking to operate in the international market. From an SME perspective, the SLEPT factors are largely uncontrollable, yet they fundamentally define the parameters of the firm’s operating environment. Social-cultural factors like religion, family structure and ethnicity affect consumer perceptions, and ultimately also patterns of purchase behavior. Legal systems fundamentally define the “rules of the game” for business activity. As will be discussed in the next chapter, rules and regulations play a fundamental, if not determining role, in the internationalization of an SME. Finally, there are many political and economic factors, not to mention technologies, that can have a significant impact on internationalization and the market strategy of an SME. Taxation, exchange rates, inflation, political stability, electric power generation and refrigeration equipment are just a few of these factors.

Figures 4 and 5 below specify the EU and U.S. perceptions on barriers that inhibit the internationalization of SMEs. Both surveys suggest that rules and regulations in foreign countries are significant determinants of SME export behavior. The World Bank, the WTO, the

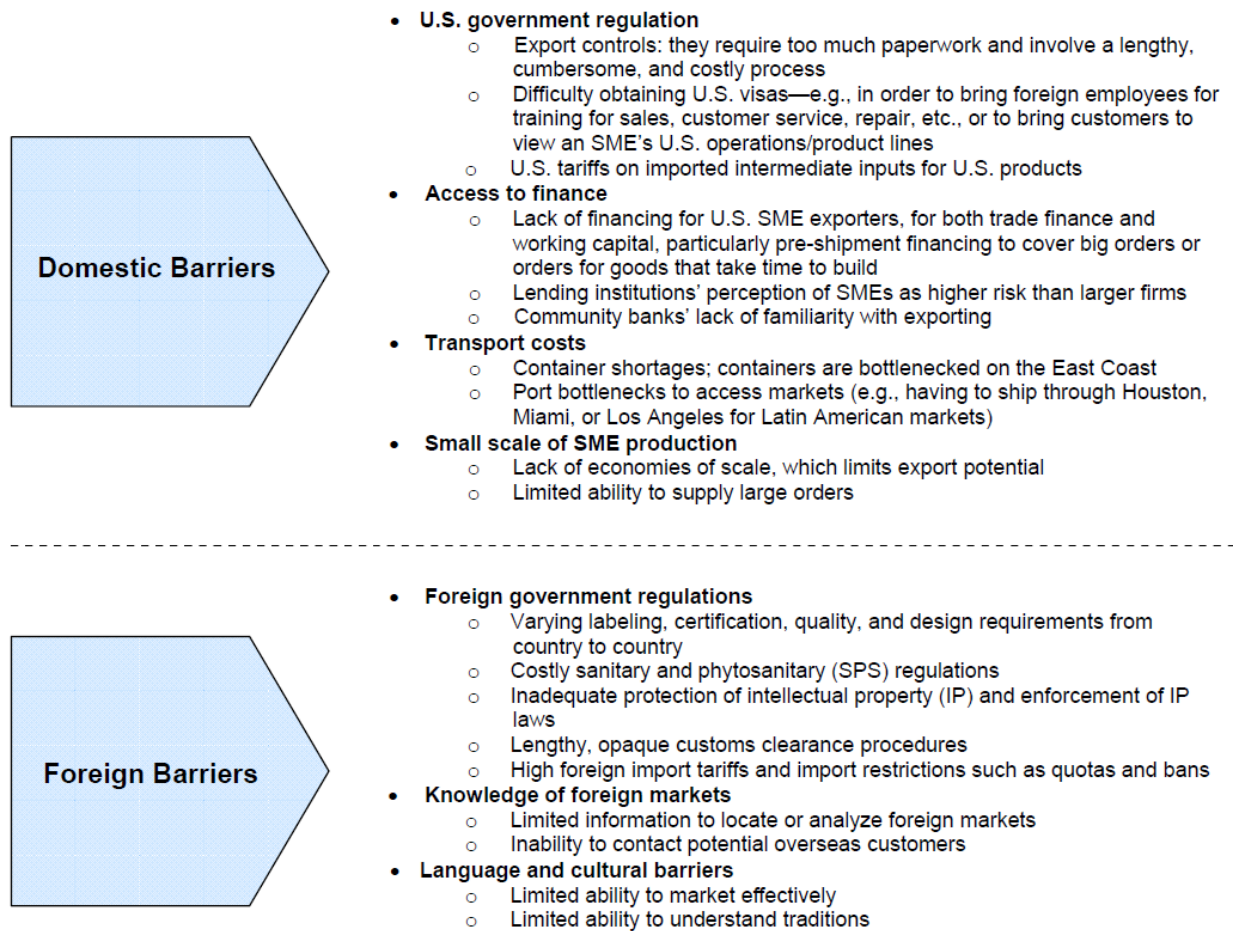
OECD and numerous other international organizations seem to support this conclusion (World Bank and International Finance Corporation 2012). The next chapter explores in more detail the rules and regulations in the functioning of international agricultural trade.

Figure 4 – EU Survey of Perceived SME Barriers to Conducting Business Internationally



Source: Survey 2009, Internationalisation of European SMEs EIM/GDCC (N=9480).

Figure 5 – U.S. Perceived SME Barriers to Conducting Business Internationally



Source: U.S. International Trade Commission, 2010

Rules, Regulations and the Problem of Regulatory Asymmetry

Notwithstanding the historic advancements in technology and policy, today's international agricultural trading environment can hardly be described as perfectly seamless, efficient, predictable and transparent (Josling, Roberts and Orden, 2004). While there may be almost no limit to the physical movement of goods from one corner of the globe to another, in practice, agricultural trade still faces a number of constraints. So while it is physically possible (and perhaps even economically viable) to ship alpaca meat from the Collao Altiplano of Peru to a butcher shop in Sydney, this trading transaction would likely necessitate considerable effort, by both exporter and importer to manage the complex regulatory clearance process.

All countries, to some degree, regulate individual and corporate behavior to protect or benefit the public, or a specific subset of the public (Stigler, 1971). In broad terms, regulation could be thus defined as “any government measure or intervention that seeks to change the behavior of individuals or groups. It can both give people rights (i.e. equal opportunities), and restrict their behavior (e.g. compulsory use of seat belts).” (Better Regulation Task Force, 2003) This definition encapsulates all measures that impact business activity, including: taxation, financial reporting, employment, health, safety, trading standards, consumer rights, data protection, environment, intellectual property, zoning and planning rules, and transportation.

Regulations arise from the need to correct market imperfections. If markets functioned perfectly, then there would be no need for regulation: people would knowingly pursue activities, perform jobs, sell and acquire products to maximize expected utility, and the outcome of these actions would be efficient. However, in practice, this idealized world does not exist. As the 16th century English philosopher, Thomas Hobbes famously describes in the Leviathan: “*Ostendo*

primo conditionem hominum extra societatem civilem (quam conditionem appellare liceat statum naturae) aliam non esse quam bellum omnium contra omnes; atque in eo bello jus esse omnibus in omnia. [I show in the first place that the state of men without civil society (which state may be called the state of nature) is none other than a war of all against all; and that in that war, all have a right to all things.]" The absence of regulation is an anarchical society, socially and politically unstable, and prone to economic inefficiency. Regulations establish order, they define property rights, tort and liability, they enforce contracts and institute penalties for violation.

Regulations can also ameliorate the flow of information in the marketplace, building trust between buyer and seller. George Akerlof's classic article on information asymmetry highlights the importance of trust: "there is incentive for sellers to market poor quality merchandise, since the returns for good quality accrue mainly to the entire group whose statistic is affected rather than to the individual seller. As a result there tends to be a reduction in the average quality of goods and also in the size of the market. It should also be perceived that in these markets social and private returns differ, and therefore, in some cases, governmental intervention may increase the welfare of all parties." (Akerlof, 1970) Governments can, for example, set up a regulatory system of certification or licensure to guarantee quality specifications and reduce uncertainty in the marketplace.

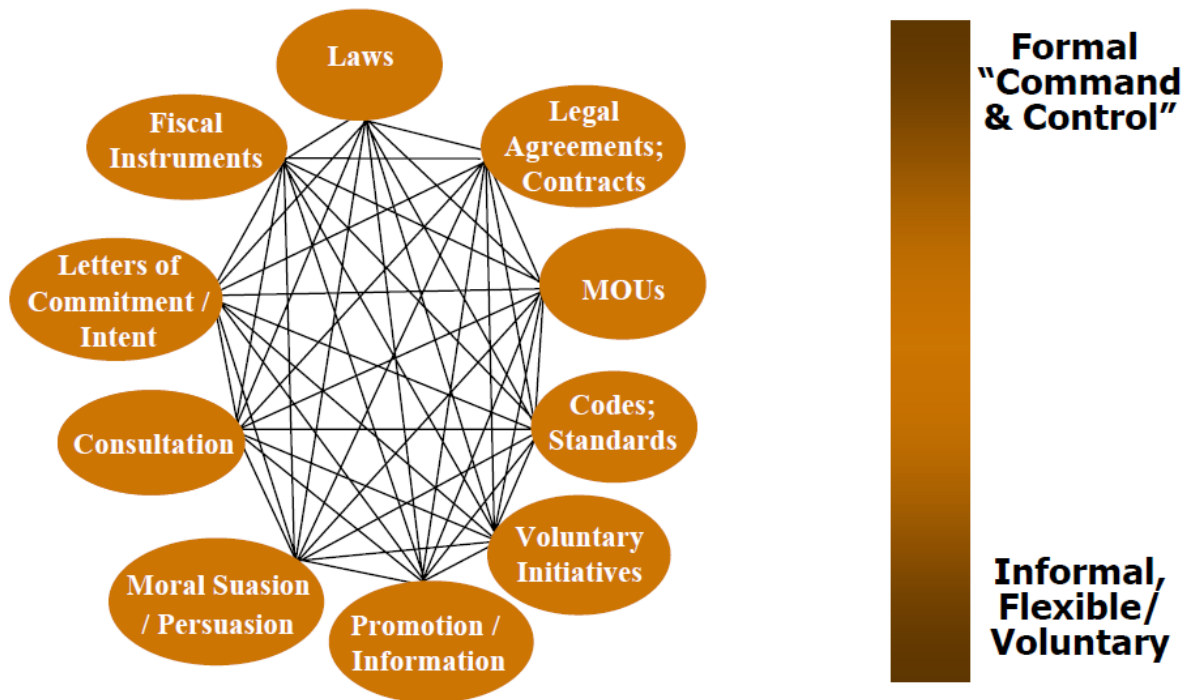
There are generally four reasons for governmental intervention:

- **Economic** – to influence decisions and behavior in the marketplace using incentives and disincentives;
- **Social** – to protect the public interest in areas such as health safety;
- **Informational** – to assist individuals in society in their decision making; and

- **Administrative** – to collect information for administrative purposes.

Specific policy instruments are designed to influence behavior and obtain desired outcomes. Some of these instruments employ “hard law” or a formal command and control approach, imposing stiff penalties for violations, others use pricing mechanisms to incentivize (i.e. through subsidies) or disincentivize (i.e. through taxation), while still others apply “soft law” or more flexible, voluntary and informal approaches to inform or persuade (e.g. anti-smoking or anti-littering campaigns) (Figure 6) (OECD, 2005).

Figure 6 - Policy Instruments Designed to Affect Behavior



Source: OECD, 2005

While the objectives of regulation are generally to improve societal welfare, regulations are only as effective as the institutions that produce, implement and enforce them, and therefore are not, by themselves, necessarily a guarantee to a perfectly functioning market. Over the last

three decades, there has been a growing interest in better understanding the societal impact of regulation. “Regulatory Impact Analysis” (RIA) is a detailed systematic approach to assess the full effects of a regulation, taking into account all the costs and benefits of achieving desired objectives. By implication, not all regulations are welfare-enhancing. Indeed, there are countless examples of regulations that have unintended consequences, or fail to achieve the intended objectives. Wage and price controls introduced during the 1970’s, for example, resulted in “stagflation” - shortages for consumers and increased production costs for industry.

With the possibility that regulations can be less than perfect, most institutions have mechanisms to repeal or amend regulations that no are longer serving their intended purpose. So at any given moment in time, literally thousands of local, regional, national and international regulations are proposed or are under review. In some countries, the process of regulatory review can be painfully slow and inefficient. Plant quarantine regulations in Bangladesh are based on the Destructive Insects and Pests Act of 1914, and while these regulations were revised in 1966 and 1989, the basic framework is still a product of the British imperial authority, predating India’s independence. Even in more developed countries, regulations can be so firmly rooted in history, to the point that they become anachronistic. In the small U.S. town of Hackberry, Arizona, there is a city ordinance that prohibits women “from eating raw onions while drinking buttermilk on the Sabbath.”

The type of regulation found in any country depends primarily on the national institutional, political and legal system, the system for drafting, interpreting and enforcing regulations. Every country has its own unique approach; most are based on civil law, common law, Islamic law, Confucian law or some combination of these. Civil law is the legal system most prevalently used around the world; it is based on the Roman law approach to statutes,

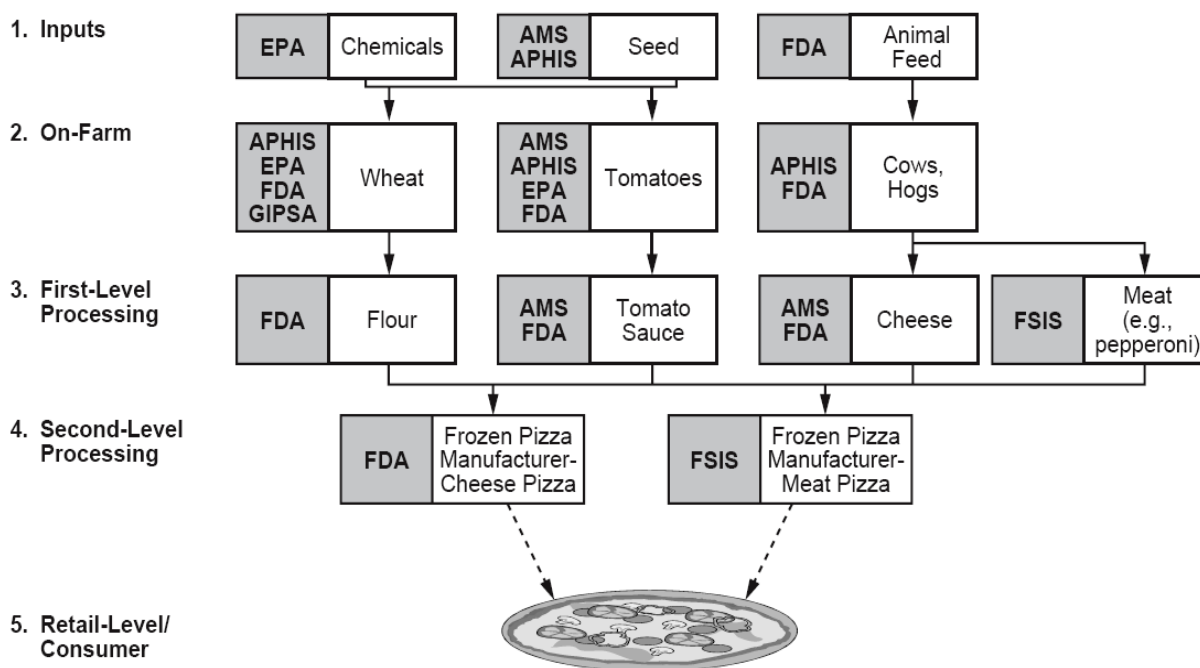
written legal codes permitting or prohibiting certain behavior or actions. Common law, the Anglo-Saxon alternative, is based on case law or the use of court precedent, and is generally viewed as more organic and malleable. The American jurist Oliver Wendell Holmes, Jr. observed that "The life of the law has not been logic; it has been experience. The felt necessities of the time, the prevalent moral and political theories, intuitions of public policy, avowed or unconscious, even the prejudices which judges share with their fellow men, have had a good deal more to do than the syllogism in determining the rules by which men should be governed. The law embodies the story of a nation's development through many centuries, and it cannot be dealt with as if it contained only the axioms and corollaries of a book of mathematics."

In practice, countries often embrace a combination of different legal traditions, as is the case for example in the United States, where environmental law is based more on civil law than on common law. A country's constitutional arrangements, defining the legislative, executive and judicial functions of government, will also have a profound effect on how regulations are promulgated and enforced. A federal system may devolve regulatory powers to a state or provincial government, while an Islamic state will rely on religious authorities to oversee and administer Sharia law. Some societies are highly regulated and controlled, other societies embrace a more laissez faire approach to regulation.

In the United States, food safety regulations have been governed by a complex system, based on more than 30 laws administered by 12 different government agencies. There are more than 50 interagency agreements to coordinate responsibilities. In addition to U.S. federal law, there are 50 different state statutes, each administered by state level agencies. Within this system, one can easily get lost. The 1970 Egg Products Inspection Act, gives the U.S. Secretary of Agriculture the authority to regulate egg products, while the Secretary of Health and Human

Services retains responsibility to regulate whole eggs. In the case of ensuring the safety of a frozen pizza, there are 5 different U.S. government agencies involved, ranging from the U.S. Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) to the U.S. Food and Drug Administration (FDA). If meat is added to the frozen pizza, regulatory oversight extends to a 6th U.S. agency, the USDA Food Safety and Inspection Service (FSIS) (Figure 7) (GAO, 2004).

Figure 7 – U.S. Federal Agencies Responsible for Ensuring Safe Frozen Pizza

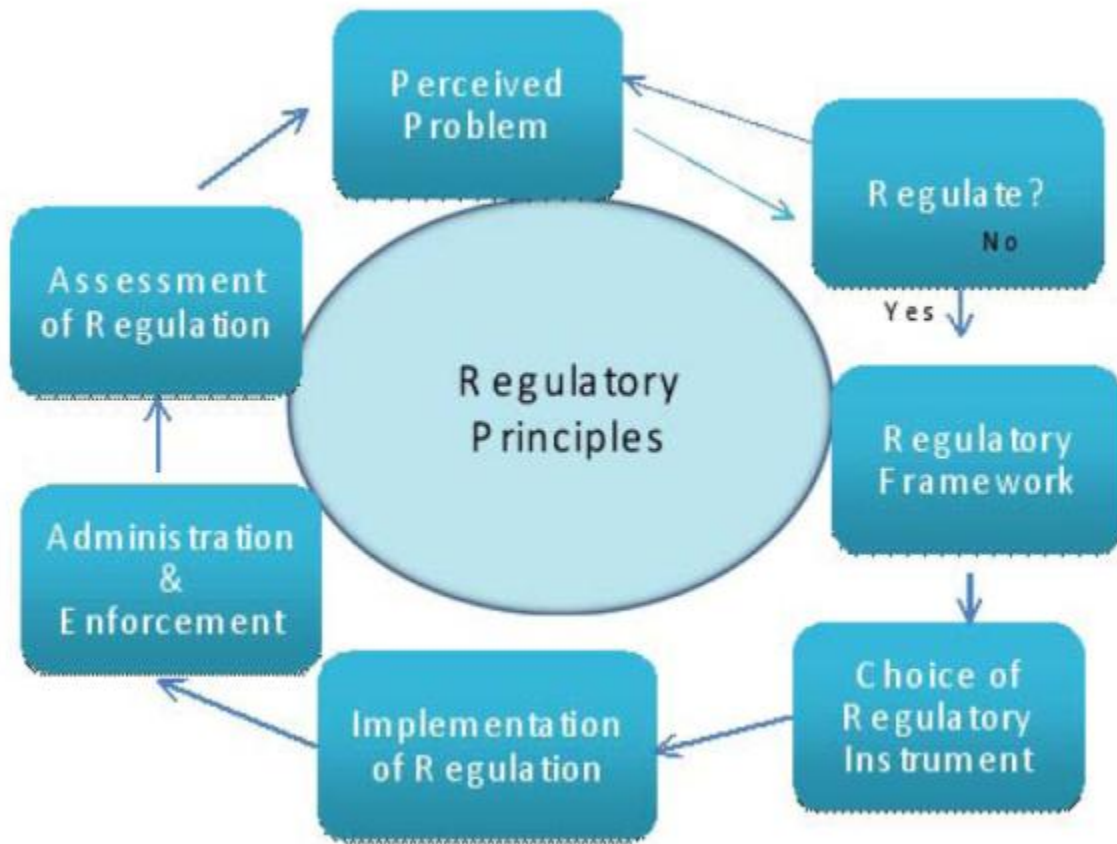


Source: GAO, 2004

Regulations are almost never static; they are the product of a regulatory lifecycle, a dynamic process that responds at variable speed depending on the political and societal pressures to correct perceived problems (Figure 8). Cataclysmic events can often accelerate regulatory action. In September 2008, the Sanlu Group, a Chinese-New Zealand joint venture, was found to have produced milk powder tainted with melamine. As a result of this incident, which affected

an estimated 300,000 victims and witnessed at least 6 recorded deaths in China, several countries quickly introduced new regulations to test and certify milk and milk products (World Health Organization, 2008).

Figure 8 – The Regulatory Lifecycle



Source: OECD, 2005

In 1904, Upton Sinclair, an occasional writer for the Socialist Appeal to Reason magazine, was commissioned to write a series of articles on the condition of immigrant workers in the slaughter and meat packing houses of Chicago. The articles, which became known as the novel *The Jungle*, exposed the revolting practices employed by America’s largest meat packing plants:

“It was only when the whole ham was spoiled that it came into the department of Elzbieta. Cut up by the two-thousand-revolutions-a-minute flyers, and mixed with half a ton of other meat, no odor that ever was in a ham could make any difference. There was never the least attention paid to what was cut up for sausage; there would come all the way back from Europe old sausage that had been rejected, and that was moldy and white-it would be dosed with borax and glycerine, and dumped into the hoppers, and made over again for home consumption. There would be meat that had tumbled out on the floor, in the dirt and sawdust, where the workers had tramped and spit uncounted billions of consumption germs. There would be meat stored in great piles in rooms; and the water from leaky roofs would drip over it, and thousands of rats would race about on it. It was too dark in these storage places to see well, but a man could run his hand over these piles of meat and sweep off handfuls of the dried dung of rats” (Sinclair, 2002).

Sinclair’s lurid descriptions of the working conditions in the meat packing plants shocked many, including Indiana senator Albert Beveridge, who gave the book to President Theodore Roosevelt. Roosevelt who was initially skeptical of the allegations, eventually responded to Sinclair’s suggestions, and ordered a new investigation by the U.S. Department of Agriculture (figure 9). Earlier USDA investigations had whitewashed the problem, and Congress did not seem inclined to act. However, President Roosevelt, determined to push for a new legislative proposal, authorized the public release of the USDA investigative report, and thus forced Congress to pass the remedying law. On June 30, 1906, President Roosevelt signed the Pure Food and Drug Act and the Federal Meat Inspection Act into law.

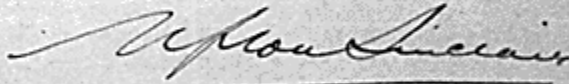
Figure 9 - Letter from Upton Sinclair to President Theodore Roosevelt, March 10, 1906

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You ask - "Is there anything further, say in the Department of Agriculture, which you would suggest my doing?" I would suggest the following: That you do as Doubleday, Page & Company did; find a man concerning whose intelligence and integrity you are absolutely sure; send him up here, or let me meet him in Washington, and tell him all that I saw, and how I saw it, and give him the names and addresses of the people who will enable him to see it. Then let him go to Packingtown as I did, as a work-ing-man; live with the men, get a job in the yards, and use his eyes and ears; and see if he does not come out at the end of a few weeks feeling, as did the special correspondent of the London "Lancet," whom I met in Chicago, that the conditions in the pack-ing-houses constitute a "menace to the health of the civilized world." *The Lancet for Jan 8, 15, 22, 29 - 1905.*

Thanking you for your kind interest,

Very sincerely,


Upton Sinclair

P. S.

I might add that when I was in Chicago I learned a good deal about the connections which the packers have in Washington, so that I think it most likely that before the Department of Agriculture get anybody started for the purpose of investigating Packingtown, word had been sent there to the packing-houses that things should be cleaned up. I know positively that this was done in the case of Major Seaman, who went out there for "Collier's Weekly."

However, realistically, it can take years or sometimes even decades to introduce and implement new regulations. The 2010 U.S. Food Safety Modernization Act was the first major U.S. food safety legislation in more than 30 years; it was “fast-tracked” by a Presidentially appointed high level Food Safety Working Group, and yet it still took almost 3 years of consultations before it was finally enacted. India’s new Food Safety and Standards Act was introduced in 2006; it took almost 5 years to establish the Food Safety and Standards Authority and begin implementing the new regulations.

The speed and efficiency of the regulatory process depends fundamentally on the capabilities of the responsible regulatory institution. If an institution lacks resources, technical expertise, managerial experience or political / judicial support, the implementing regulations and enforcement will likely be weak. Many regulatory institutions, at least in democratic countries, typically have participatory mechanisms to enable stakeholders to comment, and in some cases, directly participate in the regulatory process. To the extent that an institution is “fair, transparent, accessible, and open,” one may assume that its regulators act in the common interest. Conversely, a secretive institution that has self-interested “rent-seeking” (corrupt) functionaries will more than likely act with little, if any, regard to the common interest (Mattli and Woods, 2009).

Stakeholders or external lobbyists can play a very important role in the regulatory process. While many regulatory agencies aspire to remain apolitical and seek to maintain regulatory independence, external stakeholders can, and often do, exert significant influence throughout the regulatory lifecycle. Starting with the perception of the problem, stakeholders can use public and private channels to frame and define issues. Animal rights activists, for example, can use informational campaigns in the public media to ridicule people who wear fur.

Environmental regulation is another area that often pits different interest groups against each other. In the case of pesticide use, the issue can easily be characterized as an “imminent calamity” or as a “manageable risk.” Stakeholders can also influence the choice of regulatory instruments, as well as the administration and enforcement of regulation. In some cases, stakeholders can press legislatures to withdraw funding or shift the regulatory authority to a different agency, or failing legislative action, can file grievances in courts of law (Drezner, 2007).

The idea that regulators can be influenced or, in extreme cases, intimidated or corrupted undoubtedly weakens the assumption that regulatory institutions always act purely on behalf of the public interest. Even when taking the most benign view of external stakeholders, Kenneth Arrow (1951) proved in his “impossibility theorem” that one cannot simply aggregate individual preferences into a general social welfare function. Anthony Downs (1957) noted the political implausibility of obtaining a social welfare function: “...even if social welfare could be defined, and methods of maximizing it could be agreed upon, what reason is there to believe that the men who run the government would be motivated to maximize it? To state that they should do so does not mean that they will.” (Downs, 1957)

Despite the continuing menace of “regulatory capture” (i.e. the notion that private interests can control the regulatory process for narrow ends), many OECD countries are beginning to make a more conscious effort to improve the quality of regulations, and have even gone so far as to establish “guiding principles for regulatory quality and performance.” The OECD guiding principles note that a “a good regulation should:

- 1) serve clearly identified policy goals, and be effective in achieving those goals:
- 2) have a sound legal and empirical basis;

- 3) produce benefits that justify costs, considering the distribution of effects across society and taking economic, environmental and social effects into account;
- 4) minimize costs and market distortions;
- 5) promote innovation through market incentives and goal-based approaches;
- 6) be clear, simple, and practical for users;
- 7) be consistent with other regulations and policies;
- 8) be compatible as far as possible with competition, trade and investment-facilitating principles at domestic and international levels.”

Moreover, the OECD recommends a “whole of government approach” to support the entire process, from risk assessment to implementation and enforcement. The OECD stresses the importance of independent regulatory institutions, and suggests that they be “well-placed in the country’s legal and institutional architecture.” The OECD also urges for the establishment of a central oversight body to coordinate on regulatory issues (OECD, 2005). Even though most countries fall short of the “ideal OECD regulatory framework,” this initiative, and other efforts like it, have undoubtedly encouraged deeper reflection at the policy level.

As noted in the introductory chapter, food and agricultural issues often evoke a deeply emotive societal connection. As producers seek to maximize returns from the land they cultivate, the animals they raise and the food they produce, consumers are equally driven to maximize utility from the products they consume. In the transactions between producer and consumer, there is much at stake; for the consumer, it is not just the purchase of a good, but fundamentally it can be the acquisition of a vital ingredient to sustain life. With this in mind, one can easily see how regulations concerning food and agriculture are foundational to the history of human development.

Food regulations are among the earliest official enactments known to man. Ancient civilizations from Egypt to China, from India to Greece and Rome, implemented rules to provide for the safety and wholesomeness of food. To prevent fraud and the distribution of unsafe food, government authorities instituted legal provisions, and where possible, took appropriate punitive action. These measures were sometimes very rudimentary, like using slaves as “tasters” to prevent poisoning of royal family members. Other measures had more legal sophistication, punishing specific acts of fraud or food adulteration with prison or even death. In the 2nd century BC, Marcus Cato recommended that inspectors use ivy wood containers to determine whether water had been added to wine (an ivy wood vessel will let wine will soak through, while the water remains in the container). In 1202 AD, King John of England proclaimed the first English food law, the *Assisa Panis et Cervisiae*, which regulated the weight, measure and ingredients of bread and ale, prohibiting adulteration with ingredients like ground peas or beans (Wilson, 2008).

The birth of modern chemistry in the early nineteenth century created new opportunities for unscrupulous fraudsters to adulterate food in sophisticated ways: adding red lead to old cayenne pepper to make it look new, adding rice flour to old cream to make it look thick and fresh, and using sulphuric acid to make vinegar sharp. Around this time, in 1820, Frederick Accum, a Westphalian chemist living in London, published a small book, entitled *A Treatise on Adulterations of Food, and Culinary Poisons*. Accum’s book heightened public awareness of food adulteration, and revolutionized the analytical methods for detecting contamination (Wilson, 2008).

The development of modern food chemistry had a profound influence on food regulation. Medical research in nutrition and sophisticated analytical methods in food chemistry led to a

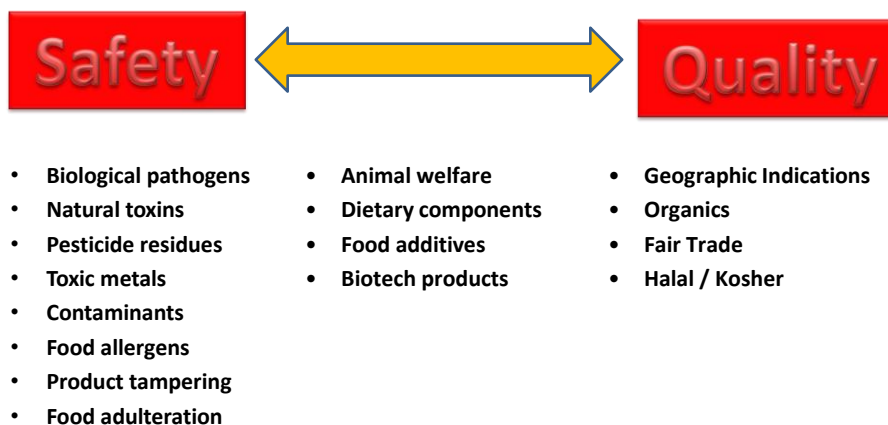
deeper understanding of contaminants, additives, carcinogens, allergens, diabetes, heart disease etc... With the ever expanding body of scientific research, regulators and public interest groups today continue to press for greater regulatory control over products that are perceived to pose a threat to consumers and the environment.

Perceptions and the cultural context of perceptions play a very important role in determining the shape and direction of regulation. While scientific evidence may be objective, the interpretation and management of risk are generally a matter of choice, subject to beliefs and biases. The measurement and management of risk is not an exact science, particularly within the context of policy choices. Most people readily understand catastrophic risk, such as the operational failure of a nuclear power plant. Even though there might be a very low probability that such a catastrophic event would occur, most people want to ensure that a strong regulatory system is place to oversee the proper operation of a nuclear facility. But what about “lesser” risks, like global climate change? For some island states in the Pacific Ocean, it is a catastrophic risk that could entirely wipe out their very existence. For other countries, the risks of climate change seem to be a lot less defined, at least in the near term. Animal welfare regulation is another example where cultural differences can clearly affect perception, and ultimately dictate how regulations are written and enforced. In developed countries, most consumers have come to recognize animals as sentient creatures, capable of perceiving and feeling pain and pleasure. For this reason, there are concerted efforts to adopt comprehensive animal welfare regulations. In developing countries, where chronic malnutrition affects infant mortality and child growth, the issue of animal welfare is practically ignored.

As most modern food safety regulatory regimes focus on mitigating chemical, biological and physical hazards, there are almost infinite regulatory choice options. Figure 10 illustrates a

simple paradigm of the food safety – food quality continuum. The distinction between food quality and food safety, and where exactly one draws the line between them, is a matter of preference conditioned by priorities set within a very specific political, social, cultural, historical, institutional and religious context.

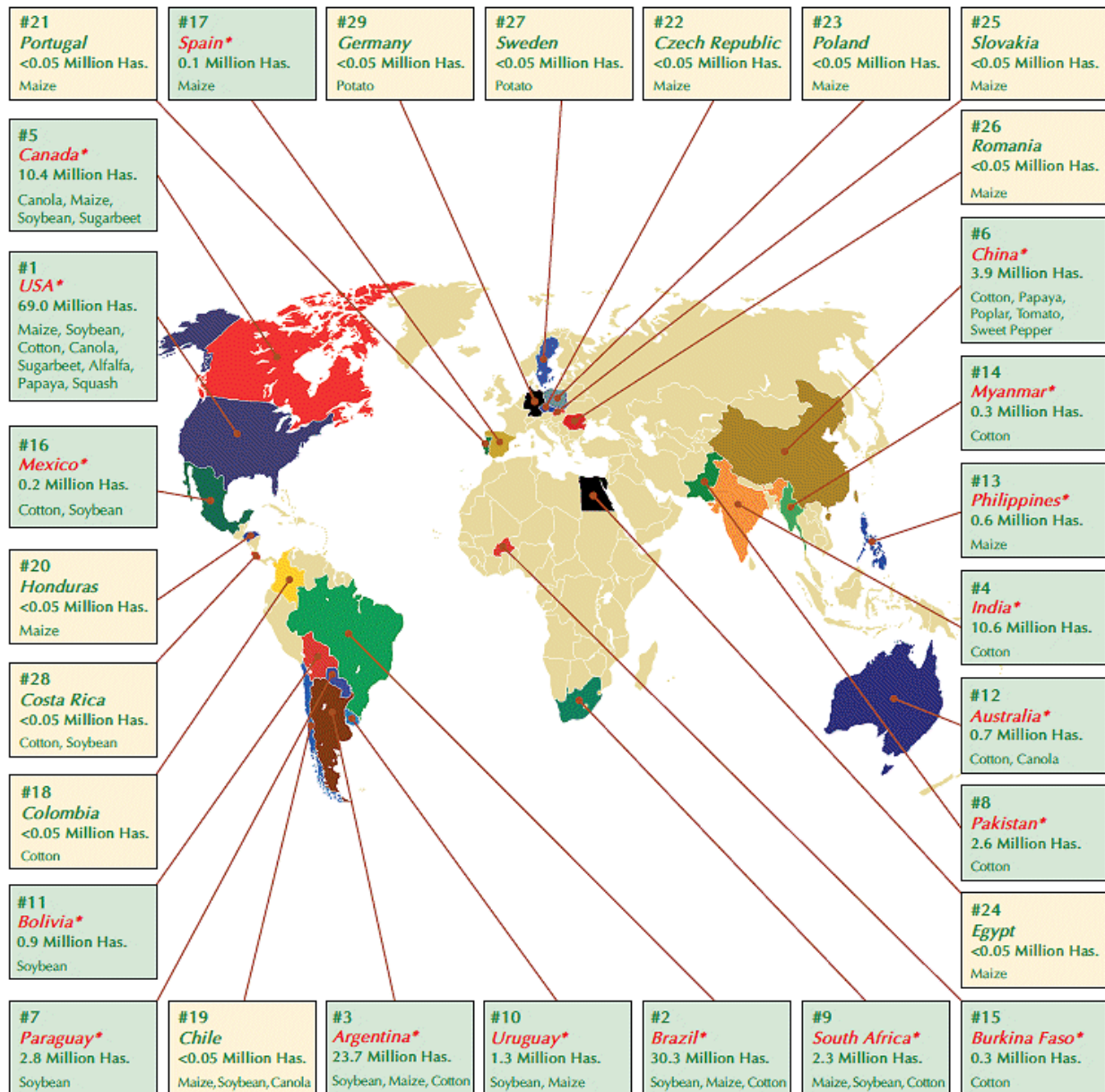
Figure 10 – The Food Safety – Food Quality Continuum



Regulations pertaining to genetically modified organisms (GMOs) perhaps best exemplify the relative subjectivity of perceptions on safety and quality. In the 50 years since James Watson and Francis Crick first described the double-helix structure of the DNA, the use of genetic technology in agriculture and food production has grown considerably. In global terms, nearly 82 percent of total cotton produced in 2011 was derived from biotech seed. Biotechnology also accounts for approximately 75 percent of global soybean production, 32 percent of global maize production and 26 percent of global canola production (representing 160 million hectares). Regulators in the countries that allow commercial development of GMOs (Figure 11) have reviewed the scientific evidence, and have concluded that these products are “generally

recognized as safe” (GRAS). That is not to say that all these countries have identical regulations or necessarily regard biotech crops as equivalent to conventionally grown crops. In some cases, countries apply very stringent labeling requirements to ensure that consumers understand the differentiation between GMO and conventional products (Fortin, 2009 and ISAAA, 2011).

Figure 11 – Biotech Crop Countries and Megacountries, 2011



* 17 biotech mega-countries growing 50,000 hectares, or more, of biotech crops.

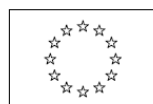
Source: Global Status of Commercialized Biotech/GM Crops 2011, ISAAA

On the other hand, numerous countries refuse to accept the commercialization of GMOs, citing ongoing environmental and food safety concerns. The widespread availability of scientific risk assessment information offers equal opportunity to any country to examine the evidence in favor or against GMOs. Yet, regulators (or the risk managers) obviously embrace different approaches in managing risk (Lee, 2008). In some cases, the approach has been preventative, where the identified threat is to be avoided at all costs. Preventative regulation aims to reduce, phase-out or ban the product or activity in question. Alternatively, some regulators adopt a precaution-based approach, where the true dimensions of the threat are still not known. Precautionary regulation aims to contain and closely monitor incremental implementation. Regulators may also choose to pursue a risk-based or a concern-based approach, where threats are described in probabilistic terms with an understanding of the potential magnitude. Risk-based regulation is typically done using cost-benefit analysis (Dreyer and Renn, 2009).

The effectiveness of any regulatory framework depends not only on how the rules are written and managed, but ultimately also on how they are enforced. In the European Union, Regulation EC 178/2002 established the European Food Safety Authority (EFSA) with an Advisory Panel consisting of “representatives from competent bodies in the Member States which undertake tasks similar to those of the regulatory Authority.” EFSA is further guided by a Scientific Committee and permanent Scientific Panels, who are “responsible for providing the scientific opinions of the Authority...and for the general coordination necessary to ensure the consistency of the scientific opinion procedure, in particular with regard to the adoption of working procedures and harmonization of working methods.” At the administrative level, the European Commission Directorate General for Health and Consumers (DG SANCO) is assisted

by EU Member State representatives in the Standing Committee on the Food Chain and Animal Health (SCFCAH). The SCFCAH meets regularly, typically once a month, to discuss food safety concerns and recommend appropriate measures to mitigate risk (Figure 12) (O'Rourke, 2005).

Figure 12 – Agenda of the Standing Committee on the Food Chain and Animal Health



EUROPEAN COMMISSION

HEALTH & CONSUMERS DIRECTORATE-GENERAL

Ares (2011) 115416

STANDING COMMITTEE ON THE FOOD CHAIN AND ANIMAL HEALTH
Section Toxicological Safety of the Food Chain

COMITÉ PERMANENT DE LA CHAÎNE ALIMENTAIRE ET DE LA SANTÉ ANIMALE
Section Sécurité Toxicologique de la Chaîne Alimentaire

STÄNDIGER AUSSCHUSS FÜR DIE LEBENSMITTELKETTE UND TIERGESUNDHEIT
Sektion Toxicologische Sicherheit der Lebensmittelkette

MONDAY 14 MARCH 2011

LUNDI 14 MARS 2011

MONTAG 14. MÄRZ 2011

AGENDA - ORDRE DU JOUR - TAGESORDNUNG

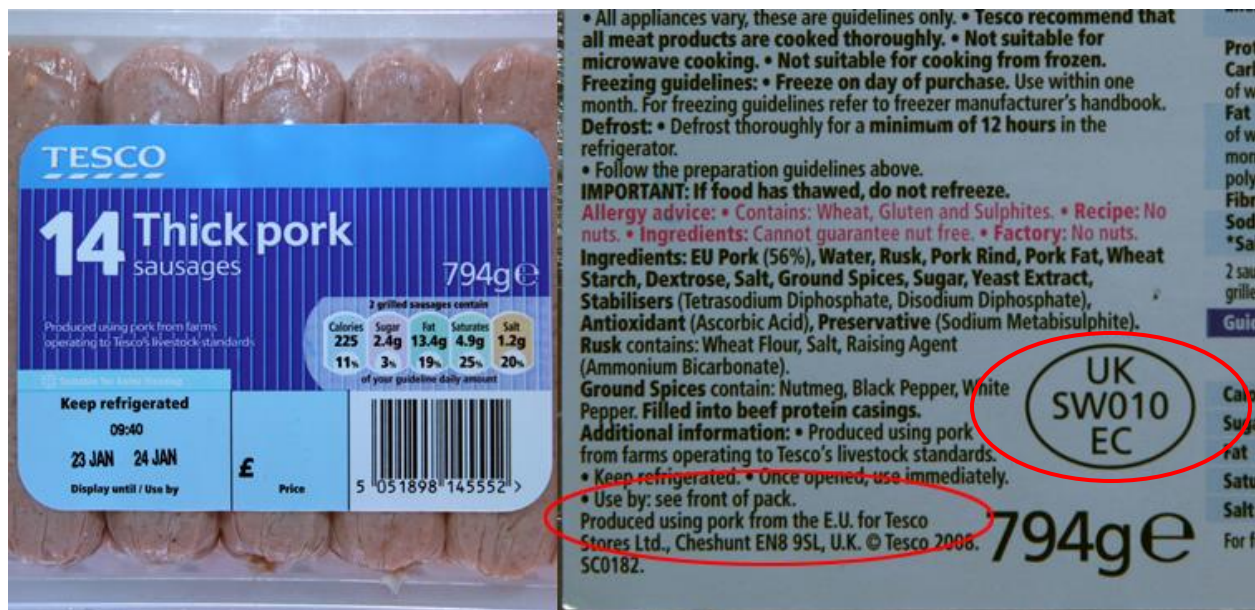
SECTION A Information and/or discussion - Information et/ou discussion -
Zur Information und/oder Diskussion

The documents under Section A will not be distributed at the meeting.

1. Annual report on monitoring of residues of veterinary medicinal products.
2. Information about the use of polyphosphates in the production of salted fish.
3. Information concerning certain requests of applications for use of food additives in food.

Regulation EC 178/2002 also established a Rapid Alert System for Food and Feed (RASFF), an electronic network that connects each Member State to the European Commission and to EFSA. The network enables the exchange of information between Member States related to any measures that impose restrictions on food, including risk-based rejections at the port of entry. In 2011, the RASFF issued 3.700 notifications, or more than 10 notifications a day, for products that for one reason or another failed to conform to EU regulatory requirements. To facilitate the withdrawal of food from the market place, regulation EC 178/2002 also provides for a system of traceability “at all stages of production, processing and distribution. Food and feed business operators shall be able to identify any person from whom they have been supplied with a food, a feed, a food-producing animal, or any substance intended to be, or expected to be, incorporated into a food or feed. To this end, such operators shall have in place systems and procedures which allow for this information to be made available to the competent authorities on demand.” Traceability information is also available on retail food package labels (Figure 13).

Figure 13– EU Label for Pork sausage



The European regulatory framework governing food and agriculture is the product of a very long process that began formally with the signing of the Treaty of Rome on March 25th, 1957. The Treaty which created the European Economic Community aspired to establish “a common market and progressively approximate the economic policies of Member States, to promote throughout the Community a harmonious development of economic activities, a continuous and balanced expansion, an increase in stability, an accelerated raising of the standard of living and closer relations between the States belonging to it.” Article 3 of the Treaty of Rome provided for a timetable to (a) eliminate customs duties and quantitative restrictions on trade; (b) establish a common customs tariff and commercial policy toward third countries; (c) abolish obstacles to freedom of movement for persons, services and capital; (d) adopt a common policy in the sphere of agriculture; (e) adopt a common policy in the sphere of transport; (f) institute a system ensuring that competition in the common market is not distorted; (g) apply procedures by which the economic policies of Member States can be coordinated; and (h) approximate the laws of Member States to the extent required for the proper functioning of the common market (Treaty of Rome, 1957).

In affirming the goal of “approximating the laws of Member States,” the framers of the Treaty of Rome clearly recognized that an efficiently functioning common market would require the elimination of regulatory distortions. From the Spaak Report of June 1956 to the Delors Report on Economic and Monetary Union in 1989, the process of European integration clearly called for the harmonization of regulations between Member States. By implication, even though the countries of the European Economic Community shared similar objectives (not to mention history, tradition, geographic proximity etc...), specific regulatory measures varied considerably from one country to the next.

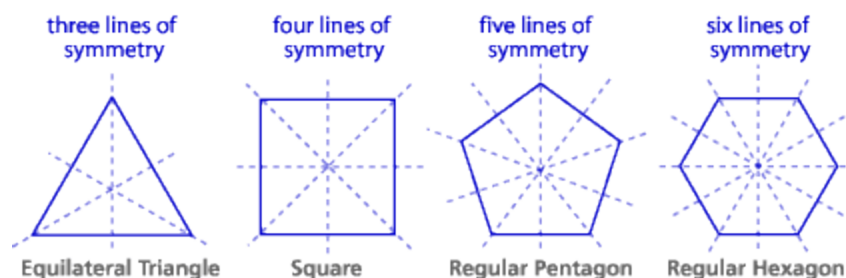
In the famous “Cassis de Dijon” case brought before the European Court of Justice (ECJ) in 1978, Rewe-Zentral AG (the Plaintiff) complained that it had been prohibited by the German Federal Monopoly Administration for Spirits (the Defendant) from marketing Cassis de Dijon, a French fruit liqueur containing 15 to 20 percent alcohol. The defendant maintained that, to protect consumers, fruit liqueurs sold in Germany had to contain at least 32 percent alcohol. The Plaintiff argued that the German regulation was equivalent to a quantitative restriction on imports. However, the Defendant argued that the measure was not discriminatory as it applied equally to products of all origins, foreign and domestic. Moreover, the measure had been introduced to “protect consumer health from excessive alcohol abuse.” The ECJ ended up ruling in favor of the Plaintiff, noting that “there is therefore no valid reason why, provided that they have been lawfully produced and marketed in one of the Member States, alcoholic beverages should not be introduced into any other Member State; the sale of such products may not be subject to a legal prohibition on the marketing of beverages with an alcohol content lower than the limit set by national rules. Therefore, any minimum alcohol requirement constitutes a measure having equivalent effect and should not be allowed.” The ECJ also dismissed the Defendant’s health arguments, pointing out that any such concerns could be addressed by labeling (ECJ Case 120/78).

The landmark Cassis de Dijon decision was particularly meaningful in the fact that it removed a trade barrier caused by differing national legislation. The Cassis de Dijon case also illustrates the point that if the process of making, implementing, monitoring and enforcing rules could vary so significantly between relatively similar European countries, then how much greater is the potential for regulatory divergence, or “asymmetry,” between countries with substantially different institutions, traditions, cultures, infrastructure etc...

“Regulatory asymmetry” is a term that has been most frequently associated with regulatory economics. In the early 1980’s, as U.S. telephone companies and public utilities were undergoing a process of deregulation, “regulatory asymmetry” was used to describe the informational gap in the principal-agent model of regulator and regulated industry, where the regulator had less information than the regulated firm. In 1984, Richard Schmalensee, Professor of Management and Economics at the Massachusetts Institute of Technology, described the U.S. Federal Communications Commission’s regulatory policy as “asymmetric”, “subjecting AT&T [the American Telephone and Telegraph Company] to more stringent regulation than its rivals in the markets for telecommunications services” (Haring, 1984). Schankerman and Waverman (1997) defined “symmetric regulation as rules which do not preclude the low cost firm from being the low price provider.” Timothy Wu (2007) noted that “asymmetric regulation refers to the application of different regulatory constraints to firms competing within the same market.”

The word “asymmetry” or “lack of symmetry” is derived from the Greek **συμμετρέειν**, literally meaning "measure together." Symmetry implies agreement in dimension, proportionality, even correspondence, or an harmonic arrangement of parts. Geometrically, it is the rotation, reflection or translation of a plane figure that leaves the figure unchanged even though its position has been altered (Figure 14). From this perspective, “regulatory asymmetry”

Figure 14 – Examples of Geometrical Symmetry



Source: IMPACT Mathematics, Educational Development Center, Inc.

is not only unevenness in the information flow or the way regulations are applied within a single regulatory framework (i.e. regulatory discrimination), but it is a much broader concept of divergence. As an example, one may consider a situation where there is scientific evidence to suggest that a certain invasive pest can potentially decimate an economically significant crop. Country “A” authorizes the use of certain pesticides, and allows relatively high maximum residue levels (MRLs) for products treated with those chemicals. Country “A” may also require that agricultural imports undergo extensive fumigation treatments or irradiation. If another country, “B”, concludes that the invasive insect does not present a significant threat, perhaps because country “B” is in a colder climate, it may decide to limit the use of certain pesticides, propose substantially lower MRLs, and perhaps even ban certain fumigation treatments. The regulatory approaches taken by the two countries with respect to the invasive pest are said to be “asymmetric.” In this case, “regulatory asymmetry” is regulatory divergence between two regulatory frameworks, something that presents a real challenge for firms wishing to trade between countries “A” and “B”.

Regulatory asymmetry may also be characterized as a test of adaptability. How does a small exporting firm adapt to different regulatory environments? If a person, for example, wants to live in a foreign country, that individual will likely need to adapt, learn to speak the local language or perhaps engage the services of a translator. The individual might also need to adapt personal electrical appliances to the local power supply. As is the case with language differences and different electrical standards, the problem of regulatory asymmetry is a matter of degrees: some regulations may be relatively “more asymmetrical” than others. Languages often have “close relatives,” languages with similar roots that enable individuals to understand with

little, if any, formal training. A person speaking only Portuguese, would almost certainly find it much easier to understand people in Spain than people in China. A traveler who has the knowledge of a “bridge language” like French or English might have a higher likelihood of understanding people from another country. When traveling to a foreign country, one does not necessarily always need a full voltage converter to use personal electrical appliances: a simple adapter to convert the pin configuration of the plug may suffice.

As was suggested in the previous chapter, an SME’s adaptability is generally conditioned by the availability of resources: a typical SME cannot always afford the “expensive language translator or voltage conversion equipment.” Whereas a multinational corporation is likely to behave like a local firm in the foreign market, hiring local workers, (learning the local language and buying local appliances that don’t even need a voltage converter), the SME faces a significant challenge in trying to understand the foreign market, and deciding how to best comply with local regulations.

A firm’s decision to comply with regulatory requirements will be largely influenced by the prevailing situation of regulatory asymmetry present in the market place (Figure 15). In the least restrictive situation, the regulations of a foreign market are practically identical to those which apply in the domestic market. This would be the case of “national treatment” within a customs union or a single market like the European Union. Even though the SME might still face some challenges of asymmetry in the way a regulation is interpreted, applied or enforced, the firm would have considerable leverage to adjust and quickly address problems of asymmetry (not least by appealing to a central authority like the European Commission or the ECJ). In the case of regulatory equivalence or mutual recognition, two (or more) regulatory regimes recognize each other to be broadly equivalent, insofar as they produce similar outcomes (i.e.

functional equivalence) and/or they impose similar burdens (cost equivalence). Equivalence determination allows different standards, regulations or procedures to remain in place, but these are treated equally as long as they achieve the same results and policy objectives, even if by different means. In a situation of mutual recognition or equivalence, the firm's regulatory compliance costs are minimized by the fact that the firm can generally operate in the foreign market by simply complying with its own domestic regulations. It should be noted that equivalency agreements sometimes include additional requirements (i.e. compensatory measures) to cover regulatory goals are not completely met by the agreement.

Figure 15 – Market Situations of Regulatory Asymmetry



Over the last hundred years, there have been numerous cooperative efforts to close or at least try to narrow the regulatory gap between countries. In the early part of the 20th century, food trade associations like the International Dairy Federation, began to work on the harmonization of product standards. In 1924, l' Organisation International des Épizooties (OIE) was established to organize common international guidelines for veterinary medicine.

Recognizing the critical importance of controlling animal diseases, which obviously do not recognize international boundaries, the 167 member state veterinary services authorities of the OIE meet regularly in Paris to discuss animal disease status. The OIE also collects, analyzes and disseminates scientific veterinary information, assisting members with expertise and technical support for animal disease control and eradication operations. A standards committee develops international protocols / standards and periodically reviews them to facilitate international trade in animals and animal products.

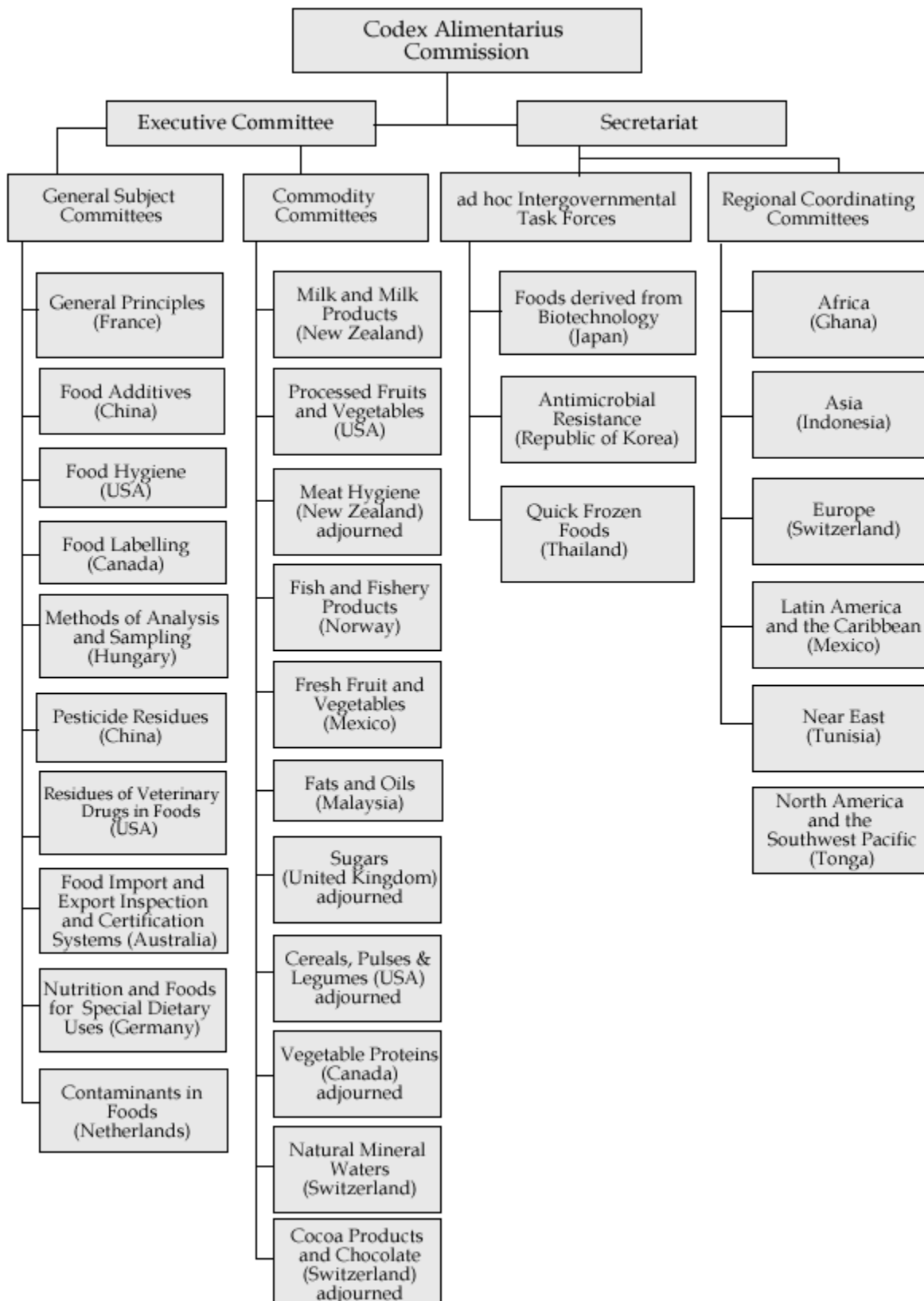
The International Phylloxera Convention, signed in Bern in 1881, established the foundation for international regulatory cooperation on plant health. Germany, Austria-Hungary, Belgium, France, Italy, Luxembourg, the Netherlands, Portugal, Serbia and Switzerland agreed to cooperate to control the spread of grape phylloxera, a North American aphid that had been accidentally introduced into Europe, and had subsequently devastated much of Europe's grape-growing regions. The Phylloxera Convention was broadened in 1929, and in 1952 became the International Plant Protection Convention (IPPC), formally under the mandate of the United Nations Food and Agriculture Organization (FAO).

In October 1949, the newly formed FAO and World Health Organization (WHO) established a Joint FAO/WHO Expert Committee on Nutrition to develop close collaboration on nutrition and health programs. Early on, the Joint Committee recognized that "Food regulations in different countries are often conflicting and contradictory. Legislation governing preservation, nomenclature and acceptable food standards often varies widely from country to country. New legislation not based on scientific knowledge is often introduced, and little account may be taken of nutritional principles in formulating regulations." The Committee also noted "the conflicting nature of food regulations may be an obstacle to trade in foodstuffs

between countries and hence may affect the distribution of nutritionally valuable foods,” and thus recommended further study of the issue (WHO, 1949). Over the next decade, a number of public and private sector-led initiatives pressed for a more formal process to encourage regulatory harmonization of food standards. The United Nations Economic Commission for Europe (UNECE) proposed quality standards for fresh fruit and vegetables with the objective of facilitating the handling and movement of these products throughout Europe. In South America, Dr. Carlos C. Grau proposed a “Código Latino Americano de Alimentos” to harmonize food standards; and in 1960, the FAO noted "the desirability of international agreement on minimum food standards and related questions (including labeling requirements, methods of analysis, etc.) was recognized as an important means of protecting the consumer's health, of ensuring quality and of reducing trade barriers, particularly in the rapidly integrating market of Europe."

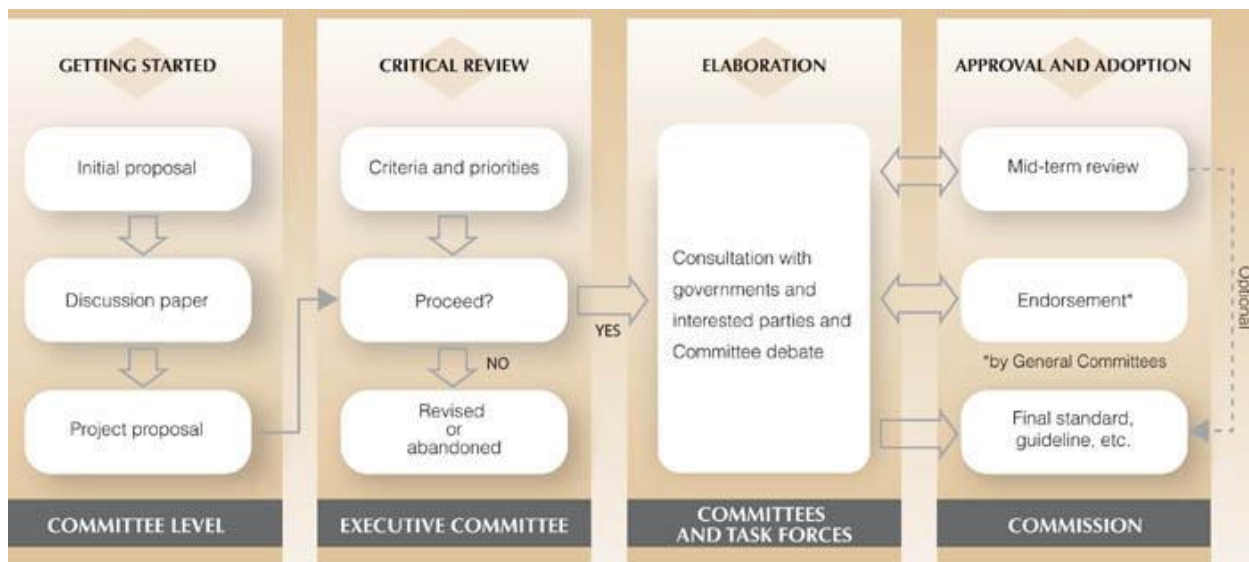
The *Codex Alimentarius* Commission (CAC) was thus established in 1963 to serve as an international standard setting body for raw, semi-processed and processed food. It consists of 184 Member Countries, plus the European Union (any member of FAO or WHO can request membership). In addition, there are 208 *Codex* observers, including inter-governmental and non-governmental organizations. The *Codex* is one of the few international organizations that formally brings together scientists, technical experts, government regulators, as well as international consumer and industry organizations. The Plenary of the *Codex Alimentarius Commission* normally meets every two years, alternately in Rome and in Geneva. Between plenary sessions, *Codex* Coordinating Committees meet to discuss and prepare draft standards for submission to the Commission. There are 10 General Subject and 11 Commodity Committees that review standards, set limits, and develop other codes of practice (although some of these Committees are no longer active) (Figure 16) (*Codex Alimentarius*, 2007).

Figure 16 – Structure of the *CODEX ALIMENTARIUS COMMISSION*



The Codex uses an eight-step process to introduce new standards. In the first step, the Commission must authorize new work. Typically the request will come through a Member or a specific Committee, but the Commission will ultimately decide which Committee will do the work. The Committee prepares an evaluation document and reviews how the proposal will fit into the Codex work priorities. In the next step, the Secretariat will draft, or hire an outside consultant to draft, a proposed draft standard. The draft standard is then circulated to Members and observers for comment. In step 4, the originating Committee considers the comments in formal and informal discussion, and then proposes any amendments. If the Committee decides to move forward with an amended draft, the Commission can vote using an “accelerated procedure,” requiring consent from a two-thirds majority of voting Members. Step 6 and 7 consist of another round of consultations and Committee discussions. In the final step, the Commission publishes the new standard (Figure 16) (Codex Alimentarius, 2007).

Figure 16 – The Codex Decision Making Procedure



Source: Codex Alimentarius, 2007

While the *Codex Alimentarius* process may appear to be relatively straight forward and transparent, in practice a draft standard can take anywhere from 3 to 7 years, and sometimes even longer, to make its way through the Committee. *Codex* Committees usually meet once a year, and while much of the preparatory work is done virtually over the internet, controversial measures often require significantly more technical consultation with different stakeholders. High profile issues, including import bans and court cases (e.g. biotechnology and production aids like BST-Bovine Somatotropin), often languish as Members introduce “other limiting factors like consumer rights, fraudulent or unfair trading practices, labeling, and various other ethical and cultural considerations. Even debates over maximum residue limit levels (MRLs) for contaminants sometimes to reach common positions. Given the technical and political complexities of the *Codex* process, many poorer countries (and indeed also SMEs) find it very difficult to actively participate in the *Codex* process (Consumers International, 2005).

Much like the OIE and the IPPC, *Codex Alimentarius* standards were initially a matter of “soft law,” voluntary recommendations that did not necessarily require Member States to formally adopt or implement them. However, with the establishment of the WTO and the SPS Agreement, *Codex*, the OIE and the IPPC, have become the principal reference bodies for international standards. As all WTO members are committed to comply with the SPS Agreement, there is a much stronger impetus to implement *Codex*, OIE and IPPC standards. The SPS Agreement formally expresses a desire “to further the use of harmonized sanitary and phytosanitary measures between Members, on the basis of international standards, guidelines and recommendations developed by the relevant international organizations, including the *Codex Alimentarius* Commission, the International Office of Epizootics, and the relevant international and regional organizations operating within the framework of the International Plant Protection

Convention, without requiring Members to change their appropriate level of protection of human, animal or plant life or health.” Members may impose stricter SPS measures provided that there is a scientific justification for doing so, and the importing country provides evidence of the potential damage in terms of loss of production, the spread of pest or disease and the estimated costs of control or eradication (Article 3 and Article 5 of the SPS Agreement).

The WTO SPS Agreement plays a very important role in ensuring transparency and non-discrimination in how governments can apply food safety, animal, and plant health regulations. It requires Members to take “take into account, inter alia, the level of prevalence of specific diseases or pests, the existence of eradication or control programs, and appropriate criteria or guidelines which may be developed by the relevant international organizations.....in particular, recognize the concepts of pest- or disease-free areas and areas of low pest or disease prevalence. Determination of such areas shall be based on factors such as geography, ecosystems, epidemiological surveillance, and the effectiveness of sanitary or phytosanitary controls.” In other words, the SPS Agreement seeks to limit arbitrary behavior in how member states introduce and implement SPS regulations (Matsushita et. al, 2003).

In similar vein, the WTO TBT Agreement seeks to ensure that technical regulations and standards, including, testing and certification procedures, packaging, marking and labeling requirements do not create unnecessary obstacles to international trade. The TBT Agreement covers all technical standards not covered by the SPS Agreement, and applies to all food and agricultural products. As in the case of the SPS Agreement, the TBT Agreement recognizes the right of WTO members to adopt technical regulations that are no “more trade-restrictive than necessary to fulfill a legitimate objective, taking account of the risks non-fulfillment would create. Such legitimate objectives are, inter alia: national security requirements; the prevention of

deceptive practices; protection of human health or safety, animal or plant life or health, or the environment. In assessing such risks, relevant elements of consideration are, inter alia: available scientific and technical information, related processing technology or intended end-uses of products.” (Article 2.2 of the TBT Agreement). Interestingly, the TBT Agreement, unlike the SPS Agreement, does refer to a specific international standard-setting body, but rather encourages Member States to use international standards where appropriate. So if a Member State observes the standards, guidelines and recommendations of *Codex*, these are presumed to be in compliance with the TBT Agreement. (Matsushita et. al, 2003).

The WTO framework, including the SPS and TBT Agreements, is intentionally designed to serve as a legal instrument to counteract protectionist tendencies. While every country has a fundamental sovereign right to develop its own regulations and standards, the WTO seeks to impose a level of discipline on its Members to ensure that rules are a) based on science, b) are applied only to the extent of protecting human, animal and plant health, and c) cannot be used in an arbitrary way to unjustifiably discriminate between domestic producers and trading partners (i.e. this is the so-called “national treatment rule” of Article 3.1 and 3.2 of the SPS Agreement). Some international trade observers have cynically argued that as international tariff regimes are gradually dismantled, rules and regulations are emerging as a new, and possibly more pernicious, form of protectionism. (Victor 2000, World Bank 2005, Post 2006).

To minimize the incidence of trade barriers, Article 18 of the WTO Agreement on Agriculture commits Member States to submit a report on the implementation of commitments which “shall be reviewed by the Committee on Agriculture. The review process shall be undertaken on the basis of notifications submitted by Members in relation to such matters and at such intervals as shall be determined, as well as on the basis of such documentation as the

Secretariat may be requested to prepare in order to facilitate the review process. In addition to the notifications to be submitted, any new domestic support measure, or modification of an existing measure, for which exemption from reduction is claimed shall be notified promptly.” Article 7 of the SPS Agreement obligates Members to “notify changes in their sanitary or phytosanitary measures and shall provide information on their sanitary or phytosanitary measures in accordance with the provisions of Annex B.” Annex B specifically outlines the conditions for “Transparency Of Sanitary And Phytosanitary Regulations:

“ Whenever an international standard, guideline or recommendation does not exist or the content of a proposed sanitary or phytosanitary regulation is not substantially the same as the content of an international standard, guideline or recommendation, and if the regulation may have a significant effect on trade of other Members, Members shall:

- (a) publish a notice at an early stage in such a manner as to enable interested Members to become acquainted with the proposal to introduce a particular regulation;
- (b) notify other Members, through the Secretariat, of the products to be covered by the regulation together with a brief indication of the objective and rationale of the proposed regulation. Such notifications shall take place at an early stage, when amendments can still be introduced and comments taken into account;
- (c) provide upon request to other Members copies of the proposed regulation and, whenever possible, identify the parts which in substance deviate from international standards, guidelines or recommendations;
- (d) without discrimination, allow reasonable time for other Members to make comments in writing, discuss these comments upon request, and take the comments and the results of the discussions into account.

However, where urgent problems of health protection arise or threaten to arise for a Member, that Member may omit such of the steps enumerated in paragraph 5 of this Annex as it finds necessary, provided that the Member:

- (a) immediately notifies other Members, through the Secretariat, of the particular regulation and the products covered, with a brief indication of the objective and the rationale of the regulation, including the nature of the urgent problem(s);
- (b) provides, upon request, copies of the regulation to other Members;
- (c) allows other Members to make comments in writing, discusses these comments upon request, and takes the comments and the results of the discussions into account.

Notifications to the Secretariat shall be in English, French or Spanish. Developed country Members shall, if requested by other Members, provide copies of the documents or, in case of voluminous documents, summaries of the documents covered by a specific notification in English, French or Spanish.

The Secretariat shall promptly circulate copies of the notification to all Members and interested international organizations and draw the attention of developing country Members to any notifications relating to products of particular interest to them.

Members shall designate a single central government authority as responsible for the implementation, on the national level, of the provisions concerning notification procedures...”

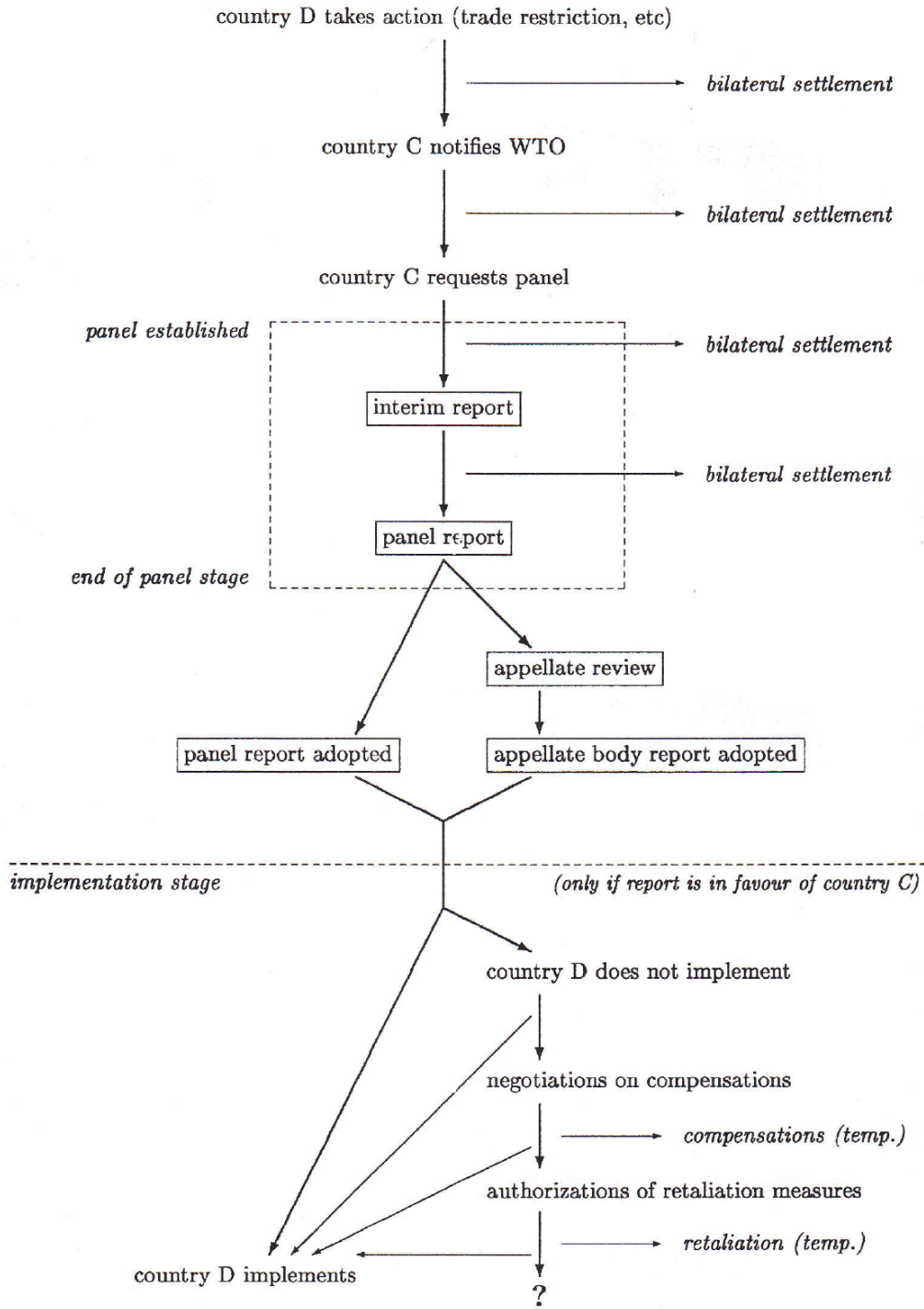
Article 2.9 of the TBT Agreement also calls on Members to notify the WTO through the Secretariat whenever a new technical regulation is introduced, providing a ”reasonable amount of time” to comment. An electronic or hard copy of the notification is typically submitted by a national authority to database known as the Central Registry of Notifications (CRN). In 2011,

the WTO received 4,316 notifications on measures. Every Member has a national enquiry point to collect information for manufacturers and exporters on the latest standards in their market, and also to notify other member states of any draft measures.

Full transparency is one of the central goals of the SPS and TBT Agreements. But at the same time, Member States recognize that “developing countries may encounter special difficulties in complying with the measures of importing Members, and as a consequence in access to markets, and also in the formulation and application of measures in their own territories,” and therefore may require assistance. Developing and least developed countries, which account for about two-thirds of the WTO membership, often lack the technical, human and financial resources to enable them to achieve their regulatory objectives. Many regulatory provisions are outdated and/or are not harmonized with the SPS and TBT Agreements, or with the standards set by the relevant international organizations. As a result, many countries (and by extension, companies) face significant constraints in their capacity to implement and enforce sanitary measures and technical regulations. With inadequate infrastructure (institutions, regulatory and standardizing bodies, accredited laboratories or other testing facilities to conduct risk analysis), many countries cannot always provide the proper justification for measures that impact trade.

If a WTO Member State fails to live up to its commitments, other Member States can formally request an explanation or justification, and discuss these in regular SPS or TBT Committee meetings in Geneva. Member States are encouraged to avoid taking unilateral action, and as a last resort, are urged to follow the procedures of dispute settlement. The Dispute Settlement Body (DSB) has the authority to establish “panels” of experts to consider case and to issue a report and recommendations which the DSB may then adopt or reject.

Figure 17 – Stages of the WTO Dispute Settlement System



Source: Büttler and Hauser, 2000

The first stage of the WTO dispute settlement system begins with a request by the complaining country to the allegedly offending country to settle the dispute through consultations (Figure 17). Third parties having an interest in the dispute can also join the consultations. If the consultations fail to satisfy the complaining country, the complainant can request the establishment of a panel, which can take up to 45 days to form and 6 months to conclude a report. The panel report is then submitted to the DSB, which is then adopted or rejected within 60 days. Either party can appeal a panel's ruling; the Appellate Body will review and generally issue a ruling within 90 days. The DSB then monitors the implementation of the ruling, and may authorize action against a Member State if it fails to abide by the DSB decisions (Bütler and Hauser, 2000).

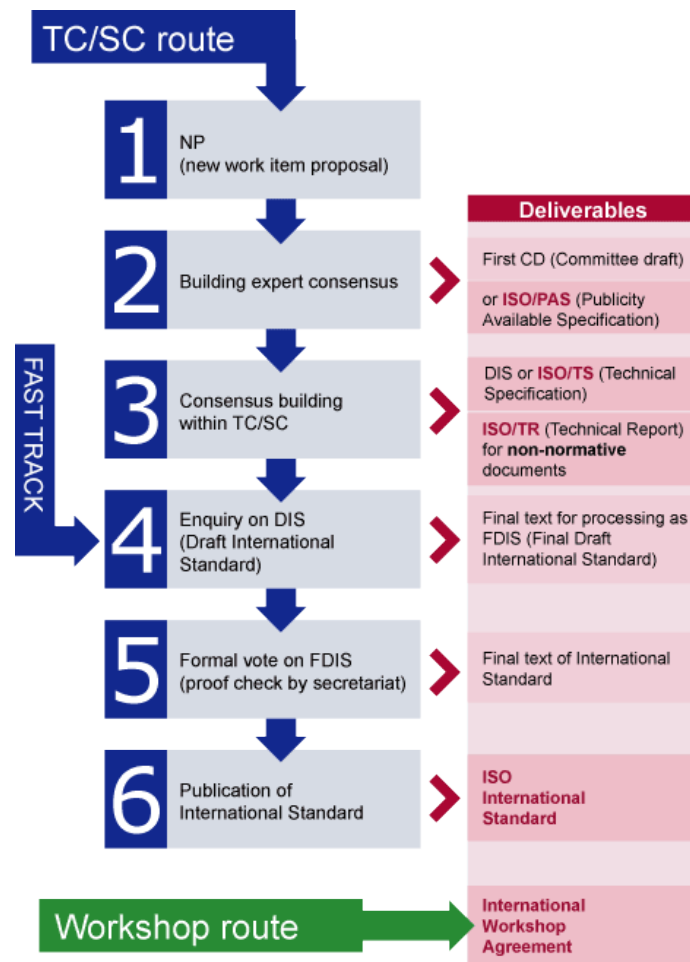
The historical record suggests that the WTO litigation process is not well suited for SME grievances, at least not in the short term. From the outset, the decision to initiate dispute settlement consultations is taken by the national trade authority in the Member State. In practice, this decision is not only based on the legal merits of a particular complaint, but could in fact depend more on the prevailing political and economic policies of the government. Strategic interests in the United Nations Security Council are very likely to eclipse most trade irritants in the WTO. In similar vein, a national trade authority will typically do cost-benefit analyses to determine what cases would a) have the highest probability of a successful outcome, and b) yield the greatest economic or political benefit. Legal challenges in the WTO can be very resource intensive - Simon Potter, a trade lawyer with the Canadian law firm McCarthy Tétrault, estimates that it took 3 years and about \$10 million for Canada to litigate the EU ban on seal products. The significant political and financial costs involved in filing a case in the WTO do not favor poor countries, and certainly are even more daunting for the individual SME.

Sebastian Wilckens (2007) notes that during the decade 1995-2005 there were a total of 335 disputes notified to the WTO, consisting of 368 individual country complaints. The majority of these complaints (66 percent) were filed by high income countries against other high income countries. Wilckens and others have suggested that subsidies should be offered to assist less privileged countries in gaining better access to the WTO process – and indeed, the WTO Secretariat is now collaborating with some Member States to offer assistance in legal and other technical training program.

The effort to reduce regulatory asymmetry, or the process of international regulatory harmonization, is by no means only confined to the work of national governments and their interactions in international bodies like *Codex* or the WTO. The International Organization for Standardization (ISO), founded in 1946, groups the national standards institutes of 163 countries. Although ISO works on the basis of one institution per country, in several cases the standard institute can be an entirely private sector initiative. The ISO has three levels of membership: 1) “member bodies” are full members with full voting rights for any policy or technical committee of the ISO; 2) “correspondent members” are typically organizations from countries that do not yet have a fully developed national standards system; and 3) “subscriber members” are institutes from small countries that pay a fee to have access to information on international standards, but as non-voting members, they generally do not participate in the standard making process. The ISO process is driven by the market considerations, and therefore the institution will only undertake the development of a new standard if there is a market for it. Industry groups or other interested parties work through national standard bodies to communicate the perceived need for a new standard in the ISO.

If the proposal is accepted, it is referred to the relevant ISO Technical Committee (made up of technical and industry experts) for further development and discussion. A standard may be “fast-tracked” for adoption if it is already accepted by another international standardizing body recognized by the ISO Council. As the Committee deliberates on the various elements of the conformity assessment (testing, surveillance, inspection, audit, certification, registration and accreditation), it may invite an outside perspective to account for the broader interest of consumers and developing country welfare. Once the Technical Committee completes a consensus draft, it is circulated to the entire the entire ISO membership for comment and a vote.

Figure 18 – ISO Process for Standard Development



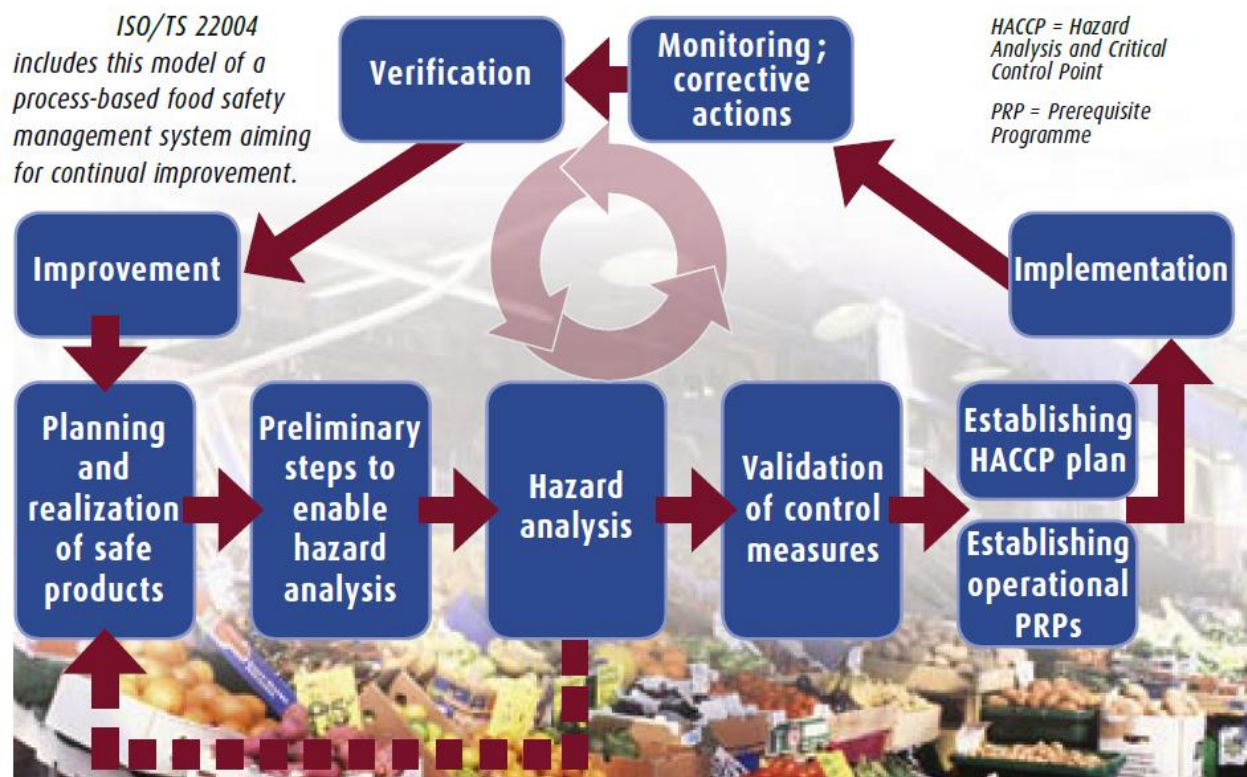
Source: ISO

The comment and vote period lasts 5 months, but only the participating members of the Technical Committee are obliged to vote – for all other members, it is voluntary. The draft standard is adopted when at least two-thirds of the participating members of the Technical Committee vote in favor of the standard, and not more than one quarter of all votes cast are negative. Otherwise the draft is returned to the Committee for further study and revision, before it is resubmitted to the entire ISO membership for a “yes or no” vote that lasts 2 months. All ISO standards are reviewed at the least three years after publication, and every five years thereafter the relevant Technical Committee must decide whether the standard should be confirmed, revised or withdrawn (ISO, 2011).

As the world’s largest developer of technical standards, the ISO has published, since 1946, more than 19,000 international standards across a diverse range of industrial, technical and business sectors. While ISO standards are voluntary, they can be adopted as part of a national regulatory framework, or incorporated directly into national legislation. In many sectors, ISO standards apply a form “peer pressure” as suppliers or customers may demand ISO certification, and are thus turning voluntary standards into de facto mandatory ones. The ISO is particularly known for the ISO 9000 series, which establishes the requirements for a quality management system to demonstrate an ability to consistently provide products that meet customer needs and meet the applicable regulatory requirements. The ISO 14000 series outlines what organizations should do to minimize harmful effects of their activities on the environment. In September 2005, ISO published ISO 22000, establishing the requirements for implementing food safety management systems in all types of organizations along the food chain, ranging from feed producers, primary producers, food manufacturers, transport and storage operators to retail and food service establishments – as well as related organizations like equipment and packaging

manufacturers, and producers of additives and ingredients. ISO 22000 was developed in cooperation with *Codex* and other various specialized international organizations, also incorporating the principles of HACCP (Figure 19). ISO Technical Specification ISO/TS 22004 offers specific guidance on the implementation of this standard, with particular emphasis on SMEs.

Figure 19 – ISO model of a process-based food safety management system



Source: ISO

Hazard Analysis Critical Control Points, or HACCP, is a system that was developed by Dr. Howard E. Bauman and the Pillsbury Company in the late 1960's as part of the U.S. National Aeronautics and Space Administration's (NASA) Gemini and Apollo space program. While the system was originally conceived to ensure food safety in the U.S. space program, it was subsequently adopted as a mandatory standard for meat inspection by the U.S. Department of

Agriculture (USDA) in 1996, and for seafood and juice by the U.S. Food and Drug Administration (FDA). Others have also embraced HACCP as voluntary or mandatory guidelines. In Europe, Article 5 of the Food Hygiene Regulation (EC) No 853/2004 stipulates that:

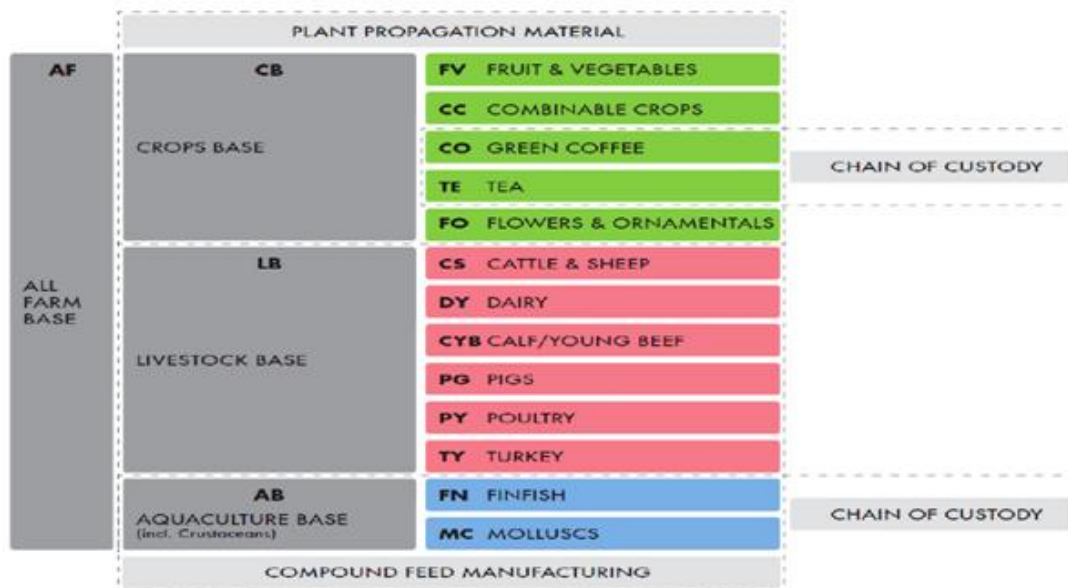
“Food business operators shall put in place, implement and maintain a permanent procedure or procedures based on the HACCP principles. The HACCP principles referred to in paragraph 1 consist of the following:

- (a) identifying any hazards that must be prevented, eliminated or reduced to acceptable levels;
- (b) identifying the critical control points at the step or steps at which control is essential to prevent or eliminate a hazard or to reduce it to acceptable levels;
- (c) establishing critical limits at critical control points which separate acceptability from unacceptability for the prevention, elimination or reduction of identified hazards;
- (d) establishing and implementing effective monitoring procedures at critical control points;
- (e) establishing corrective actions when monitoring indicates that a critical control point is not under control;
- (f) establishing procedures, which shall be carried out regularly, to verify that the measures outlined in subparagraphs (a) to (e) are working effectively; and
- (g) establishing documents and records commensurate with the nature and size of the food business to demonstrate the effective application of the measures outlined in subparagraphs (a) to (f).”

The HACCP food safety standard is a meta-system, a system within a system, sharing many similarities with the ISO food safety standard (Bauman, 1994). However, there are also other institutions, both public and private, that contribute to the process of international harmonization, standardization and certification.

One of the largest and best known private standard setting bodies in existence today is GlobalGAP, an initiative launched in 1997 by a group of retailers belonging to the Euro-Retailer Produce Working Group (EUREP). The EUREP Good Agricultural Practices (GAP) system created a set of common certification standards for producers aiming to satisfy consumer interests in food safety, environmental protection, workers' health, safety and welfare and animal welfare. While European supermarkets have been the driving force behind the effort to harmonize different company standards, over 100.000 producers from more than 100 countries are now certified; and in 2007, EUREPGAP appropriately changed its name to GlobalGAP.

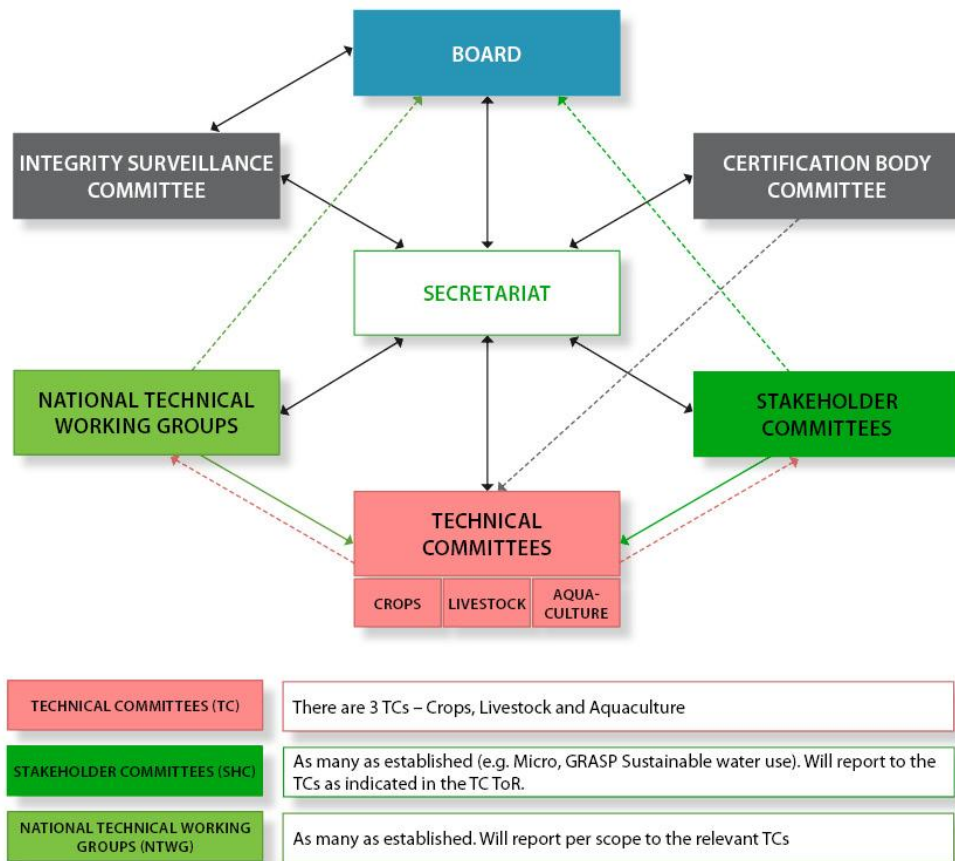
Figure 20 – GlobalGAP Certification Modules



Source: GlobalGAP, 2011

The emphasis of GlobalGAP certification is on compliance of minimal standards in different production processes at the farm gate. As seen in Figure 20, GlobalGAP standards are organized in modules: one module applies to all farms (i.e. worker health and safety), while the other modules are either sector or product specific. GlobalGAP standards are reviewed by technical committees that include 50-50 participation from producers and retailers; and after two 60 day consultation periods, draft standards may be approved by the GlobalGAP Board (Figure 21).

Figure 21 – GlobalGAP Governance



Source: GlobalGAP, 2011

The GlobalGAP certification process has come under a lot of criticism for “imposing additional costs” that can be particularly burdensome for small farmers. Aside from the GlobalGAP fee structure for certification (Figure 22), farmers incur additional costs of compliance in terms of time, equipment and labor. These additional costs do not necessarily guarantee substantially better prices at the farm gate, and in fact, depending on the marketing channel, prices could remain substantially equivalent to those offered for non-certified products.

Figure 22 – GlobalGAP Fee Structure

Voluntary GLOBALG.A.P. Association Membership Fees				
Fee Type	Applies to	Amount		Notes
Retail Membership Fee⁵	Retailer and Foodservice Members	Annual Turnover		GLOBALG.A.P. Retail and Food Service membership fees are size related according to overall retail turnover per calendar year.
		≤ 5 Billion €	5,000 €	
		> 5 to 15 Billion €	7,000 €	
		> 15 Billion €	9,000 €	
Group Supplier Membership			2,550 €	Per calendar year, includes one scope and sector committee voting right.
Individual Supplier Membership	Individual Producer, or Exporter/Importer without production		1,550 €	Per calendar year, includes one scope and sector committee voting right.
Supplier Membership Extension	Each additional sub-scope		525 €	Per calendar year up to maximum of 1,050 €.
Associate Membership	Certification Body (CB), Consulting, Plant-Protection or Fertilizer Industry, etc., and their associations		1,550 €	Per calendar year; covers all scopes and sub-scopes.

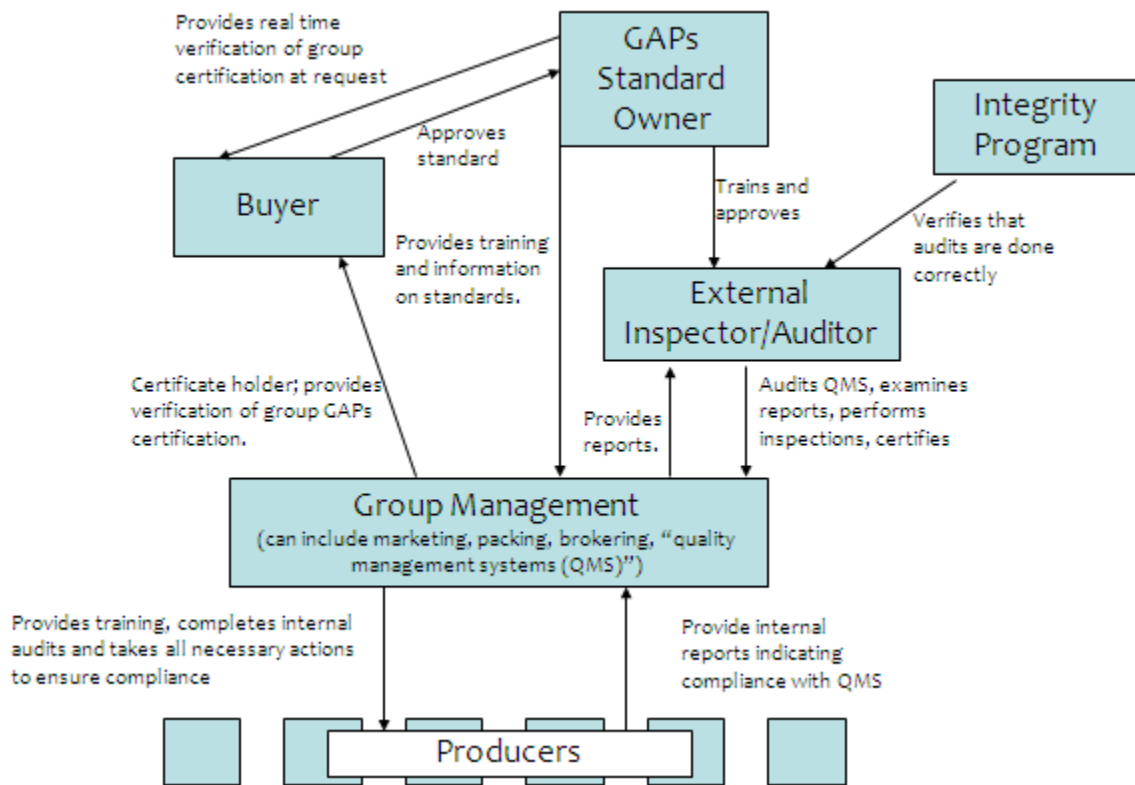
**Benchmarking Fees
Equivalent Certification System Owner (ECSO) Fees and Approved Modified Checklist
Owner (AMCO)**

Fee Type	Applies to	Amount	Notes
Initial Application Fee	Applicant schemes	2,500 €	Per initial application, this includes an initial GLOBALG.A.P. Secretariat review and report (two rounds of feedback to scheme owner).
Additional Review	Applicant scheme or scheme in re-benchmarking process	1,000 €	GLOBALG.A.P. Secretariat review and report.
Base Administration Fee	First benchmarked sub-scope	2,500 €	Per calendar year for private sector schemes with ECSO and AMCO agreement and includes voluntary membership.
Sub-scope Extension	Each additional sub-scope	525 €	Per calendar year up to maximum of 1,050 €.

Source: GlobalGAP, 2011

Perhaps sensitive to this criticism, the GlobalGAP organization seems to have recognized the challenges of small producers, and has adjusted its fee structure to enable a “group certification approach,” also known as “Option 2.” Under GlobalGAP Option 2, the group owning the certificate commits to a quality management system (with a documented management structure and a written procedures manual), and agrees to institute a central administration and management of the group to control and sanction member farms (Figure 23).

Figure 23 – GlobalGAP Organizational Chart for Group Certification (Option 2)



Source: GlobalGAP, 2011

In modern context of food and agriculture, there are literally thousands of standards, regulations and certification programs. Governments institute regulations on production (i.e. prohibiting the use of child labor, setting guidelines on the use of certain land, seed or pesticide, etc...), transportation (i.e. animal welfare, quarantine etc...), storage (i.e. warehouse location,

ambient temperatures, etc...), processing (i.e. food handling, additives, residues, etc...), and marketing (i.e. quality standards, labeling, expiration dates, etc...). Depending on individual country circumstances, the responsibility for regulation monitoring and enforcement may be delegated to a combination of national, federal, regional, state and local authorities. In some cases, the regulations are mandated by law, and non-compliance can result in fines, forfeiture, prison sentences and even the death penalty. In other cases, regulations are voluntary, and are managed by non-governmental entities like industry associations and marketing boards. The private sector industry-led initiatives can complement government regulation, or can potentially set more restrictive parameters, creating in essence a “club good,” which aims to exclude certain actors from participating in the market place.

At the international level, the very complex web of national and sub-national regulations can be a significant barrier to trade, and for this reason, there is a very strong economic incentive to reduce regulatory asymmetry and push toward regulatory convergence. From a political perspective, there is also keen political interest to encourage greater participation of SMEs in international trade. The initiatives of international governmental and non-governmental organizations like WTO, *Codex Alimentarius*, ISO and GlobalGAP are criticized for not being sufficiently sensitive to the needs and cost structure of the SME. The next chapter considers the problem of SME export behavior.

Economic Theory of SME Export Behavior

Economic theory of the firm provides a useful starting point for developing an analytical framework to understand, explain and predict the export behavior of a SME. In the seminal 1921 book, *Risk, Uncertainty, and Profit*, Frank H. Knight argued that in a perfectly competitive world, economic profit is eliminated because no economic agent experiences uncertainty. Under perfect competition, economic agents know all opportunity costs and benefits. Individual desires are known to all and everyone expects that all contractual obligations will be fulfilled. In this environment, decision-making appears almost mechanical – “Economic man neither competes nor haggles . . . ; he treats other human beings as if they were slot machines.” The opportunity for economic profit is therefore a signal of uncertainty. It gives purpose to the modern enterprise, which can be defined as a group of owners and/or managers who pool together resources to perform the entrepreneurial function of providing the “responsible direction of economic life.” (Emmett, 2011)

Much of what is known as the “neoclassical” theory of the firm emerged during the 1920’s and 1930’s in the work of Alfred Marshall, Arthur Pigou, John Hicks and others, and has been generally described as a parallel effort to the formalization of consumer theory. Just as individual consumers gain satisfaction or maximize utility from consuming goods and services, given a limited budget set that is determined by exogenous prices and expenditure, so firms maximize profit subject to a given production function and input prices. The firm is essentially modeled as a “technical unit,” described as a production function or production possibilities set. Assuming there are n commodities in the economy, the firm’s production plan is a vector

$$(1) \quad y = (y_1, \dots, y_n) \in \mathbb{R}^n$$

where an output will have $y_k > 0$ and an input will have $y_k < 0$. If the firm has nothing to do with good k , then $y_k = 0$. The production possibilities of the firm are described by a set $Y \subset \mathbb{R}_n$ where any $y \in Y$ is a feasible production plan. Given the technical capacity to produce, the firm's *raison d'être* is typically characterized as a profit maximization problem, defined by the profit function:

$$(2) \quad \pi(p) = \max_{y \in Y} p \cdot y$$

Within this framework, the firm is modeled as a single actor, facing a series of decisions that seem relatively simple: what level of output to produce, how much of each factor to hire, and so on. However, in many respects, these are not really “decisions,” but mathematical calculations. In the long run, a firm may choose an optimal size and output mix, but these choices are fundamentally determined by the characteristics of the production function (economies of scale, scope, and size). In short, the firm is a black box, transforming inputs into outputs. Profit maximization is a calculus problem whose solution is derived from a set of cost curves. There is really nothing for an entrepreneur to do (Foss and Klein, 2011).

In 1968, William J. Baumol noted that “the theoretical firm is entrepreneurless - the Prince of Denmark has been expunged from the discussion of Hamlet.” While Baumol was emphatic in defending the validity of the neoclassical model of the firm, he was pointing to a significant shortcoming of the neoclassical paradigm. “Obviously, the entrepreneur has been read out of the model. There is no room for enterprise or initiative. The management group becomes a passive calculator that reacts mechanically to changes imposed on it by fortuitous external developments over which it does not exert, and does not even attempt to exert, any influence. One hears of no clever ruses, ingenious schemes, brilliant innovations, of no charisma or of any of the other stuff of which outstanding entrepreneurship is made; one does not hear of

them because there is no way in which they can fit into the model..... The entrepreneur is at the same time one of the most intriguing and one of the most elusive characters in the cast that constitutes the subject of economic analysis” (Baumol, 1968).

Baumol’s observations were not entirely new. Nearly 50 years earlier, Frank Knight had written that “the mental operations by which ordinary practical decisions are made are very obscure, and it is a matter for surprise that neither logicians nor psychologists have shown much interest in them. Perhaps it is because there is really very little to say about the subject.....So when we try to explain what to expect in a certain situation, and how to behave ourselves accordingly, we are likely to do a lot of irrelevant mental rambling, and the first thing we know we find that we have made up our minds, that our course of action is settled. There seems to be very little meaning in what has gone in our minds, and certainly little kinship with the formal processes of logic which the scientist uses in an investigation” (Knight, 1921).

Holmstrom and Tirole substantiate this view in their 1989 survey article on the “Theory of the Firm,” noting that “while substantial progress has been made on the description and analysis of market performance, firm behavior and organization have remained poorly understood. Typically, the firm has been treated in no more detail than the consumer; indeed, the standard textbook analysis of production corresponds closely to the analysis of consumption.” Holmstrom and Tirole go on to suggest that “the nature of decision-making within firms is of a different kind than individual choice in markets. Firm members act as agents for their superiors rather than themselves. In the aggregate, firm behavior is the result of a complex joint decision process within a network of agency relationships. One can justly ask what forces ensure that the process will maximize profits as postulated in the neoclassical theory. Thus, the question of firm

organization is not an independent appendix to value theory. It could well have ramifications for market analysis.” (Holmstrom and Tirole, 1989)

Although it may have been convenient to ignore entrepreneurship as a less than scientific field of inquiry, early economic theorists nonetheless fully recognized the empirical significance of entrepreneurship as an important determinant of economic behavior. The 18th century French-Irish economist Richard Cantillon was the first to integrate the notion of entrepreneur into economic theory. In his 1755 *Essai sur la Nature du Commerce en Général*, Cantillon described the entrepreneur as someone who seeks business opportunity and undertakes risk: “*Le Fermier est un Entrepreneur qui promet de paier au Propriétaire, pour sa Ferme ou Terre, une somme fixe d’argent (qu’on suppose ordinairement égale en valeur au tiers du produit de la Terre), sans avoir de certitude de l’avantage qu’il tirera de cette entreprise. Il emploie une partie de cette Terre à nourrir des Troupeaux, à produire du grain, du vin, des foins, &c. suivant ses idées, sans pouvoir prévoir laquelle des especes de ces denrées rapportera le meilleur prix. Ce prix des denrées dépendra en partie des Saisons & en partie de la consommation; s’il y a abondance de blé par rapport à la consommation, il sera à vil prix, s’il y a rareté, il sera cher. Qui est celui qui peut prévoir le nombre des naissances & morts des Habitans de l’État, dans le courant de l’année? Qui peut prévoir l’augmentation ou la diminution de dépense qui peut survenir dans les Familles? Cependant le prix des denrées du Fermier dépend naturellement de ces événemens qu’il ne sauroit prévoir, & par conséquent il conduit l’entreprise de sa Ferme avec incertitude.*” (Cantillon, 1755). In other words, Cantillon’s entrepreneur can be best described as a speculator.

Jean Baptiste Say, who coined the term "entrepreneur," emphasized the coordinating, innovative, creative and risk taking role of the decision maker. The entrepreneur is the

individual who takes on the immediate responsibility and risk to conduct commerce, using personal and/or borrowed capital: “*C'est l'agriculteur, le manufacturier ou le commerçant; ou, pour les désigner par une denomination commune à tous les trois, c'est l'entrepreneur d'industrie, celui qui entreprend de créer pour son compte, à son profit et à ses risques, un produit quelconque.*” Say noted that an effective entrepreneur must possess knowledge of the world, and have qualities of judgment and perseverance. Say also realized that wealth creation is metaphysical, the result of creativity, ideas, imagination, and innovation. He understood that economic advancement requires accumulation of capital and “entrepreneurship,” and therefore placed the role of the entrepreneur at the center of economic theory. (Say, 1803)

The French term, “entrepreneur,” does not readily translate into English; hence the widespread use of the French word. Loosely translated, one might use the term “undertaker,” from the French “*entreprendre*,” to undertake. Ludwig von Mises suggested the notion of entrepreneur as an “adventurer” or “speculator;” he notes, “the outcome of action is always uncertain. Action is always speculation.” Therefore, “the real entrepreneur is a speculator, a man eager to utilize his opinion about the future structure of the market for business operations promising profits. This specific anticipative understanding of the conditions of the uncertain future defies any rules and systematization” (Mises, 1949).

Joseph Schumpeter rejected the proposition that entrepreneurship is simply capitalistic speculation by the firm’s management. In his *Theory of Economic Development* (1911), Schumpeter emphasized leadership and “creative destruction,” the innovative driving force of the entrepreneur. Schumpeter compared a static world without entrepreneurship, a world of “circular flow” without uncertainty or change, to a more dynamic world of ongoing entrepreneurial innovation. The contrast between these two worlds highlighted the importance

of the “Mann der Tat” (the Man of Action), the individual effort: “entrepreneurs must expend great energy and possess a strong will to be successful.” “If there exists no demand for a good, for example, the Man of Action will create such a demand; he will make people want it. He (the Man of Action) is full of energy and leaps at the obstacles: The Man of Action acts in the same decisive manner inside as well as outside the usual tracks in the economy. He does not feel the restrictions that block the actions of the other economic actors” (Schumpeter, 1911). In other words, the entrepreneur innovates; he is not an inventor; but instead introduces “new ways of using existing means.” Schumpeter’s Man of Action makes intuitive decisions which are not always necessarily “rational.” The capacity to make the right intuitive choice separates the good entrepreneur from the bad. Arguably, the Schumpeterian vision of entrepreneurship, emphasizing action and innovation, effectively integrates the psychology of entrepreneurship into economic theory, and thus offers a valuable perspective on how an SME might approach the decision to export (Swedberg, 2007).

Schumpeter emphasized two main types of entrepreneurial innovation: product and process innovation. Product innovation refers to a new product entering a new market, the “creation of a new good which more adequately satisfies existing or previously satisfied needs.” Product innovations may offer opportunity for product differentiation in the market, which may put the supplier in a monopoly or quasi-monopoly position. Process innovation on the other hand is a new production method or a new source of supply of raw material or semi-finished goods that can potentially reduce the firm’s costs of production.

Cost minimization is, after all, a central tenet for why a firm exists in the first place. Ronald Coase’s pioneering article, “The Nature of the Firm,” notes that “outside the firm, price movements direct production, which is coordinated through a series of exchanges on the market.

Within a firm, these market transactions are eliminated and in place of the complicated market structure with exchange transactions is substituted the entrepreneur-coordinator, who directs production.” Coase underscored the firm’s role in facilitating exchange, in reducing the transaction costs of information, negotiation, monitoring, coordination, and enforcement of contracts. The “boundary” or the size of the firm is determined by the firm’s capacity, or the extent to which the firm is able to internalize and integrate transaction costs within its organizational structure. The firm’s propensity to expand, to merge or acquire another firm, is driven by a desire to reduce the transaction costs of conducting business outside the firm. But “as the firm gets larger, there may be decreasing returns to the entrepreneur function, that is, the costs of organizing additional transactions within the firm may rise. Naturally, a point must be reached where the costs of organizing an extra transaction within the firm are equal to the costs involved in carrying out the transaction in the open market, or, to the costs of organizing by another entrepreneur” (Coase, 1937).

In similar vein, Edith Penrose also noted the special importance of experienced management and labor force to obtain “the productive services and knowledge that are necessary for a firm to establish itself in a new field, and the addition of new managerial and technical services is often far more important than the elimination of competition and the reduction of the costs of entry.” A firm’s managerial limitation to undertake or expand activities at any given point in time, is sometimes referred to as the “Penrose effect.” According to Penrose, planning and executing expansion activities requires the employment of an experienced manager who understands the complex inner workings of the firm. As the firm manager cannot be in all places at all times, the firm will eventually reach an upper limit of growth defined by its managerial capacity. While it is possible to hire outside managers from the labor market, it takes

time to effectively internalize an experienced manager. If a firm expands faster than its ability to effectively internalize managerial capacity, the firm's growth and operational development can be compromised. A firm's decision to conduct business internationally usually involves a series of complex choices beginning with location, logistics and risk exposure. The manager must not only understand the contextual circumstances of operating in the foreign market, but most also have a very strong sense of the firm's own resources, strategic goals and risk preferences (Penrose, 1959).

The work of Penrose, Coase, Schumpeter and others set a foundation for the development of behavioral economics, and the analysis of the firm as a complex organization. During the 1950's and 1960's, the faculty at Carnegie Mellon University's Graduate School of Industrial Administration initiated a process to integrate disciplines like political science, sociology and social psychology into formal economic analysis of the firm (Williamson, 2000). In their influential book, *The Behavioral Theory of the Firm* (1963), Richard Cyert and James March maintained that firms are heterogeneous organizations, not easily imitated or replicated; and therefore individual firm capabilities can give rise to significant advantages over the competition. Just as Coase, Penrose and others had highlighted the drawbacks of conceptualizing firm behavior as a production function -- with all the neoclassical assumptions of perfect information, certainty, profit maximization, perfect allocation of resources etc... -- Cyert and March were not satisfied with the neoclassical model of the firm. Cyert and March argued that a true behavioral theory of the firm required attention to organizational goals, expectations, choice, and control. Only through these characteristics can one really gain a deeper understanding of how a firm functions (Cyert and March, 1963).

A firm can have numerous goals and objectives which ultimately influence the way decisions are made. These goals may even change over time. A firm may, for example, want to maximize profit in the long run and may, by intertemporal choice, be prepared to incur short term losses to achieve the longer term goal. A firm may aim to maximize shareholder value, or may wish to maximize market penetration or geographic reach, or may even have non-economic goals like political or social influence. Depending on the size and structure of the firm, these goals may be defined by the company founder, by the shareholders / investors, or any combination of other firm stakeholders. The way in which specific objectives of firm relate to each other will ultimately influence decisions on sales, market share, profit, inventory, production levels etc....

The Behavioral Theory of the Firm sets out to construct a theory that (1) establishes the firm as the basic unit of analysis, (2) predicts firm behavior with respect to decisions such as price, output, and resource allocation, and (3) explicitly emphasizes the actual process of organizational decision making. Referring to the “Penrose Effect” of managerial limitations, Cyert and March suggest that firms may aim for satisfactory outcomes rather than global maxima like profit maximization. The concept of “satisficing” implies that managers within the firm may not be able to perceive all possible courses of action, and that the limited cognitive ability may inhibit the pursuit of complex maximization. The firm is therefore presented as “adaptively rational,” where learning, memory and behavior are conditioned by experience; this is operationalized in the form of standard operating procedures and decision rules. Standard operating procedures include general choice procedures and specific operating procedures. General choice procedures are learned through the firm’s past environmental conditions and internal constraints, and are stable over the long-run, changing only with considerable pressure.

They generally follow three principles: avoid uncertainty, maintain the rules, and use simple rules. Specific standard operating procedures are the unique characteristics of the firm, which define and determine how the firm reacts to stimuli and situations. Some of these procedures may be codified in an operational manual, or as is more often the case with SMEs, they may be informal or tacit in nature (Cyert and March, 1963).

Figure 24 illustrates the theoretical construct of *The Behavioral Theory of the Firm*, suggesting that a firm's aspirations are determined by past aspirations, past performance, social comparisons, and firm characteristics. Aspirations drive a firm's satisfaction with its present state, which in turn drives the extent to which the firm searches for new, uncertain solutions, or attempts to preserve the status quo. When a firm performs below its aspiration level, it will tend to take on more uncertainty. Figure 25 illustrates the relational concepts of the Cyert and March decisional process:

- **Quasi-Resolution of Conflict** - assumes that the governance of a firm will have some procedures in place to resolve any conflict in organizational goals.
- **Uncertainty Avoidance** – assumes that a firm will typically try to avoid uncertainty.
- **Problemistic Search** – suggests that a firm's informational search is usually triggered by a specific problem, and therefore may be oriented toward a specific solution. The organizational search is assumed to be simple-minded and biased.
- **Organizational Learning** - suggests that organizations will exhibit adaptive behavior over time. With experience, organizations can change goals, shift attention and revise procedures.

Figure 24 – Behavioral Theory of the Firm

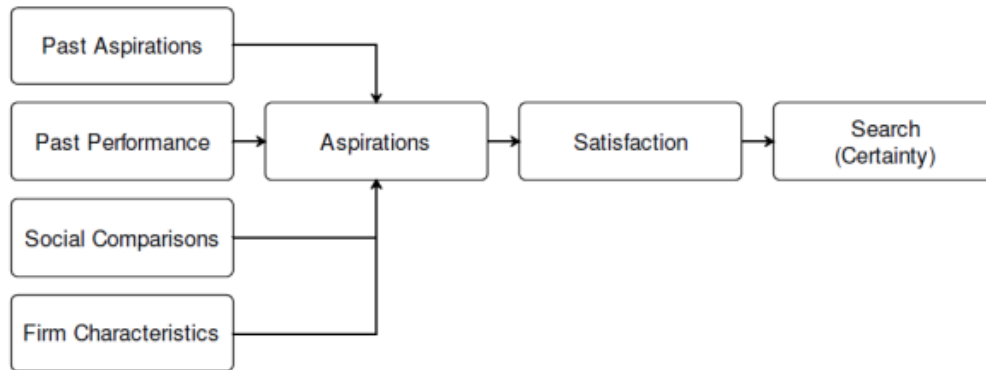
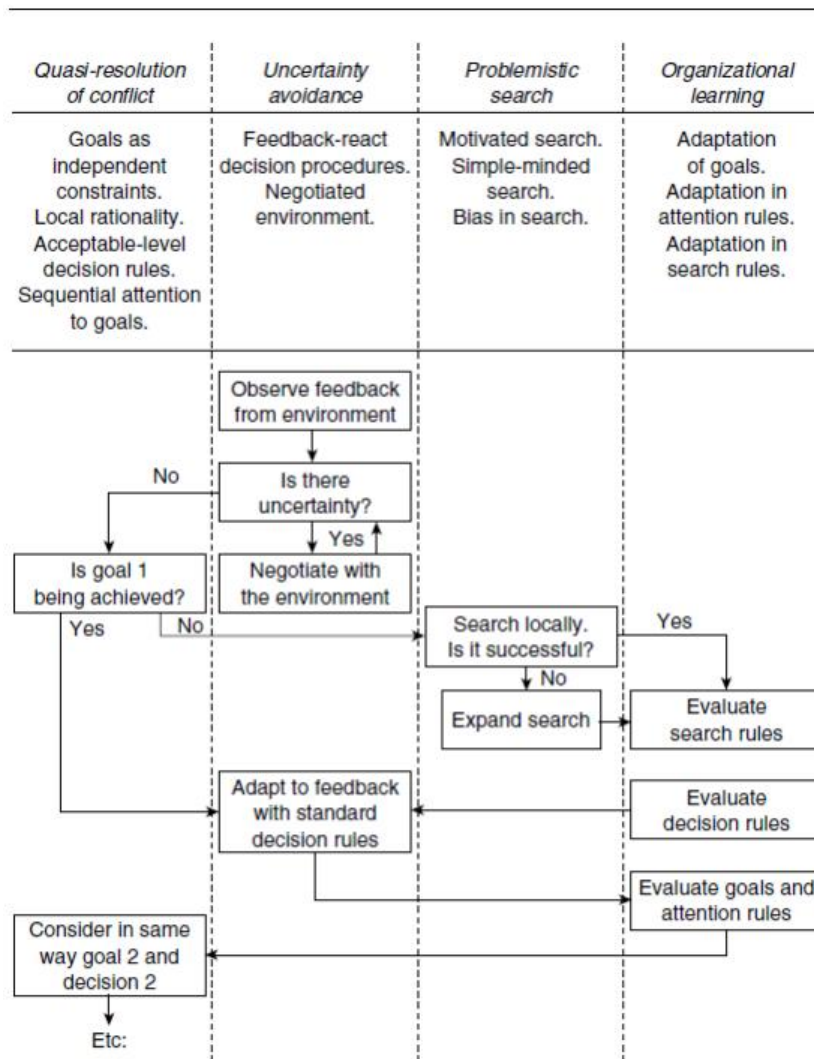


Figure 25 – Organizational Decision Process in Abstract Form



Source: Cyert and March, 1963

Behavioral economics undoubtedly gained considerable acceptance after the award of the 2002 Nobel Prize in Economic Sciences to Daniel Kahneman; but it is significant to note that the antecedents to behavioral economics date back to the 17th century, to the contributions of Blaise Pascal and Pierre de Fermat. In 1654, a gambler by the name of Chevalier de Méré approached Pascal and Fermat to request their insight into the following problem –

Suppose two noblemen play a coin-tossing game where the first to have two heads (or two tails) wins. The game ends after at most three tosses. Suppose further that for some reason the two noblemen have to stop after one heads. In this case, what would be the most reasonable way to divide the money? Intuitively, it is clear that the money should not be split equally because the player with heads has a higher chance of winning. But how much more should this player receive? The game could end in three ways: 1) heads heads (the heads player wins), 2) tails, tails (tails player wins), 3) tails, heads (heads player wins). This would suggest that the money should be divided (2/3:1/3). However, there are in fact four possibilities. With the third toss, the possibilities are 1) heads, heads (heads player wins), 2) heads, tails (heads player wins), 3) tails, tails (tails player wins), 4) tails, heads (heads player wins). The best way to divide the payoff would thus be (3/4:1/4).

The problem highlighted a disconnect between the mathematical solution to the problem and what could be deemed to be a “reasonable outcome.” The so-called “Saint Petersburg paradox” is a notorious case. Returning to the example of the two noblemen, suppose that one of the them proposes to pay the other 2 ducats for a coin falls heads on the first toss, four ducats if it falls heads on the second toss, eight ducats for the third heads, and so on ad infinitum until the coin

turns up tails. If first nobleman demands an entrance fee to the game (i.e. does not want to allow the other nobleman to play the game for free), what would be the maximum entrance fee that the second nobleman would be willing to pay? The payoff for this gamble would be $\pi_i = 2^i$, where i is the number of heads tossed and probability $p_i = \left(\frac{1}{2}\right)^i$. The expected profit $E(\pi)$ for nobleman 2 would be:

$$(3) \quad E(\pi) = \sum_{i=1}^{\infty} p_i \pi_i = \sum_{i=1}^{\infty} \left(\frac{1}{2}\right)^i 2^i = 1 + 1 + 1 \dots = \infty$$

Essentially, second nobleman would have to sacrifice all of his current and future wealth to pay the entrance fee to this gamble. Obviously, this mathematical proposition is not tenable. In 1738, Daniel Bernoulli published a solution to this problem in the Commentaries of the Imperial Academy of Science of Saint Petersburg (hence the name, Saint Petersburg paradox). Bernoulli's solution was very simple: one should not use the objective value of the gamble, but rather should focus on the expected utility or value. "[T]he value of an item must not be based on its price, but rather on the utility it yields. The price of the item is dependent only on the thing itself and is equal for everyone; the utility however, is dependent on the particular circumstances of the person making the estimate. Thus there is no doubt that a gain of one thousand ducats is more significant to a pauper than to a rich man though both gain the same amount" (Heukelom, 2007).

In 1947, more than 200 years after Bernoulli, John von Neumann and Oskar Morgenstern revolutionized expected utility theory by advancing the notion of revealed preference. Whereas Bernoulli assumed that individuals would prefer the option that would provide the highest utility, von Neumann and Morgenstern emphasized individual preferences as indicators of subjective expected utility. As long as individual preferences satisfied certain crucial axioms, the von

Neumann and Morgenstern model could demonstrate the pursuit of maximum subjective utility by constructing an individual's utility function:

$$(4) \quad EU(X) = p_1u(x_1) + p_2u(x_2) + \cdots + p_nu(x_n)$$

where p_k is the probability that state $k = 1, 2, \dots, n$ will occur, and x_k is the outcome if state k occurs. To fully appreciate the expected utility model, one must carefully consider both the utility function u and probability p . The crucial axioms of subjective utility models are transitivity, dominance and invariance. Transitivity assumes that if option A is preferred to option B, and option B is preferred to C, then option A is preferred to C as well. Dominance implies that if one option is better in at least one respect (and at least as good in all other respects), it will be the preferred option. Invariance denotes the supposition that preferences should remain unchanged no matter how (or in what order) they are presented (Heukelom, 2007).

While these axioms appear to be logically correct, and indeed have been foundational to the development of most rational models of decision-making, observation of actual individual choice behavior suggests that these axioms are routinely violated (e.g. the Allais Paradox and the Ellsberg Paradox). This was one of the main findings of Daniel Kahneman and Amos Tversky's seminal article "Judgment under Uncertainty: Heuristics and Biases," published in *Science* in 1974, and subsequently refined in the 1979 *Econometrica* article, "Prospect Theory: An Analysis of Decision under Risk." Prospect theory suggests that "people rely on a limited number of heuristic principles which reduce the complex tasks of assessing probabilities and predicting values to simpler judgmental operations. In general, these heuristics are quite useful, but sometimes they lead to severe and systematic errors. The subjective assessment of probability resembles the subjective assessment of physical quantities such as distance or size. These judgments are all based on data of limited validity, which are processed according to heuristic

rules. For example, the apparent distance of an object is determined in part by its clarity. The more sharply the object is seen, the closer it appears to be. This rule has some validity, because in any given scene the more distant objects are seen less sharply than nearer objects. However, the reliance on this rule leads to systematic errors in the estimation of distance. Specifically, distances are often overestimated when visibility is poor because the contours of objects are blurred. On the other hand, distances are often underestimated when visibility is good because the objects are seen sharply. Thus, the reliance on clarity as an indication of distance leads to common biases. Such biases are also found in the intuitive judgment of probability” (Tversky and Kahneman, 1974 and Kahneman and Tversky, 1979).

Tversky and Kahneman’s “Prospect Theory” suggests that people do not just make decisions based on the expected utility or the value of a certain option, but are rather conditioned by perception or how the brain understands and processes information. Prospect theory distinguishes between two phases in the decision making process: an early editing phase in which individuals analyze and often simplify options, and a subsequent evaluation phase in which individuals assess the edited options and choose the outcome with the highest value. In the “framing” or “editing” phase, much depends on the way a choice or option is presented to the decision-maker; in this phase, individuals are vulnerable to the misinterpretation of objective information. “Framing is controlled by the manner in which the choice problem is presented as well as by the norms, habits, and expectations of the decision maker.” In one of Kahneman and Tversky’s experiments, participants were asked to make a public policy recommendation in face of a reported major flu epidemic that was expected to kill 600 people. The two options in the experimental choice were presented as follows:

Policy A₁ – Certainty of saving 200 people

Policy B₁– One-third chance that all 600 people would be saved (and a two-third chance they would be all lost)

Kahneman and Tversky found that 72 percent of the respondents chose policy option A₁.

However, in reframing the same options as:

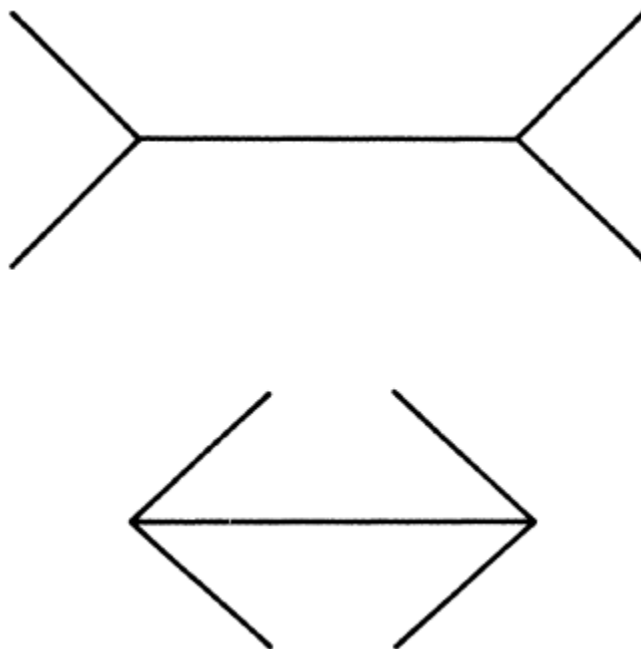
Policy A₂ – Certainty that 400 people would die

Policy B₂– One-third chance that no one die (and a two-third chance that all would die)

Kahneman and Tversky found that 78 percent of the respondents chose policy option B₂ (Kahneman and Tversky, 1984).

Clearly, the participants in the experiment were responding differently to different frames of the same policy options. Misperception is something that psychologists have studied for over a hundred years, at least since the Müller-Lyer optical illusion was presented in 1889 (Figure 26).

Figure 26 - The Müller-Lyer Illusion



Framing is a way to simplify the decision maker's evaluation of options; it is typically accomplished through the use of several editing procedures:

Acceptance – once a decision maker is presented with a “reasonable construction,” the decision maker is unlikely to second-guess the presentation of choices.

Segregation – when people make a decision, they tend to focus on the factors that seem to be most relevant to the immediate problem, potentially ignoring factors that seem less relevant, but may in fact have an actual impact on the outcome.

Coding – people tend to categorize outcomes in terms of gains and losses, rather than in terms of absolute states of welfare (in other words, one may be focusing on “winning the battle” instead of “winning the war”).

Combination – people tend to add together the likelihood of choices that present identical outcomes (e.g. if a person lives in a building that has a 2 percent chance of collapsing due to an earthquake, and a 2 percent chance of collapsing due to fire, the person may decide to move to a different building with a 2 percent chance of collapsing due to a landslide, believing this building has a lower probability of collapsing).

Cancellation – people tend to discount choices that have similar outcomes (e.g. if a ship navigating a particular route has a 5 percent probability of being attacked by pirates, and 3 percent probability of hitting an iceberg, faces the alternative of going a different route where there is still a 5 percent chance of being attacked by pirates and 5 percent chance of hitting a reef, the likelihood of being attacked by pirates may be ignored).

Simplification – a decision maker may simplify choices by mathematically rounding probabilities or by discarding unlikely alternatives altogether.

Detection of Dominance - outcomes which are strictly dominated are scanned and rejected without further evaluation.

Editing or framing operations are believed to facilitate the task of decision making, and therefore it is generally assumed that they are employed wherever and whenever possible. Framing can obviously have a very profound impact on decisions, and therefore also on outcomes (Kahneman and Tversky, 1984).

Once a decision maker evaluates all options, he or she will typically choose the option that offers the highest overall expected value. This evaluation phase consists of two elements, the value function and the weighting function. Analogous to the von Neumann and Morgenstern expected utility function (4) $EU(X)$, prospect theory calculates the expected value function by replacing utility function u and probability p with the more subjective value function v and decision weight w .

$$(5) \quad EV(X) = w_1v(x_1) + w_2v(x_2) + \dots + w_nv(x_n)$$

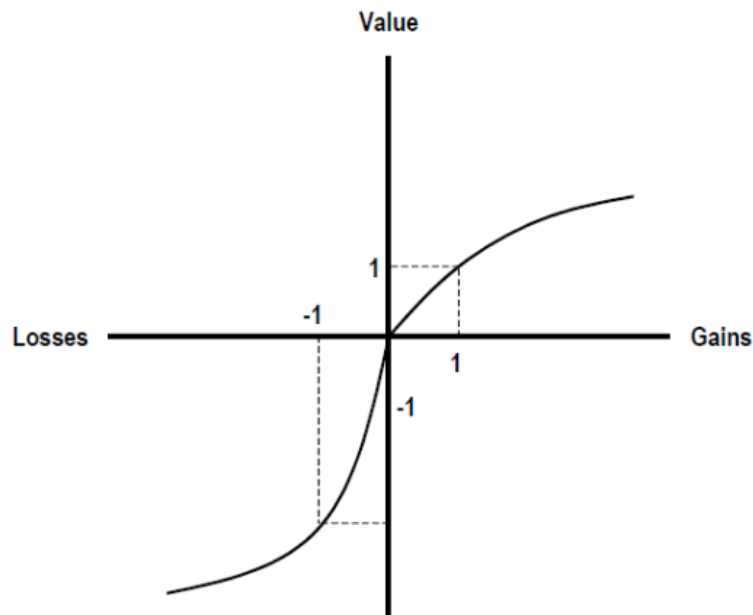
The value function has three basic characteristics:

- 1) It is defined over changes in wealth rather than in terms of absolute wealth. Expected value is dependent on the initial position of the decision maker. As such, the value function focuses on the magnitude of a change relative to an initial reference point (e.g. the initial asset position).
- 2) It is an S-shaped value curve (Figure 27), concave for gains and convex for losses relative to the initial reference point. The slope measures sensitivity to change – it is most sensitive at the origin, and becomes progressively less sensitive as it moves away from the origin. This reflects the psychophysical principle that the difference in the subjective value between €50 and €100 is

regarded as greater than the difference between €1000 and €1050. The marginal value of both gains and losses decrease with their magnitude; this is also known as the diminishing marginal utility.

- 3) It is steeper for losses than for gains. A loss of €50 is more deterring than a gain of €50 is attractive. In other words, the fear of losing money is more compelling than the pleasure of gaining a similar amount.

Figure 27 – Hypothetical Value Function

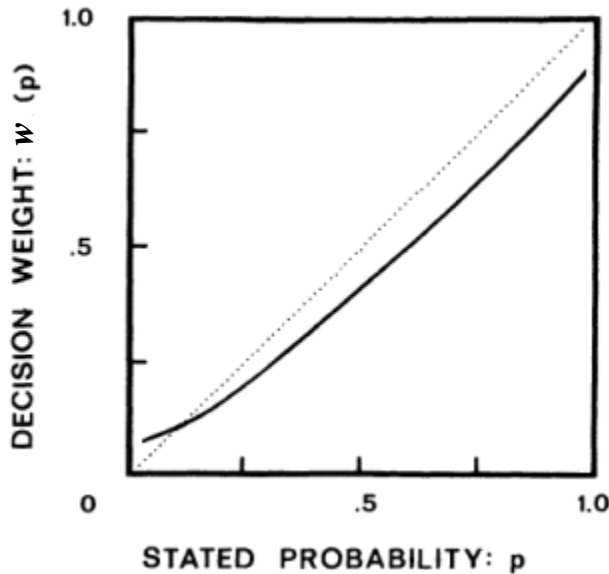


Source: Kahneman and Tversky, 1984

The weighting function, represented graphically in Figure 28, is also a critical part of the decision evaluation phase of prospect theory. Each possible outcome is given a decision weight which can be a function of the more objective probability $w_I = w(p_I)$, but is not equal to it. As in the case of expected utility maximization, subjective decision weights are multiplied by the expected value of each outcome. Decision weights reflect subjective ambiguity, and therefore do

not operate near the end-points of absolute certainty or absolute impossibility. Kahneman and Tversky suggest that low probability events are generally overweighted $w(p) > p$ (e.g. winning the lottery), while higher probability events may be underweighted $w(p) < p$ (e.g. playing Russian roulette).

Figure 28 – Hypothetical Weighting Function



Source: Kahneman and Tversky, 1979

Decision weights do not follow the logic scale of probabilities, and therefore the weighting function is non-linear. Moreover, unlike the probabilities in the expected utility function, the decision weights of prospect theory do not add up to 1. For example, $w_1 + w_2 + \dots + w_n < 1$.

One of the main criticisms of prospect theory and the Tversky-Kahneman paradigm is the fact that it is both simple and complex at the same time. Unlike the von Neumann and Morgenstern expected utility model which aims to provide normative prescriptions for economic behavior under uncertainty, prospect theory reveals the difficulty, if not the near impossibility, of combining descriptive and normative theories into an adequate single model of choice. Prospect theory shares many of the characteristics of the expected utility model, yet it distances itself from

the normative model by explaining the behavioral violations of the expected utility axioms. Payne, Bettman, and Johnson (1993) also note the arbitrariness in defining the weighting function and the theoretical incoherence of the framing effects. Yet, Kahneman and Tversky seemed unperturbed by this criticism, coming to the conclusion that the “dream of constructing a theory that is acceptable both descriptively and normatively appears unrealizable” (Tversky and Kahneman 1986).

“Prospect theory differs from the other models in being unabashedly descriptive and in making no normative claims. It is designed to explain preferences, whether or not they can be rationalized.” The Kahneman and Tversky approach is oriented toward developing tools that offer accurate and reliable assessments: “The failure to construct a canonical representation in decision problems contrasts with other cognitive tasks in which such representations are generated automatically and effortlessly. In particular, our visual experience consists largely of canonical representations: objects do not appear to change in size, shape, brightness, or color when we move around them or when illumination varies. A white circle seen from a sharp angle in dim light appears circular and white, not ellipsoid and grey. Canonical representations are also generated in the process of language comprehension, where listeners quickly recode much of what they hear into an abstract propositional form that no longer discriminates, for example, between the active and the passive voice and often does not distinguish what was actually said from what was implied or presupposed own experience and through various other sources, people dynamically develop cognitive representations about their environment. For every decision problem, given the context of the decision, this cognitive representation is filtered. The filtered cognitive and/or affective representation constitutes the basis for judgments and decisions” (Tversky and Kahneman 1986).

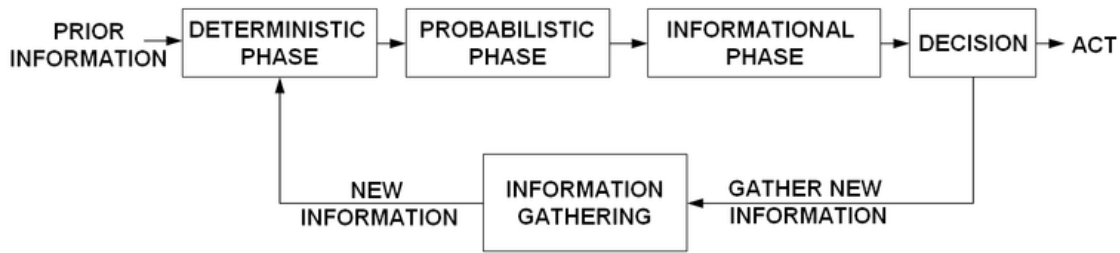
Notwithstanding some of the theoretical lacunae of prospect theory, the Tversky-Kahneman paradigm provides a very useful framework for understanding and explaining the SME export decision under regulatory asymmetry. In its simplest form, an SME's decision to export can be characterized as a choice between different decision alternatives, starting with the binary choice of whether or not to export in the first place. The decision may be subsequently deconstructed to various levels of specificity such as what to export, where and how. A firm may choose to export only a specific product range (e.g. non-perishable items) to a specific market using a specific mode of transportation and distribution network.

The firm will typically evaluate the expected value (EV) of each decision alternative (d_i), and presumably choose the alternative which has the highest expected value. The expected value of each decision is determined by the decision weight (w_i), which is a function of probability (p), that the firm will achieve a certain outcome (s_j) and by the corresponding value payoff of this decision given the outcome (X_{ij}).

$$(6) \quad EV(d_i) = \sum w_i (s_j) X_{ij}$$

Consistent with prospect theory, the SME will frame and evaluate each alternative using historical data and managerial judgment to estimate decision weights and payoffs. Regulatory asymmetry affects the expected value of the decision in two fundamental ways: firstly, the SME must acquire information to understand the regulatory requirements of the "other market;" and secondly, it must adapt to the different regulatory structure. It is assumed that the firm's preferences for information are "locally non-satiated" (the firm does not have "bliss point," but will rather continue to gather and analyze information to preserve or expand its existing market position).

Figure 29 – Early Decision Analysis Cycle



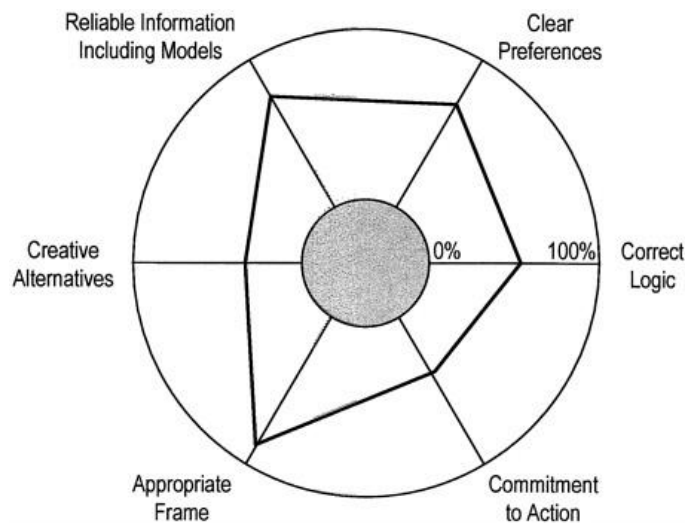
Source: Edwards et. al. 2007

With every incremental purchase of new information, it is generally assumed that the SME will be better informed. The firm has ready access to average quality information, which is available at an average per unit cost basis. In the real world, the availability, cost and quality of information can vary considerably depending on the subject matter and the geographic focus; and in fact, there may be very little correlation between cost and quality of information. For example, one can find easily find an almost infinite amount of regulatory information on selling oranges in Florida, but find almost nothing on selling blueberries in Croatia. While the internet has opened the door to a vast array of free information, ranging from governmental reports to news articles, academic studies and private consultancy briefings, there may still be a substantial cost for information search and filtering.

As the SME acquires information, it will gain better insight on the decision weight w_i and will thus be approximating the objective probability of achieving a certain outcome $p(s_j)$. Assuming that the SME has the managerial capacity to effectively process new information, the informational purchase will improve the quality of the firm's decisions. Ronald Howard, an early pioneer of decision analysis has noted that the quality of a decision is independent of outcome: "A good decision is a logical decision - one based on the uncertainties, values, and

preferences of the decision maker. A good outcome is one that is profitable or otherwise highly valued. In short, a good outcome is one that we wish would happen. Hopefully, by making good decisions in all the situations that face us we shall ensure as high a percentage as possible of good outcomes. We may be disappointed to find that a good decision has produced a bad outcome or dismayed to learn that someone who has made what we consider to be a bad decision has enjoyed a good outcome. Yet, pending the invention of the true clairvoyant, we find no better alternative in the pursuit of good outcomes than to make good decisions.” In other words, a good decision never turns into a bad decision, and a bad decision never turns into a good decision. A decision to drive a vehicle while under the influence of alcohol is always a bad decision, regardless of the outcome of whether or not one causes an accident. Figure 30 is a spider diagram of the critical elements for making a high quality decision. The distance from the inner circle to the outer one represents the degree of achievement for each element (Edwards et. al. 2007).

Figure 30 – The Decision Quality Spider



Source: Edwards et. al. 2007

The acquisition of information can also increase the probability of a desirable outcome (or reduce the probability of an undesirable outcome). For the SME wishing to export to a foreign market with an asymmetric regulatory system, information acquisition is a critical component for ensuring regulatory compliance. If an SME purchases a manual or hires a part-time consultant to obtain information on the labeling rules of another (asymmetrical) market, the SME will be in a stronger position to export, increasing the probability that their shipments will be in compliance with the other market's labeling requirements (or conversely, reducing the probability that their shipments will be rejected for non-compliance).

The typical firm structure of an SME is intrinsically oriented toward minimizing informational costs. SMEs are generally less likely to hire expensive consultants or dedicate significant in-house resources to researching information on regulatory asymmetry. Whereas larger corporations may have a dedicated regulatory specialist or even an entire department of "global regulatory affairs," an SME is probably more likely to treat informational costs as a variable expense, which can be increased or decreased depending on the immediate needs of the firm. As many small start-up companies may have a haphazard approach to acquiring information, relying perhaps on informal networks, internet searches or the "gut instincts" of the owner/founder, the SME would likely be better off developing a simple decisional model for acquiring new information.

Assuming the firm is risk-neutral, the Expected Value of Perfect Information (EVPI) suggests the maximum amount an SME should spend on acquiring information. EVPI is simply the difference between the expected value of a decision under certainty (i.e. with perfect information) and the expected value of the decision under uncertainty (i.e. without information).

$$(7) \quad EVPI = EV(d_i) \text{ under certainty} - EV(d_i) \text{ under uncertainty}$$

Supposing a decision-maker has to choose an option from a range of options, and denote any particular choice by d_i . The net benefit of each option will be dependent on a set of input variables, denoted by x . There is uncertainty about the true values of these input parameters, denoted by \mathbf{X} . The value of a particular option d conditional on \mathbf{X} is denoted by $V(d, \mathbf{X})$. The decision maker then chooses the option d to maximize expected value $E\{V(d, \mathbf{X})\}$. The expected value of the optimum decision is V^* where:

$$(8) \quad V^* = \max d \quad E_{\mathbf{X}}\{V(d, \mathbf{X})\}$$

Supposing the decision maker learns the value of \mathbf{X} before making the decision. Once \mathbf{X} is known, the value is then:

$$(9) \quad \max d \quad V(d, \mathbf{X})$$

so the expected value of learning \mathbf{X} (i.e., before find out what \mathbf{X} actually is) is:

$$(10) \quad E_{\mathbf{X}} \{\max d \quad V(d, \mathbf{X})\}$$

The expected value of perfect information (EVPI) is then defined as the expected gain in value:

$$(11) \quad E_{\mathbf{X}} \{\max d \quad V(d, \mathbf{X})\} - \max d \quad E_{\mathbf{X}} \{V(d, \mathbf{X})\}$$

The firm will have an incentive to continue purchasing information as long as the marginal cost of acquiring the information is less than or equal to the marginal value of perfect information.

Aside from the informational costs of regulatory asymmetry, all firms must consider the obvious compliance costs of operating in a market with a different regulatory regime. This effectively reduces the value payoff X_{ij} in Equation (6). For the large multinational company, compliance costs are often internalized into the structure of the firm (e.g. by setting up a foreign joint venture or by opening a foreign subsidiary). This enables the multinational company to essentially behave like a “local firm,” employing local expertise and managerial skill to

potentially help overcome any regulatory barriers. This of course does not mean that multinational corporations are immune from the effects of regulatory asymmetry. To the contrary, many multinational companies are often at the center of international regulatory disagreement, and as a result, these large companies tend to play a leading role in the global effort to bring greater regulatory harmonization. However, compared to large firms, SMEs generally face greater disadvantages in terms of compliance cost. Small firms tend not to have the resources to effectively lobby for regulatory change, they rarely participate directly in international fora like *Codex* or ISO, and they are less likely to influence a national trade authority to initiate a dispute in the WTO. While large firms may be more constrained by economic regulation like anti-trust, SMEs often struggle to meet the growing compliance costs of social regulations.

To reduce compliance costs and mitigate the effects of regulatory asymmetry, many governments, industry associations and private organizations have resorted to the use of certification schemes. As noted in the preceding chapter, government and non-government initiatives like HACCP, GlobalGAP and ISO have effectively created a platform or “clubs” for sharing information and compliance costs. The challenge for the SME, of course, is whether or not it can afford to pay the “club membership fee.”

Case Study: Litchica International

The question of agricultural SME export behavior under regulatory asymmetry is almost by definition a multidisciplinary problem, straddling elements of agriculture, law, politics, psychology, sociology, business and indeed, economics. As Kahneman and Tversky noted in their defense of prospect theory, normative generalizations do not always easily lend themselves to the analysis of complex problems, and therefore theoretic elegance may need to be sacrificed to attain more realistic analytical results. To address the fundamentally economic question of whether regulatory information and compliance costs are significant determinants of agricultural SME export behavior, one must also find a way to overcome the significant challenge of collecting and analyzing data.

Aside from the many methodological issues which continue to plague international data collection efforts (in the UN, FAO, World Bank, WTO, OECD, Eurostat etc....), international data tend to be highly aggregated, and therefore are of limited use for firm-level microeconomic analysis (Guo, Webb and Yamano, 2009). However, with the very strong political interest in nurturing SME development, many national and sub-national authorities have recently turned their attention to gather more detailed information to develop a better understanding of SMEs. The EU SME Performance Review, launched in 2008, gathers demographic and performance indicators, focusing most notably on the measures in the EU Small Business Act Action Plan – which includes “special measures for small and micro-enterprises such as transition periods and exemptions in relation to regulatory compliance, without compromising, inter alia, on safety standards for goods and services marketed” (European Council Communication 11262/08, July

1, 2008). The World Bank Group Entrepreneurship Survey (WBGES) dataset has collected data on business registrations of limited liability corporations (LLCs) since 2003, and has shown how reduced red tape and a stable investment climate serve to increase the incidence of entrepreneurship (World Bank, 2012). The Global Entrepreneurship Monitor (GEM), a consortium established by the London Business School and Babson College in 1999; gathers annual data on 400 million entrepreneurs from 54 countries, and is the largest ongoing study of entrepreneurial dynamics in the world. The current GEM database, which mainly focuses on entrepreneurial intentions, is available to consortium members for a fee of £7.500, but data are generally released to the public after a 3 year time lag (www.gemconsortium.org, 2012).

While many of these datasets will undoubtedly continue to reveal tremendous insight into the national and international economic behavior of SMEs, there seems to unfortunately be a very limited linkage (even by proxy) to the specific circumstances of the agricultural trading sector. Some organizations have already committed to bridge the SME gap in agriculture, but progress to date remains slow. In October 2011, the International Finance Corporation published the “G-20 SME Finance Policy Guide,” which noted that the “availability of relevant financial inclusion data is critical for informing the selection, prioritization, and sequencing of elements of the SME Finance Policy.... There is lack of data on informal providers and informal businesses, though it should be acknowledged that data on the informal sector are hard to gather in general. Lack of financial identity weakens the reliability of supply-side data on usage. As users cannot be uniquely identified in forming country-level aggregates in the absence of financial identity, supply-side indicators on usage are prone to multiple counting. Lack of harmonized definitions, standardized data collection and indicator construction—especially for SMEs, active vs. dormant accounts, and demand-side data—lead to challenges with

comparability of indicators over time and across countries..... Many farmers and agrifinance SMEs are left unserved and trapped in the so-called “missing middle” between micro- and commercial finance..... Financing agricultural SMEs requires both SME finance and knowledge about the agricultural sector. However, in many LDCs, financial institutions know very little about agriculture and lack the specific agricultural risk management skills, suitable products, and term liabilities to finance agricultural SMEs. On the demand side, agricultural SMEs frequently lack the required financial data, business plans, marketing tools, and sufficiently powerful projects to convince financial institutions to provide adequate funding” (International Finance Corporation, 2011).

Considering the objectives of the research question and the inherent data limitations, a case study approach appears to be an appropriate way to test the validity of the theoretical model. Nicholas Kalaitzandonakes of the University of Missouri-Columbia Economics & Management of Agrobiotechnology Center suggests that a case study approach is an appropriate research tool “when data is scant and difficult to come by, when the past is not a good guide, and when one is interested in zeroing in detail and complexity” (Kalaitzandonakes, 2002). From an applied agricultural perspective Crosthwaite, MacLeod and Malcolm (1997) note that “a key to successfully addressing problems is to get the scale right, implying a detailed understanding of the whole resource structure, management (technological) systems and the socioeconomic context of the managers (e.g. age, dependents, interest, affordability, beliefs). A research method which explores both underlying processes and context is required and will ideally combine both cross-sectional (what is happening now across a range of cases) and longitudinal (stability over time) elements..... case studies can make a valuable contribution to research and policy development....”

To validate the theoretical model of SME export behavior, this study therefore examines the export decision of Litchica International, a small family owned litchi processing firm based Muzarffarpur, in the Indian State of Bihar. The litchi (*Litchi chinensis*, also commonly known as lychee, leechi, laichi, letsias, lichu, or lizhi) (Figure 31) is an evergreen tree belonging to the relatively large soapberry (*Sapindaceae*) family, a family with at least 125 genera and 1,000 species. The tree, which can reach 9 to 20 meters in height, grows best in warm tropical climates with brief, dry, frost-free winters and long, hot summers with high rainfall and humidity. The fruit is covered by a thin pink-red, roughly-textured skin (pericarp) that is inedible, but can be easily removed to reveal a distinctively sweet fleshy translucent white pulp (aril). The aril, which has a texture similar to a grape, can be consumed fresh, frozen, canned, dried, or can be processed into juice, wine, pickles, preserves, ice cream, candy and yoghurt (Figure 32). Litchi fruit contain relatively high concentrations of sucrose, fructose and glucose, as well as several important vitamins and minerals. (Menzel and Waite, 2005)

Figure 31– Litchi Fruit



Nutritional value of Litchi per 100 grams fresh weight

Litchi	
Water (g)	83.6
Protein (g)	0.7
Fat (g)	0.1
Carbohydrate (g)	15
Vitamin C (mg)	15
Thiamine (mg)	0.02
Niacin (mg)	1.1
Riboflavin (mg)	0.07
Phosphorus (mg)	32
Iron (mg)	0.7
Calcium (mg)	4

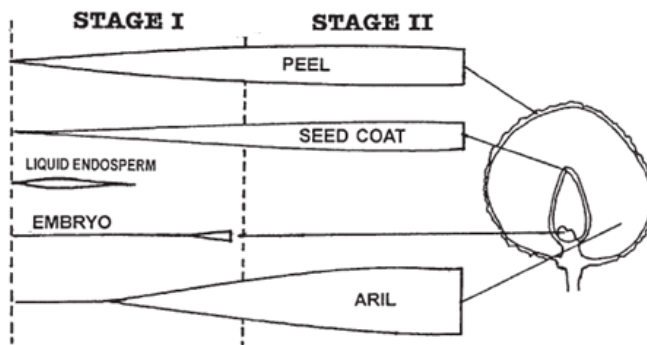
Source: Menzel and Waite, 2005

Figure 32 – Litchi Fruit Products



As a non-climacteric fruit, the litchi does not ripen once it is picked off the tree, and therefore must be picked as close to full maturity as possible. Fruit maturity depends on the agro-climatic conditions of the specific cultivar. After pollination (typically done using bees or other small insects), fruit growth will progress in two stages following a sigmoidal pattern ranging from 50 to 110 days. In the first stage, the seed and the pericarp grow to provide a protective environment for the development of the aril. The aril matures in the second stage to reach a round or ovoid shape, measuring 4 to 5 cm in diameter and weighing 18 to 35 grams (Figure 33). Fruit producing litchi trees have been known to live over a thousand years, but most commercial orchards will have mature trees ranging from 10 to 50 years in age, and typically no older than 100 years. Depending cultivar, age, weather, presence of pollinators and local production practices, a mature tree, 10 years or older, will yield 2000 to 7000 fruit, or anywhere from 36 to 245 kilograms. Some exceptional trees have borne of up to 700 kilograms of fruit in a single year; however, such examples rarely manifest themselves in regular commercial operations (Menzel and Waite, 2005).

Figure 33 – Litchi Fruit Growth



Tree density in commercial litchi orchards can vary considerably depending on topography, soil and light interception requirements. Normal tree spacing is 7 to 12 square meters (70 to 200 trees per hectare); however producers in countries like Israel and South Africa are experimenting with higher density orchard configurations of 300 to 1,100 trees per hectare. While higher density orchards can be an attractive option in areas where agricultural land is relatively expensive, concentrated plant clustering will generally reduce the potential yield of the individual plant, and may also require more intensive management for pruning, girdling, watering and fertilizing. Under normal growing conditions, an average commercial litchi orchard will produce anywhere from 3 to 25 tons per hectare.

Litchi production is highly susceptible to a range of disorders and diseases that can ultimately affect the profitability of commercial cultivation. Excessive heat or rain can compromise the pericarp, cracking the skin and leaving the delicate aril vulnerable to damage. Nutritional deficiencies in the soil (inadequate levels of phosphorus, magnesium, calcium or boron) or fungal diseases like downy mildew (*Peronosporaceae*) or litchi pepper spot (*Colletotrichum gloeosporioides*) can also weaken the cell structure of the pericarp and induce cracking. Fruit flies like *Ceratitis capitata*, *Conopomorpha sinensis*, *Ceratitis rosa*, and the litchi

moth, *Cryptophlebia*, are capable of ovipositing through the litchi pericarp, leaving larval instars that cause fruit rot and fermentation.

Aside from the risks of pest and disease, litchi fruit are also very vulnerable to commercial loss at critical stages during harvest and post-harvest handling. Litchis are typically picked early in the morning to minimize water loss and fruit heating from the sun, which can lead to premature cracking of the pericarp. The fruit is hand-picked by breaking or cutting whole panicles, sometimes with a leafy branch attached. Individual fruit may also be cut or twisted from the panicle before it is placed in the crate; however preserving the panicle on the fruit has been shown to increase the shelf life. Harvested fruit must be transferred rapidly from the orchard to the packing-house or to another cool and well-ventilated area.

Pericarp browning is probably the most significant challenge for post-harvest management of fresh litchi. Browning, which can be caused by heat stress, desiccation, chilling, disease or senescence, occurs when the cellular compartmentation is disrupted allowing polyphenol oxidase (located in the chloroplasts and other plastids) to react with phenolic substrates located in the vacuole, forming brown polymers. Peroxidase enzymes can also be involved in this process. At ambient temperatures of 20° to 30° C, the browning process can be very rapid; the pericarp can dehydrate by more than 50 percent within 72 hours. With the loss of color and weakened cell structure due to oxidation, the pericarp becomes more susceptible to cracking and fungal growth. As the aril loses water, the fruit becomes flaccid and bland.

The most common treatment to prevent pericarp browning and reduce litchi fruit decay is fumigation with sulfur dioxide (SO₂). The parameters of the SO₂ treatment depend on the quantity of fruit to be fumigated, the absorptivity of the fruit, the volume of free space in the

fumigation chamber, the absorptivity of the containers, the type of packaging material, and the potential loss through leakage. Generally, the formula is calculated as follows:

$$\text{Weight of SO}_2 \text{ (g)} = (A \times B \times C) + (D \times E)$$

Where: A = the concentration of SO₂ required

B = free space in the chamber (liters)

C = weight of 1 liter of SO₂ at 30°C (2.574 g/l)

D = weight of fruit (kg)

E = SO₂ absorption of fruit (g/kg)

SO₂ gas is injected into a chamber (or alternatively SO₂ powder is burned), with a recommended minimum fumigation exposure period of 20 minutes. The dosage per metric ton of fruit is typically 600 grams of SO₂ powder, burning in a closed chamber for 30 to 40 minutes. This process inhibits polyphenol oxidase activity, preventing the formation of quinones, which rapidly polymerize to form brown pigments. The SO₂ treatment also suppresses surface fungi. Following the SO₂ fumigation treatment, the red pigmentation of the pericarp appears bleached (Figure 34), turning to a pink hue within 3 to 5 days when kept at 22° C. As the litchi is one of the few tropical fruits that can withstand low temperatures, SO₂ treatment effectively extend the shelf life of the fruit to about 45 days when stored at 1° C (or for 25 days at 10° C).

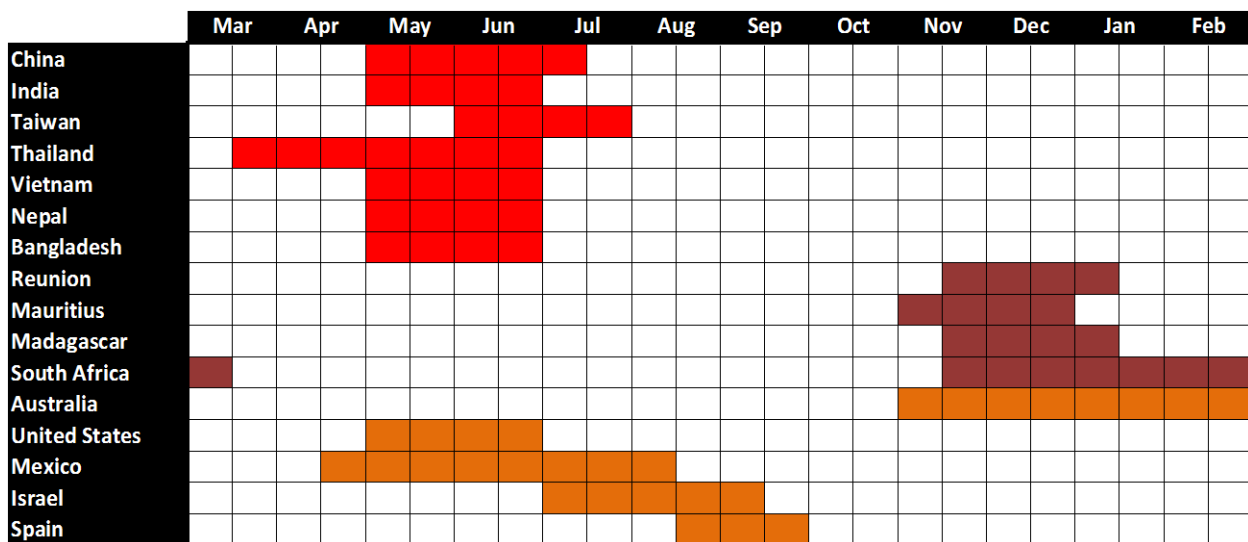
Figure 34 - Litchi Before and After SO₂ Treatment



The litchi fruit is native to southern China, and to the low elevations of the provinces of Kwangtung and Fukien, where cultivation flourishes along the rivers and near the seacoast. The earliest known record of cultivation dates back to 1059 A.D. Over the years, litchi production spread through neighboring areas of southeastern Asia, to Burma in the late in the 17th century, and to India in the 18th century. From the greenhouses of England and France, it was introduced to the West Indies in 1775, Hawaii in 1873, Florida in 1883, and California in 1897. Today, there is extensive cultivation also in Pakistan, Bangladesh, Myanmar, Vietnam, Taiwan, Japan, the Philippines, Australia, Madagascar, South Africa, Brazil, Cuba, Honduras and Guatemala.

With the many challenges of post-harvest management, and the very short duration of the production and marketing season (Figure 35), backyard production is relatively more prevalent, and therefore fresh litchi fruit are not widely available. Asian and South East Asian litchi appear in mid-April and are usually gone from the marketplace by the end June. Australian and Indian Ocean litchi are counter-seasonal, typically appearing in November and ending by mid-January.

Figure 35 - Litchi Production Calendar



Source: Gerbaud, 2009

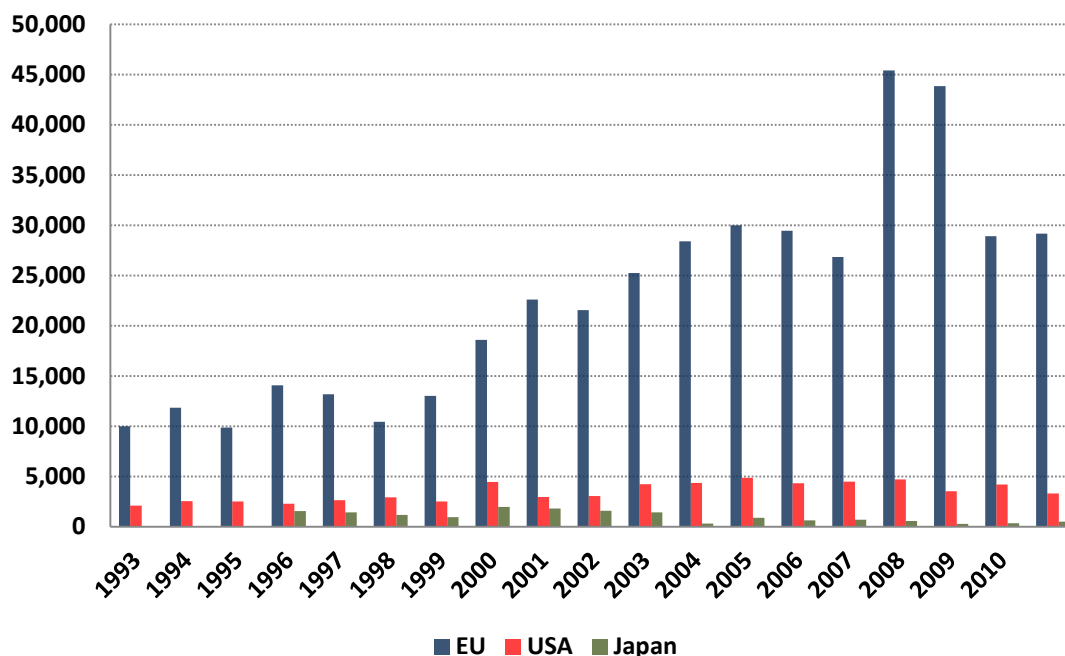
Approximately 70 percent of global commercial production, estimated to be around 2.6 million tons from 830 thousand hectares, is sold as pulp for juice, or for further processing as frozen or canned fruit (Table 6). Only 3 percent of global production of fresh litchi is traded internationally, primarily to serve the exotic tropical fruit niche market in ethnic and/or high income markets in Europe, Japan and the United States (Figure 36).

Table 6 – 2009 Litchi World Supply

COUNTRY	AREA (ha)	PRODUCTION (MT)	EXPORTS (MT)
<i>Asia</i>			
China	586,000	1,446,000	29,148
India	74,400	483,300	545
Vietnam	88,900	428,900	16,669
Taiwan	11,700	79,565	194
Thailand	21,000	40,137	7,822
Nepal	12,396	18,450	-
Bangladesh	11,681	14,195	-
Pakistan	13,000	9,250	-
<i>SW Indian Ocean</i>			
Madagascar	6,700	80,000	22,000
Réunion	700	7,500	350
Mauritius	400	4,000	250
South Africa	1,249	4,555	4,146
<i>Other</i>			
Australia	540	4,000	400
Mexico *	1,200	9,000	500
Israel *	800	1,500	600
United States	630	520	-
Spain *	250	700	100
TOTAL	834,216	2,631,652	82,724

Sources: Fruitrop May 2009, China Ministry of Agriculture 2009, China Ministry of Trade 2009, APEDA 2009, Vietnam Ministry of Agriculture 2008, Taiwan Bureau of Foreign Trade 2009, Thailand Customs Department 2010, Ministry of Agriculture and Cooperative Nepal, Bangladesh Agricultural Research Institute 2006, Australian Lychee Growers Association 2011,

Figure 36 – Volume of Japan, EU and U.S. Litchi Imports 1992-2010



India is the world’s 2nd largest litchi producer (483,000 metric tons in 2009/10). Three districts surrounding Muzaffarpur in the State of Bihar (Figure 37) account for more than 50 percent of Indian production (Tables 7,8, and 9). With room for further expansion, a 2005 World Bank report noted that growth in Bihar litchi production seems to have “occurred almost entirely due to market forces, with no concentrated effort or planning by either the government or any institutional mechanism.” Yet, Bihar, a state of over 100 million people, lacks efficient marketing and distribution. Inadequate transportation and storage infrastructure contribute to an estimated 20 to 30 percent loss in production. Fruit processing is also underdeveloped, and with only 12 small to mid-sized litchi processing units, opportunities to increase farm-level profitability are very limited. Litchi farmers in Bihar receive less than € 0.30 per kilo, or about 10 percent of the retail price commonly found in major domestic retail markets (Figures 38 and 39) (APEDA, 2009).

Figure 37 – India and the State of Bihar

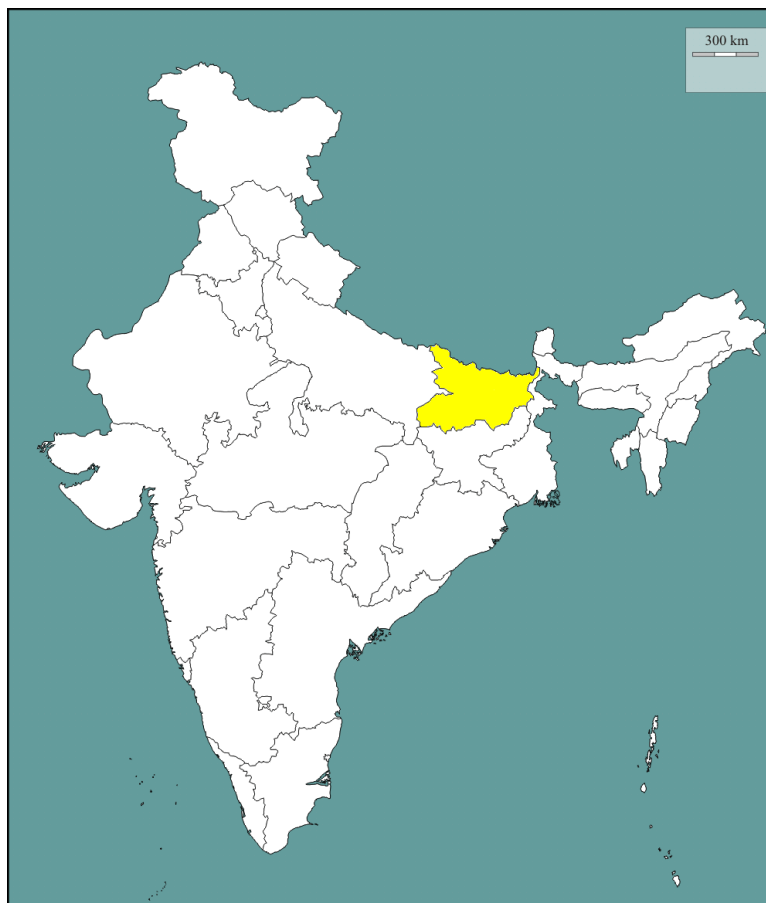


Table 7 – Indian Litchi Production 1991 - 2010

ALL INDIA AREA, PRODUCTION AND PRODUCTIVITY OF LITCHI					
YEAR	AREA (IN 000 HA)	%OF TOTAL FRT.AREA	PRODUCTION (IN 000 MT)	%OF TOTAL FRT.PRODUCTION	PRODUCTIVITY (IN MT/HA)
1991-92	49.3	1.7	243.8	0.9	4.9
2001-02	58.1	1.4	355.9	0.8	6.1
2002-03	54.1	1.4	476.4	1.1	8.8
2003-04	53.7	1.1	478.5	1.0	8.9
2004-05	60.0	1.2	368.6	0.7	6.1
2005-06	63.2	1.2	392.1	0.7	6.2
2006-07	65.0	1.2	403.0	0.7	6.2
2007-08	69.0	1.2	418.0	0.6	6.1
2008-09	72.0	1.2	423.0	0.6	5.9
2009-10	74.4	1.2	483.3	0.7	6.5

Table 8 – Indian Litchi Production by State 2007-2010

STATEWISE AREA, PRODUCTION AND PRODUCTIVITY OF LITCHI									
State	AREA (000 HA)			PRODUCTION (000 MT)			PRODUCTIVITY HA/MT		
	2007-08			2008-09			2009-10		
	Area	Production	Pdy.	Area	Production	Pdy.	Area	Production	Pdy.
BIHAR	29.8	223.2	7.5	30.5	216.9	7.1	30.6	215.1	7.0
WEST BENGAL	8.1	77.8	9.6	8.4	81.2	9.7	8.4	82.4	9.8
JHARKHAND	3.3	16.5	5.0	4.3	20.3	4.8	4.3	51.1	12.0
ASSAM	4.8	34.0	7.1	4.8	34.9	7.2	5.1	39.2	7.7
PUNJAB	1.5	19.3	12.9	1.5	21.3	13.9	1.6	22.4	14.1
CHHATISGARH							3.0	17.8	6.0
ORRISA	4.0	12.8	3.2	4.2	13.0	3.1	4.3	17.1	4.0
TRIPURA	2.6	14.4	5.5	2.8	14.4	5.1	2.8	17.0	6.1
UTTRAKHAND	8.8	15.1	1.7	8.8	15.3	1.7	9.1	15.7	1.7
Others	6.2	5.3	0.9	6.6	6.2	0.9	5.2	5.5	1.1
TOTAL	69.1	418.4	6.1	71.9	423.4	5.9	74.4	483.3	6.5

Source: APEDA, 2011

Table 9 – Mango, Guava and Litchi Production in Bihar 2007-2009

(Area in ha, Production in tonne)

Name of District	Mango				Guava				Litchi			
	Area	Prod.	Area	Prod.	Area	Prod.	Area	Prod.	Area	Prod.	Area	Prod.
	2007-08		2008-09		2007-08		2008-09		2007-08		2008-09	
Patna	3792	22752	3834	37252	1049	9601	1078	8984				
Nalanda	2686	15578	2790	26429	1448	12742	1459	11156				
Rohtas	5591	26073	5639	52983	3196	26526	3204	25992				
Kaimur	3272	17668	3305	28923	1352	11316	1357	10402				
Buxar	3283	18240	3319	29375	1483	13051	1488	11668				
Bhojpur	4496	26076	4532	40422	1866	16744	1872	14962				
Gaya	1183	6388	1262	11898	642	5392	651	5438				
Aurangabad	1144	6521	1225	11565	646	5556	667	5363				
Jehanabad	258	1496	289	3014	238	2046	248	2244				
Arwal	226	1312	284	2999	204	1796	226	2145				
Nawada	1042	5418	1094	9908	501	4208	506	4003				
Saran	4977	31852	5018	44157	803	7227	811	6524	1053	7686	1068	2476
Siwan	2372	15180	2420	22038	664	5843	672	5467	1084	8022	1097	7679
Gopalganj	2885	17887	2947	27139	578	5318	584	4856	1176	8584	1189	8085
Muzaffarpur	9608	64295	9652	90304	1383	12724	1396	11528	7206	56006	7229	54322
Sitamarhi	5139	32889	5198	45723	722	6572	728	5747	2097	15518	2136	15345
Sheohar	2548	13778	2579	22937	312	2776	317	2769	968	7164	978	6748
W Champaran	7083	48164	7138	67637	1582	15187	1594	13431	1887	14718	1998	14945
E Champaran	9098	52498	9144	85579	1629	14498	1642	1676	1808	13118	1827	13169
Vaishali	8172	56204	8238	77977	1265	12144	1289	11316	3513	26498	3546	26916
Darbhanga	12863	76750	12896	114025	601	5589	608	4980	808	5879	818	5768
Samastipur	10384	70612	10436	98638	593	5692	606	5450	1107	8634	1198	9064
Madhubani	5946	35676	5994	54486	484	4452	492	4296	786	5559	804	5749
Saharsha	2447	15663	2481	22621	644	5862	649	5357	492	3642	537	3719
Supaul	1166	6996	1207	11122	427	3628	433	3564	183	1336	188	1316
Madhepura	1881	10662	1923	17807	616	5544	628	5070	264	1954	278	1946
Purnea	2347	14786	2409	22221	358	3294	375	3285	1223	8828	1249	8828
Araria	588	3410	626	6049	186	1598	194	1873	388	2754	398	2746
Kishanganj	709	4396	741	7135	214	1862	231	2116	384	2688	403	2781
Katihar	2684	18251	2736	25164	438	4030	444	3868	1461	10464	1486	10808
Bhagalpur	7287	47365	7329	68700	668	6146	687	5993	482	3615	504	3691
Banka	6164	32052	6198	56919	304	2554	309	2708	52	364	56	358
Munger	1098	6808	1194	11524	242	2202	268	2396	233	1678	242	1727
Lakhisarai	487	2922	531	5173	118	992	134	1378	47	329	49	338
Begusarai	3958	24539	4011	37441	496	4712	508	4554	584	4322	598	4266
Jamui	992	5356	1028	9792	216	1814	221	1995	164	1048	171	1157
Khagaria	1581	9486	1629	15364	367	3376	372	3262	301	2174	323	2318
Sheikhpura	777	4351	798	7363	133	1104	137	1374	92	644	96	653
Bihar	142214	870350	144074	1329803	28668	255718	29085	229190	29843	223226	30466	216918

Source: Government of India, National Horticulture Mission, 2010

Figure 38 – Patna (Bihar) Wholesale Market Weekly Price Points 2002-2011

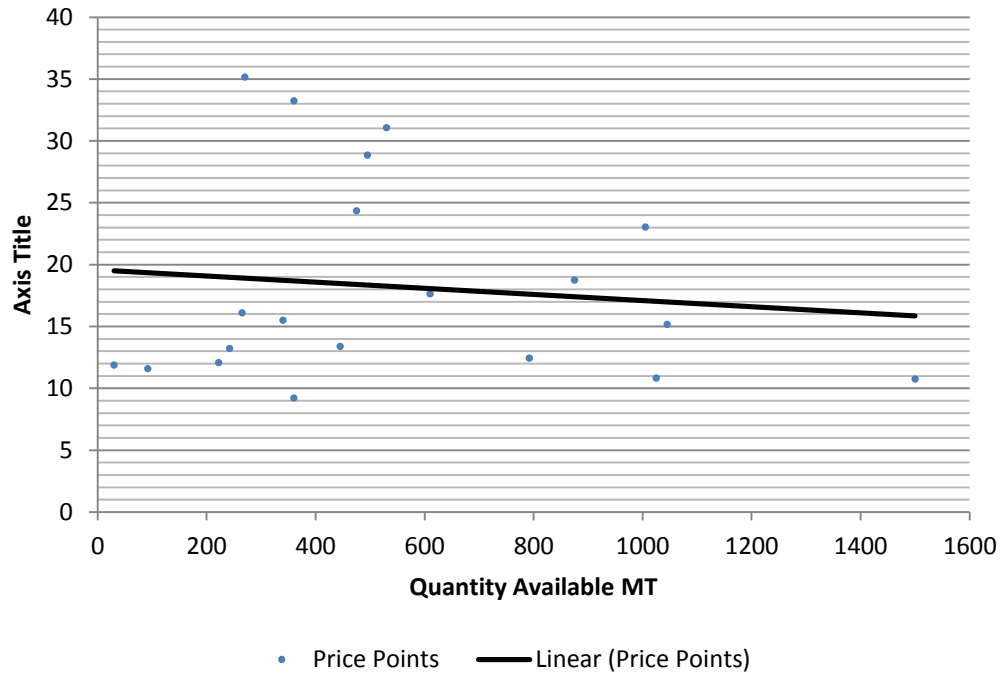
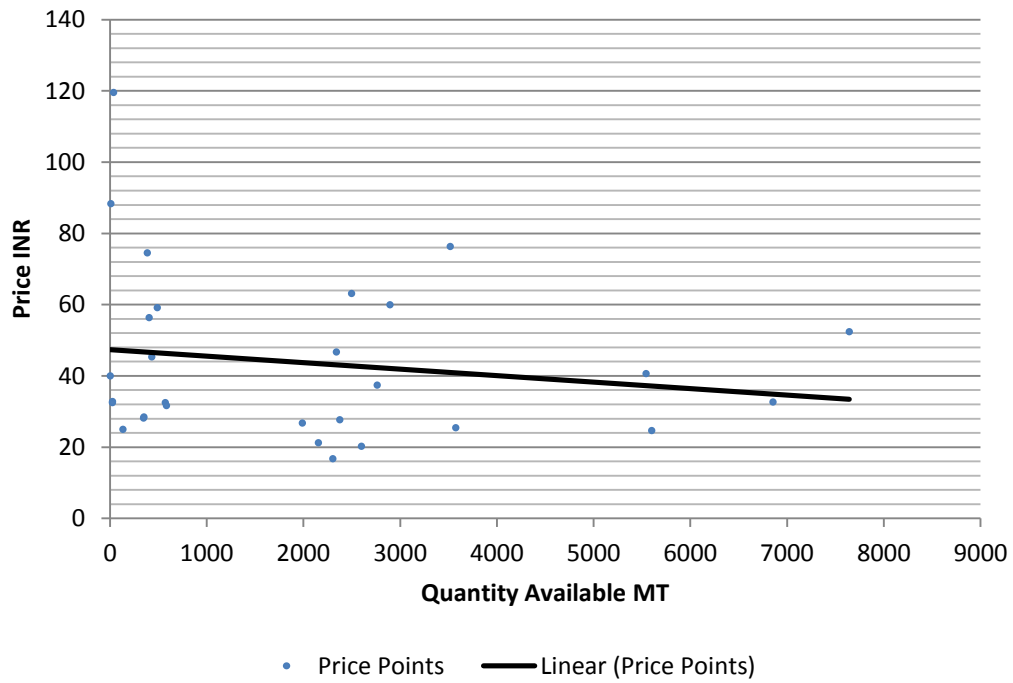


Figure 39 – New Delhi Wholesale Market Weekly Price Points 2002-2011



The scope for litchi production growth in Bihar is significant. While Bihar is India's third largest producing state for vegetables, and sixth largest for fruits, the agricultural sector, which accounts for about 80 percent of the workforce, contributes only about 40 percent to the state level GDP. The average land holding size is 0.75 hectares, which is less than half of the national average of 1.57 hectares. Small and marginal farms constitute almost 91 percent of the total land holdings, and with the high degree of fragmentation, agricultural production has been relatively inefficient and unprofitable. Low level of technology and inadequate access to rural credit have further exacerbated the effects of male out-migration from rural households.

State governance in Bihar has improved dramatically since Chief Minister Nitish Kumar assumed office in 2005. While Bihar has deep roots as a center of learning and culture – Patna (Pataliputra) was in fact the capital of the ancient Mauryan Empire (321 to 185 BC), which at the time was the world's largest, extending more than 5 million square kilometers from modern day Iran, Pakistan and Afghanistan to the eastern shores of the Bay of Bengal – it has been long regarded as a “failed state.” The land of the famous Chanakya, the Hindu Machiavelli, had been reduced to “a byword for the worst of India, of widespread and inescapable poverty, of corrupt politicians indistinguishable from mafia-dons they patronize, caste-ridden social order that has retained the worst feudal cruelties.” The so-called “Fodder Scam,” implicating senior government officials in the embezzlement of about \$200 million for fictitious fodder, veterinary medicines and animal husbandry equipment, exemplified the state of affairs (The Economist, February 21, 2004).

Since 2005, however, the Government of Bihar has taken considerable steps to improve law and order, and attract private investment. In 2006, Bihar repealed the Agricultural Produce Marketing Committee (APMC) Act that had regulated the sale and distribution of agricultural

commodities through the centralized market system (the Mandi). Working with the central government, Bihar is also incentivizing investment in post-harvest infrastructure, like cold storage (Table 10).

Table 10 – 2009 Cold Storage Capacity in the State of Bihar

S. No	Description	Nos.	Capacity	
			Cubic meter	Metric tonne
1.	Total cold storages	215	2359060	778550
2.	Total in private sector	203	2182461	721850
3.	Total in co-operative sector	12	176599	56700
4.	Total in public sector	Nil	Nil	Nil
5.	Total for potato	165	1781469	586912
6.	Total for multipurpose	50	577591	191638
7.	Total for fish & marine products	Nil	Nil	Nil
8.	Total for milk products & others	Nil	Nil	Nil
9.	% Share of private sector on total	94.40%	–	92.70%
10.	% Share of co-operative sector on total	5.60%	–	7.30%
11.	% Share of public sector on total	0	–	0
12.	% Share of potato on total	76.75%	–	75.40%
13.	% Occupation for multipurpose	23.25%	–	24.60%
14.	% Share of fish, marine & others	0	–	0

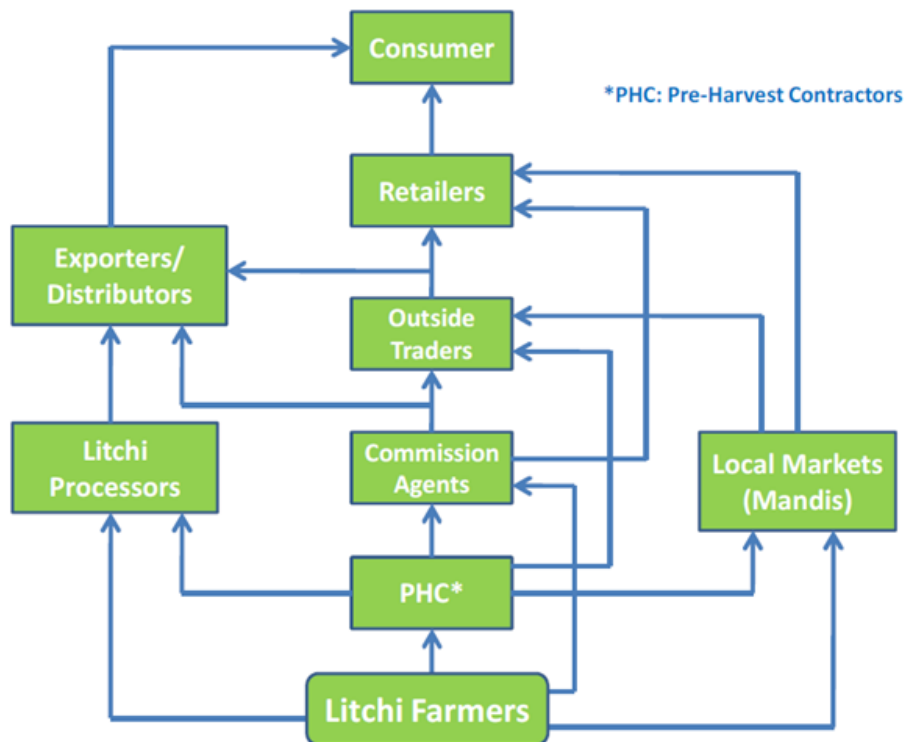
Source: Government of India, National Horticulture Mission, 2010

There are about 2000 litchi farmers in the Bihar District of Muzaffarpur. The average litchi orchard is 1.2 hectares, with approximately 170 to 200 trees. Only 10 percent of these orchards grow high quality exportable litchi; the remaining farms typically derive most of their income from cash crops like rice and maize, so litchi production is often seen as a source of supplemental income. Despite the long gestation period for litchi trees (7 years to full maturity), and a lack of formal credit facilities, an increasing number of farmers in Bihar are attracted to the stability and strong income potential of litchi production. In particular, local growers and traders

are attracted to a growing demand in international and national markets like Delhi and Mumbai (World Bank, 2005).

Approximately 50 percent of Muzaffarpur’s litchi farmers sell their crop to middlemen and traders before harvest, receiving about half of the purchase price in advance. For 15 percent of these farmers, the relationship approximates contract farming, where the middleman may finance the purchase of inputs like seed, pesticides and fertilizer. Figure 40 illustrates the basic structure of litchi marketing in Bihar. Litchi farmers have the option of selling to pre-harvest

Figure 40 – The Litchi Marketing Channel in Bihar



Source: Nath, Purbey and Singh, 2011

contractors or directly to the Mandi or to the litchi processing units. Pre-harvest contractors will typically arrange for local unskilled laborers to pick the fruit. From an orchard management perspective, the utilization of unskilled labor presents challenges in terms of preserving fruit

quality (over-packing of boxes), and also in terms of the long term care of the tree (fruit branches are sometimes torn off indiscriminately to accelerate the harvesting time). The fruit is then transported by truck on very poor roads; and therefore even though production is typically within a 150 km. radius of Muzaffarpur, it can take 4 to 5 hours to reach destination. The transportation bottlenecks, including the unregulated trucking prices that tend to spike during harvest time, often compels farmers to sell their products at cheap rates. Some progressive farmers are beginning to make private arrangements for refrigerated transportation to sell directly to the processors in Muzaffarpur.

Litchica International is one of several fruit processing SMEs located in Muzaffarpur. The firm, established by Mr. Krishnandan Prasad Thakur in 1987, has approximately 50 employees and processes nearly 500 tons of litchi a year with annual turnover of 400 million INR (€6 million). Litchica also processes mango, pineapple, papaya, oranges and tomatoes. In the weeks prior to fruit maturation (Bihar litchi fruit begin to mature during the first half of May), Litchica buyers will conduct crop quality surveys. They inspect fruit for damage caused by fungus (*Peronophythora litchi*), fruit fly (*Conopomorpha sinensis* Bradley) or other pests, and prepare arrival estimates. Even before the fruit is picked, Litchica managers will generally have an idea of whether the fruit quality arriving at the plant will be suitable for sale in the fresh market, or whether it will be pulped for further processing. Typically, 75 to 85 percent of litchi arriving at the plant is pulped and sold to food processors like PepsiCo (Tropicana) or Mother Dairy. However, other markets are also gradually developing for canned, dried and frozen fruit (litchi wine, candy, flavorings, cosmetics etc...).

Once the fruit reaches the processing facility in Muzaffarpur, it is sorted and graded into 3 classes: extra class, class 1 and class 2 (Table 11). The extra class is designated as export

quality (at least 33 mm in diameter, free from defects and with shape and coloring typical for the Shahi variety, rose to fuchsia purple and globous or obtuse in shape). Extra class and class 1 litchi are collected on trays, and are placed in a closed chamber where sulfur dioxide powder is burned to suppress the development of surface fungi, and inhibit the polyphenol oxidation that causes pericarp browning.

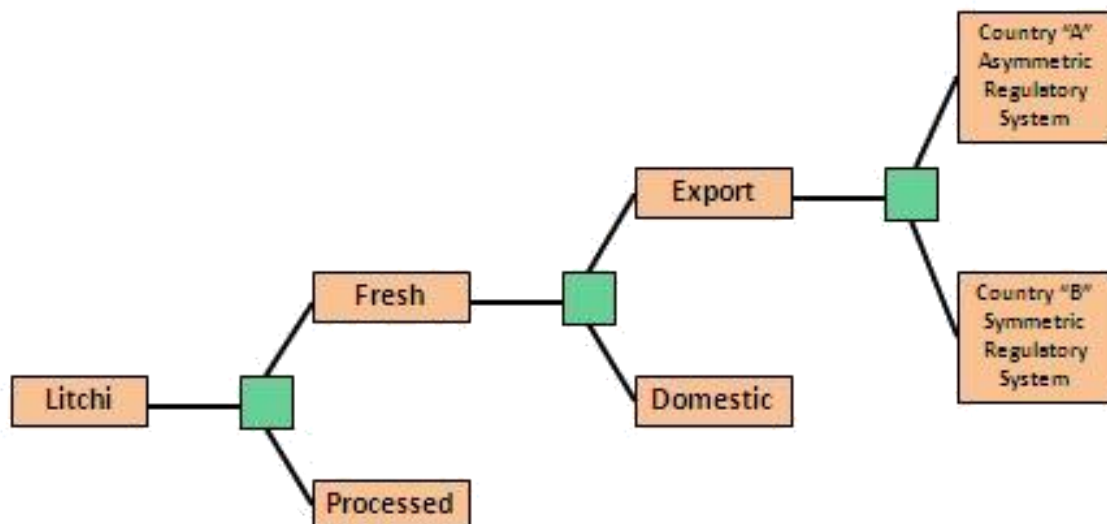
Table 11 – Litchi Grades per AGMARK standards

Grade designation	Minimum Equatorial diameter (in mm)	Grade requirements	Grade tolerances
Extra class (Export)	33	Litchis must be of superior quality. They must have the shape, development and coloring that are typical of the variety and/or varietal type. They must be free of defects, with the exception of very slight superficial defects, provided these do not affect the general appearance of the produce, the quality, the keeping quality and presentation in the package.	5% by number or weight of Litchis not satisfying the requirements for the grade, but meeting those of Class I grade or exceptionally coming within the tolerances of that grade.
Class I	28	Litchis must be of good quality. They must be characteristic of the variety and/or commercial type. The following slight defects however may be allowed provided these do not affect the general appearance of the produce, the quality, the keeping quality and presentation in the package.- slight defects in shape- slight defects in coloring;- slight skin defects Provided these do not exceed a total area of 0.25sq.cm	10% by number or weight of Litchis not satisfying the requirements of the grade, but meeting those of Class II grade or, exceptionally coming within the tolerances of that grade
Class II	23	This grade includes Litchis which do not qualify for inclusion in the higher grades, but satisfy the minimum requirements specified in general characteristics. The following defects may be allowed, provided, the Litchis retain their essential characteristics as regards the quality, the keeping quality and presentation.- defects in shape,- defects in coloring,- skin blemishes provided these do not exceed a total area of 0.5 sq. cm.	10% by number or weight of Litchis not satisfying the requirements of the grade, but meeting the minimum requirements.

As the litchi is one of the very few tropical fruits that can withstand low temperatures, the SO₂ treated fruit is placed in cold storage, where at 1° C it will have an expected shelf life of

approximately 45 days. Early on in this process, the sales manager must decide where to sell. The fruit can be sold locally in Patna, or placed on a train to reach retail outlets in Kolkata, Delhi or Mumbai, typically within 36 hours. Each domestic market has its own logistical challenges and marketing constraints. As Litchica International does not have its own wholesale or retail outlets, it needs to decide whether to accept lower price offers of selling locally, or sell the extra class (export) quality fruit to wholesale customers like Adani, Reliance and Bharti Walmart. In the case of export, litchis are packaged in 2 or 4 kg. corrugated fiber boxes, and flown or railed from Patna, through Delhi or Mumbai, to destinations in the Middle East, Europe and elsewhere. Given the limited supply of fresh litchi and the very short shelf-life, the sales manager must make a quick decision on whether to sell locally, nationally or internationally. In calculating the expected value of each option, the manager will consider the expected price of litchi in each market, and also the prospective costs of regulatory asymmetry – that is the informational and compliance costs required to ensure that the fruit can be sold in the foreign market. Litchica’s marketing decision is summarized in the decision tree in Figure 41.

Figure 41 – Litchica International’s Decision Tree



While prospect of lucrative international sales are often tempting (Figures 42 and Table 12), the full costs of regulatory asymmetry must also be carefully considered.

Figure 42 – Average Import Price for Madagascar Litchi on the French Market 2000-2009

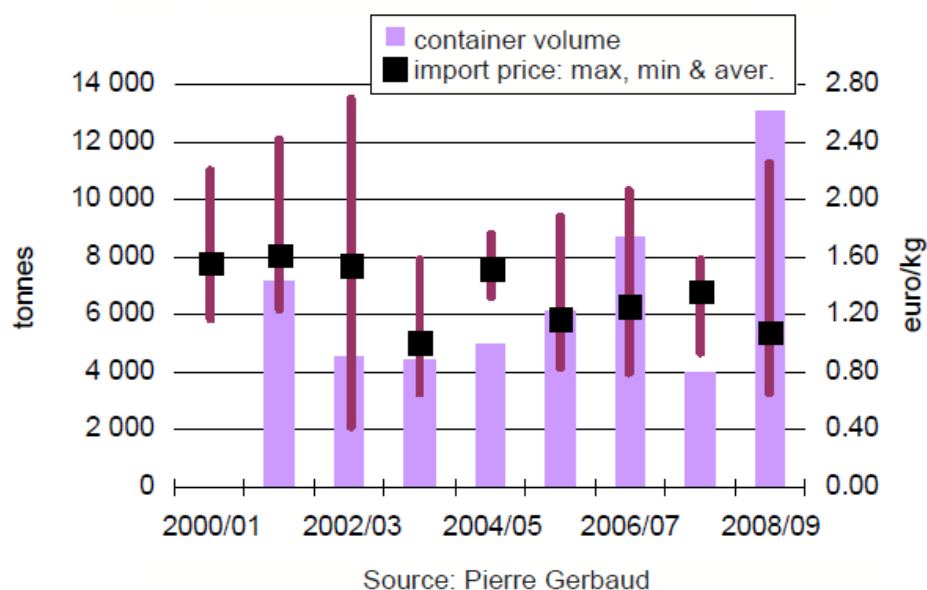


Table 12 – Average Import Price for Litchi on French Market 2009

LITCHI — IMPORT PRICE ON THE FRENCH MARKET — Euro/kg								
Weeks 2009		49	50	51	52	53	December 2009 average	December 2008 average
By air								
Mauritius	br	5.00-7.00	5.00-6.50	5.50-6.50	7.00-8.00	-	5.60-7.00	5.35-6.25
Mauritius	s	4.30-4.50	4.30-5.00	-	-	-	4.30-4.75	4.00-4.50
Madagascar	br	6.00	5.00-6.00	5.50	-	-	5.80	6.00
Madagascar	s	4.00-4.50	4.30-5.00	4.80-5.00	-	-	4.35-4.80	-
Réunion	br	7.00-8.00	7.00-7.50	7.00-7.50	7.00-8.00	10-12	7.60-8.60	5.35-6.10
South Africa	s	4.00-4.50	4.20-5.00	-	-	-	4.10-4.75	3.00-5.00
By sea								
South Africa		-	-	-	2.50-3.50	2.20-2.60	2.35-3.05	1.35-1.70
Madagascar		-	-	2.20-2.40	2.00-2.30	1.70-1.90	1.95-2.20	1.75-2.50

br: fresh on the vine / s: sulphur treated

Source: Gerbaud, 2009

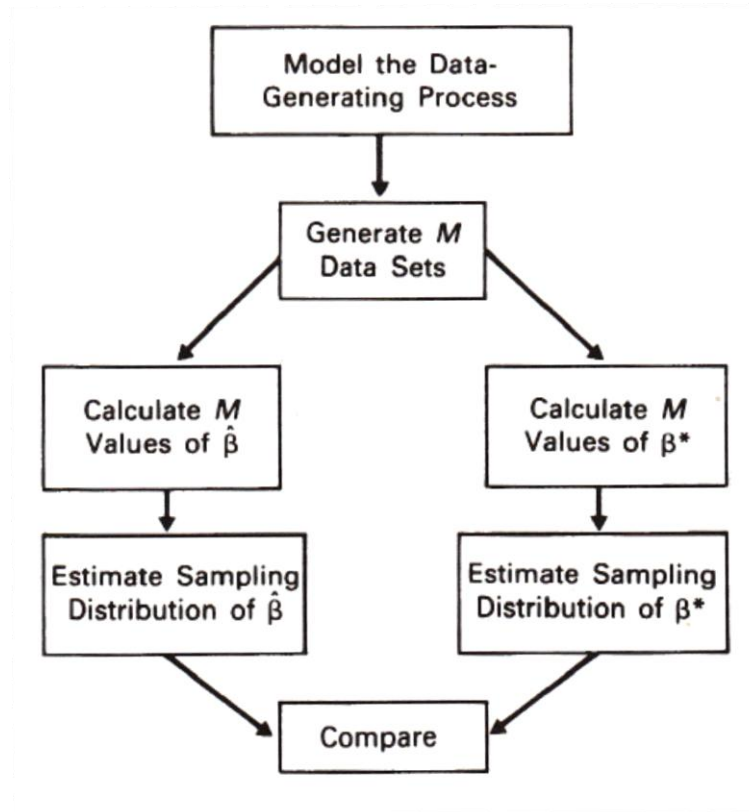
There are many inherent risks associated with the international sale of a delicate and highly perishable fruit like litchi. Unlike apples which can be treated and stored for months, litchi fruit must reach the consumer in a matter of weeks. Fruit buyers, traders, wholesalers and retailers are keenly aware of the need to maintain the highest standards of quality if they are to receive the attractive price premiums. When negotiating an international sale, the manager must obtain information to provide the necessary documentation for export. Does the importing country recognize the phytosanitary certificate issued by the Government of India Ministry of Agriculture Plant Quarantine Division? Does the consignment comply with the importing country's labeling and maximum residue level requirements? In short, the manager must consider compliance costs associated with a symmetrical or asymmetrical regulatory system.

The sulfur dioxide fumigation treatment to extend the shelf life of litchi presents a real world case of regulatory asymmetry. Most countries regulate the use sulfur dioxide as a preservative and/or as a fumigant. Health concerns over sulfite residues have even brought mandatory labeling requirements on products like wine. India's new Food Safety Standards Act, 2011 (Section 3.1.4) establishes a maximum SO₂ level of 350 parts per million (ppm). The EU has a more restrictive standard establishing a maximum SO₂ level of 10 mg/kg (10 ppm) (Directive 95/2/EC (Annex 3 Part B)). The United States effectively prohibits the use of SO₂ "on fruits or vegetables intended to be served or sold raw to consumers, or to be presented to consumers as fresh" (U.S. Code of Federal Regulations C.F.R. 21 182.3862). Even though the *Codex Alimentarius* (Standard 192-1995) recommends a maximum SO₂ residue level of 50 mg/kg (50 ppm), this is a clear case of regulatory asymmetry. Litchica International may have litchi fruit that are fully compliant with Indian regulations, and may even be fully compliant with the *Codex* standard, yet they may not be in compliance with EU or U.S. regulations.

Litchica's export decision, in the context of the sulfur dioxide fumigation regulatory asymmetry problem, is evaluated using enterprise budget data collected from company and industry experts. The data are analyzed using @RISK software, a Monte Carlo simulation computational tool developed by the Palisade Corporation. Monte Carlo simulation is a statistical technique, developed during World War II, that gets its name from the Monaco resort town renowned for its casino games. It is widely used for modeling situations that are analytically complex. The Monte Carlo approach enables stochastic analysis of the expected value of the export decision around specific point estimates (Murtha, 1997).

Unlike traditional optimization models where decision variables are outputs that seek to maximize (or minimize) the value of the objective function, simulation models treat the decision variables as inputs. The Monte Carlo method evaluates the objective function for each set of values, using distribution functions, $g_i(x)$ to represent each input variable, yielding a solution that is a discrete distribution, y_k . The distribution function $g_i(x)$ for each input variable includes the unique absolute minimum value, the absolute maximum value, and all points in between including the best (or most likely) value. This requires a number of iterations, and on each iteration the values from the input distributions are randomly sampled (using Latin Hypercube sampling) and combined to produce an estimate of risk. The process of random sampling and risk calculation is continuously repeated, hundreds or even thousands of times. As the number of iterations increases, the final distribution produced converges towards a distribution that could have been generated analytically. Figure 43 illustrates the general structure of a Monte Carlo study (Kennedy, 1998).

Figure 43– Structure of a Monte Carlo Study



Source: Kennedy, 1998

With the increasing capabilities of modern computing, Monte Carlo experiments have become manageable and relatively affordable. @RISK software offers a convenient platform that can be made intuitively accessible to SMEs, providing a decision making tool that gives structure to what is typically a very visceral decision. For what this approach lacks in preciseness, it gains in realism. This is very much line with what Herbert Simon called “satisficing,” the idea that rational organisms, possessing limited information and limited computational skills, tend to fall short of the maximizing objectives espoused by classical theory (Simon, 1956).

Table 13 – Litchica International Enterprise Budget – INR / Kg.

	PATNA	DELHI	EU EXPORT	US EXPORT
<i>COSTS</i>				
Purchase Price	<i>RANDOMLY DETERMINED BY @ RISK</i>			
Sort & Grade	0.5	4	10	10
Regulatory Compliance	n/a	n/a	30	50
SO ₂ Treatment	n/a	0.2	0.2	0.2
Packaging	n/a	6	7	7
Cold Storage	n/a	0.3	2	2
Transportation	0.5	10	\$5	\$5
<i>REVENUE</i>				
Sale Price	<i>RANDOMLY DETERMINED BY @ RISK</i>			
Exchange Rate	n/a	n/a	<i>RANDOM</i>	<i>RANDOM</i>
<i>PROFIT</i>	<i>@RISK ESTIMATE OF EXPECTED VALUE - EV(d_i)</i>			

Note: All figures are in Indian Rupee (INR) unless otherwise indicated

Table 13 presents a simplified adaptation of Litchica International’s enterprise budget, taking into consideration the four managerial options for marketing fresh litchi fruit (ref. Figure 41): sell locally in Patna, sell nationally in Delhi, export to a relatively symmetrical market (the EU), or export to an asymmetrical market (the U.S.). The litchi pulp business segment is deliberately excluded from this model since the contractual arrangements with the fruit juice and food processors would needlessly create additional layers of complexity in the analysis. The

farm gate purchase price is a randomly determined @Risk variable based on available Bihar State Department of Agriculture data, supported by anecdotal personal interviews with both farmers and processors. The sorting, grading, packaging, storage and SO₂ treatment costs are given as non-random point estimates for each of the four options. Sales to the local Patna market incur minimal handling and storage costs; local litchi production can typically move quickly in and out the door, and therefore does not require SO₂ treatment. Local production is generally considered to be of marginally higher value and quality than the fruit destined for pulping. Local transportation is inexpensive. The point estimate of INR 0,5 / kg. is based on the approximate cost of hiring a small car and driver for about INR 100 per hour. If the vehicle is used to transport 800 kg. for 4 hours of work, the total cost would be INR 400 (€6.31) or INR 0.5 / kg. The transport costs to Delhi is fixed at INR 10 / kg., while airfreight charges to the EU and the U.S. are set at a standard international rate of \$5 / kg. Sale prices and exchange rates are also randomly determined @Risk variables.

The cost of regulatory compliance, the core subject of this model, is deemed to be a fixed cost, and therefore is evaluated as a point estimate. The firm either acquires information, or it does not acquire it; it either complies with the different regulatory requirement or it does not comply. If the firm subscribes to GlobalGAP, it must pay a registration fee of €4.000, regardless of whether or not it sells a single litchi. In practice, the average cost of regulatory compliance will decline significantly as more volume is sold. Also, there is a “learning process.” which is likely to reduce costs over time. For convenience and purely demonstrational purposes, the model considers two different fixed costs of regulatory compliance: INR 30 / kg. for the “relatively symmetrical EU market” and INR 50 / kg. for the more “asymmetrical U.S. market,”

but this could be easily adapted a “variable cost” approach. Figures 44, 45, 46 and 47 illustrate the @Risk simulation results for the four managerial options.

Figure 44 – Expected Value of Selling Fresh Litchi in Patna

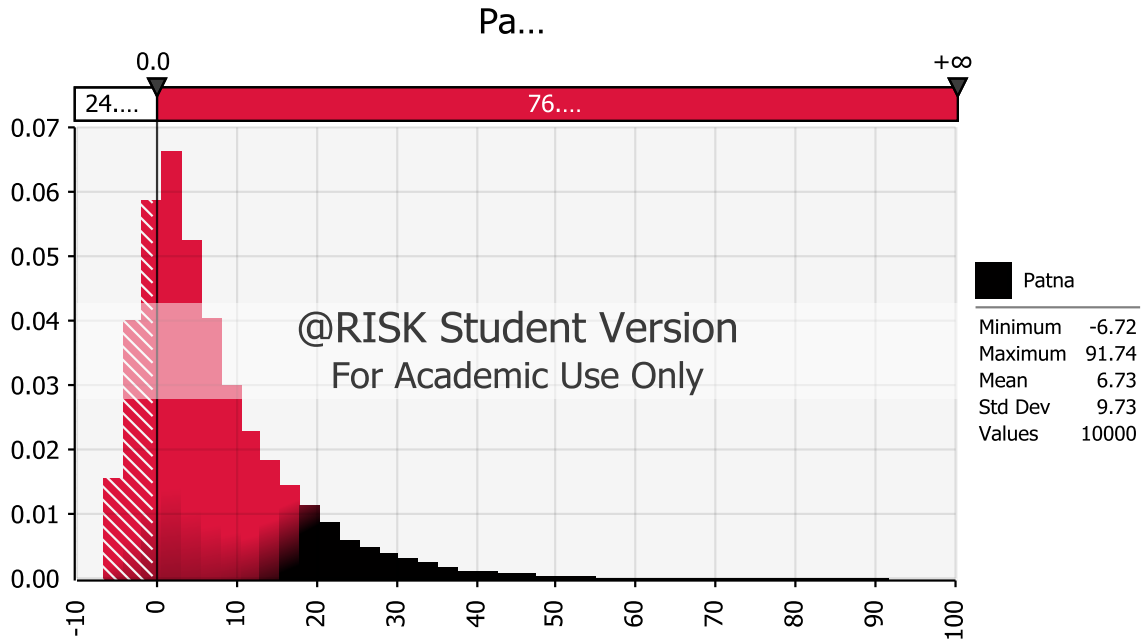


Figure 45 – Expected Value of Selling Fresh Litchi in Delhi

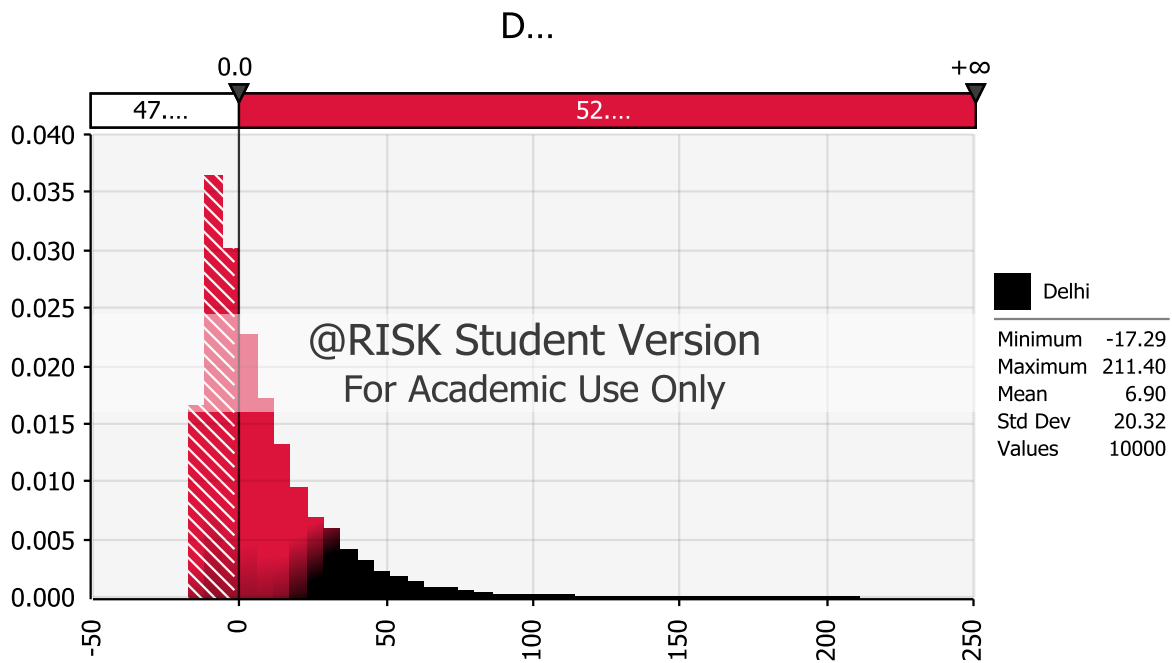


Figure 46 – Expected Value of Selling Fresh Litchi in the EU

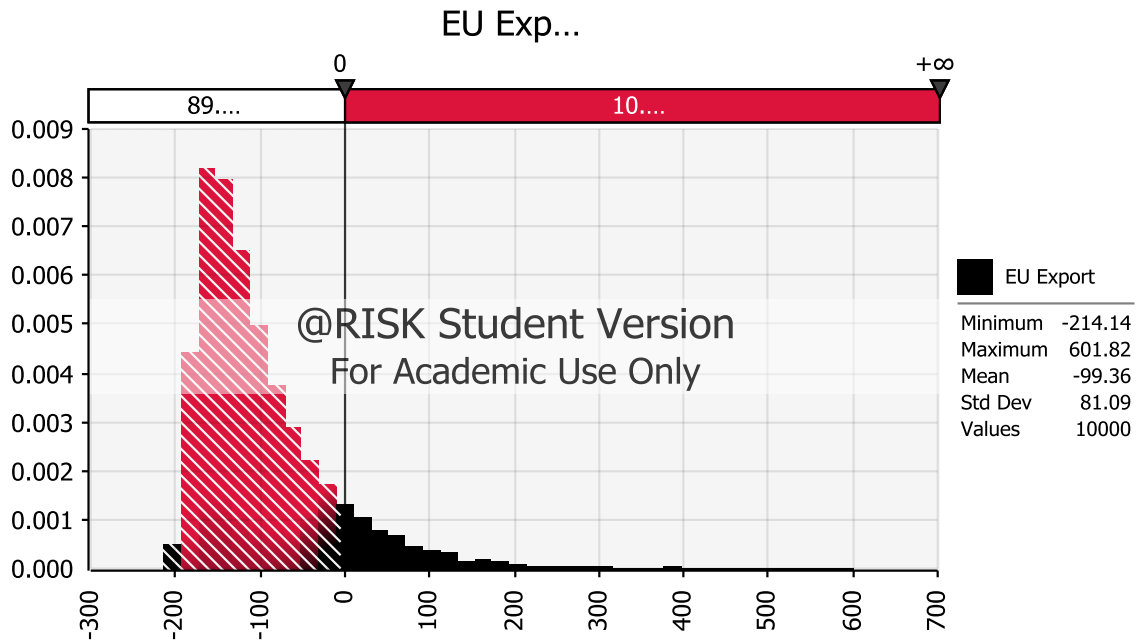
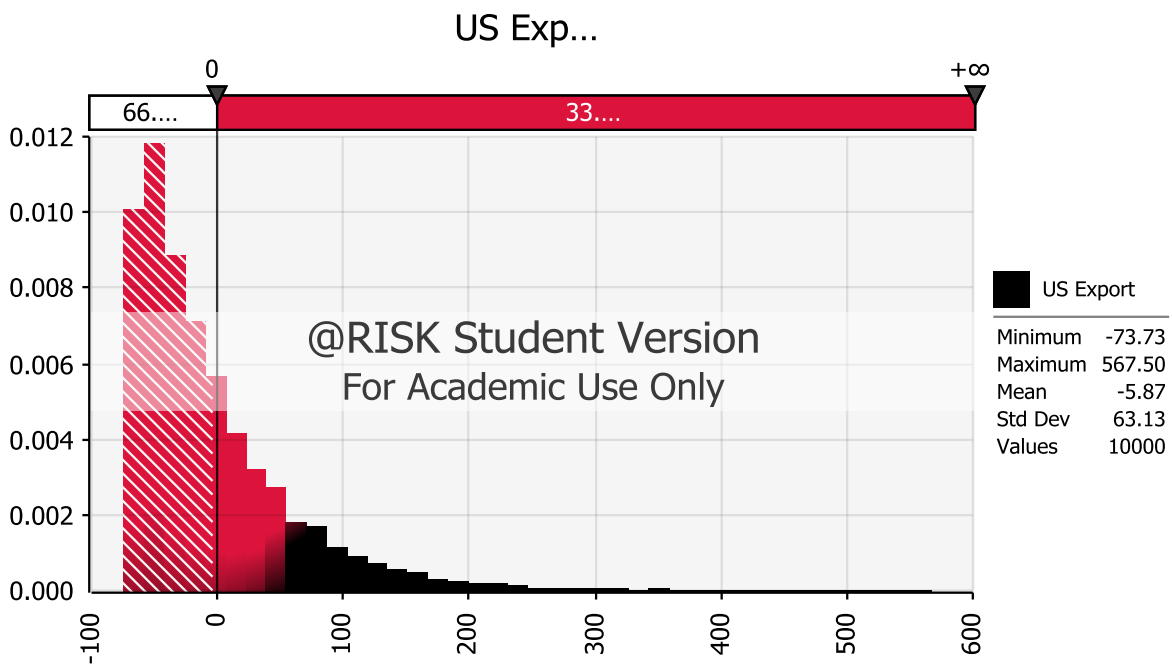


Figure 47 – Expected Value of Selling Fresh Litchi in the U.S.

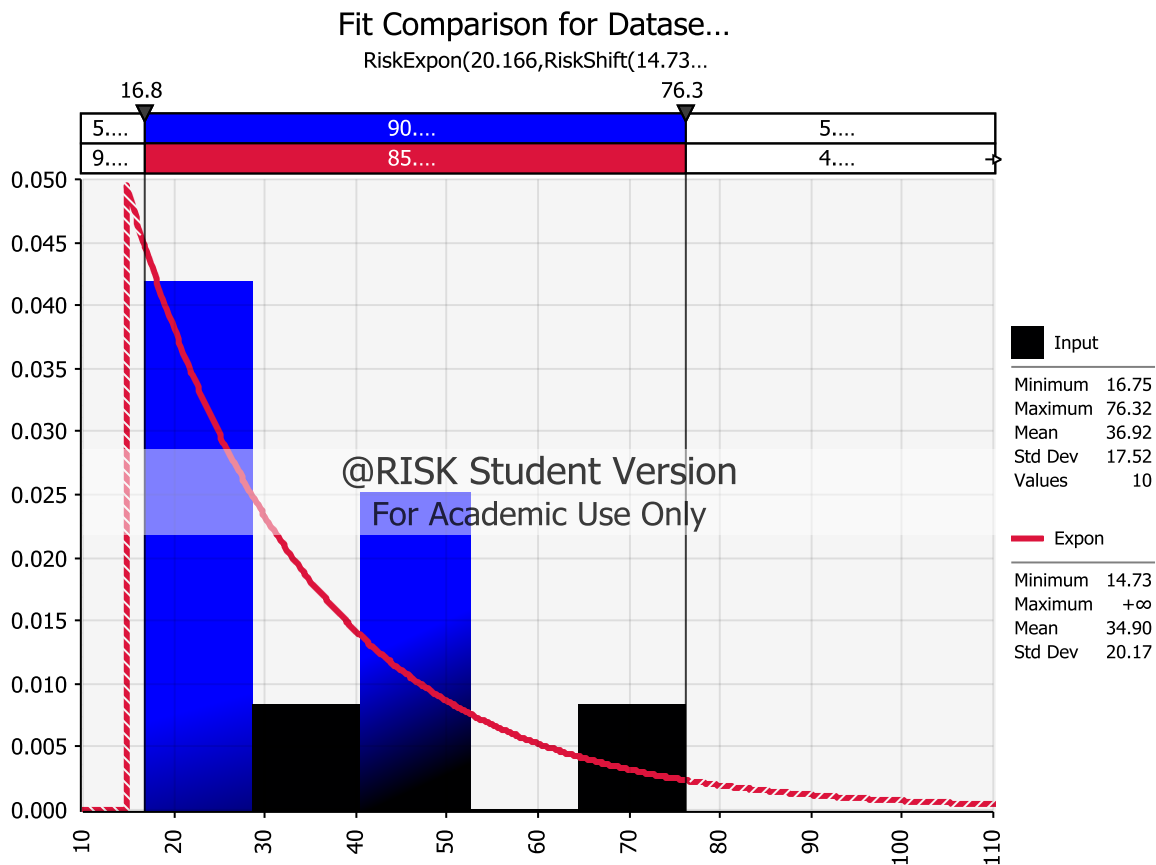


As one might expect, the option of selling the fresh fruit in Patna appears to be the least risky. The expected value of selling fresh litchi in the local market is INR 6,728 / kg, with a 76 percent likelihood of remaining profitable. As Litchica International is assumed to be a price taker, the firm must sell according to prevailing market demand, and therefore faces a 24 percent probability that it may incur a loss. The expected value of selling in Delhi (Figure 45) is marginally higher at INR 6,899 / kg. While the potential profit of selling in Delhi could be substantially higher (INR 211,4 / kg.), the firm faces a greater risk in selling its product in the national market, and in fact has a 47,9 percent chance of incurring a loss.

With respect to the export market, one can clearly see the potential for a significantly higher profit (INR 601,82 for the EU and INR 567,50 for the U.S.), but this comes at a substantially higher risk. Part of this risk is due to regulatory asymmetries. If regulatory compliance costs are eliminated, this significantly increases the expected value of the export options to (INR – 68,73 in the case of the EU and INR 43,91 in the case of the U.S.). However, the results distinguishing the asymmetric export market from the symmetric export market are counterintuitive. While both markets indicate a negative expected value partly due to the costs of asymmetry, the more symmetric EU market appears “riskier” with a lower expected value of INR – 99,36 and a high probability (89,4 percent) of incurring a loss. The asymmetric U.S. market has a higher expected value of INR – 5.87, but a higher probability of profitability (33,3 percent). These results may be skewed by data limitations and the fact that both the EU and U.S. litchi markets are very small and do not naturally gravitate toward purchasing litchi fruit from India. The probability distribution for the randomly generated @Risk variables were fitted using the @Risk distribution fitting tool, which provides a ranking of distributions based on Chi-Squared, Kolmogorov-Smirnov, and Anderson-Darling statistics. The selection of an

exponential distribution (Figure 48) is indeed somewhat arbitrary, but this can be easily be re-simulated using different probability distributions. This is the power of the @Risk software; to easily conduct various sensitivity tests to build different scenarios. At its core, this very intuitive approach enables the decision maker to anchor beliefs and preferences, and subsequently make quantitative measurements to assess the impact of decisions under different scenarios.

Figure 48 – @Risk Goodness-of-fit tool selection of an Exponential Distribution



Conclusions

Modern agriculture trade features countless examples of regulatory asymmetry. Agricultural products do not move effortlessly across geographic political boundaries. Indeed, as products are shipped from one location to another, they acquire the distinction of being a “foreign good,” which by definition may be competing with a locally produced product. There is an inherent natural friction between the local and the foreign firm competing for the consumer’s limited attention and budget. Within this context, government policy has to balance the needs of protecting its citizens and its resources from the many harmful risks that can adversely impact health, wealth and the environment. At the same time, government policy is also committed to nurture and encourage the growth of SMEs, viewing them as a vital engine of economic development. As SMEs compete in an increasingly global market place, they face enormous challenges especially in accessing markets that are not “close to home.” Whereas large firms can easily absorb the high transaction costs, including the informational and compliance costs of entering a new market, smaller firms are often daunted by the perceived risks, and therefore adopt safer strategies of operating in or around the home market, even if it means foregoing the prospect of more lucrative profits elsewhere.

This study has explored recent theory in decision making and firm behavior to develop a better understanding of how agricultural SMEs participate in the global market place. Based on a current review of the literature, this is still a very nascent field of inquiry. The main challenge has been to make the shift from descriptive analysis to a more prescriptive economic approach to the problem. Much hinges on the very significant data limitations that ultimately obscure what is occurring at the day to day operational level of agricultural SMEs. Fundamentally, this study

has tried to follow the “Garbage-In-Garbage-Out Principle,” preferring to embrace realism perhaps at the expense of theoretical elegance. Modern computing has undoubtedly made this task infinitely easier than would have been the case even 10 years ago. The internet, and powerful software applications like @Risk, are phenomenal tools that can help agricultural SMEs make better informed decisions about participation in the global market place. As more data becomes available, it will certainly become easier to quantify the impact of regulatory asymmetry.



Photos of the author visiting litchi farmers and researchers in Muzaffarpur, Bihar

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