1.1 Introduction

International trade in marine products has increased tremendously because of their high health attributes. With the high unit value, seafood has been acclaimed as one of the fastest moving commodities in the world market. As per Food and Agriculture Organization (FAO, 2012), the volume and value of fish and fishery products exported are 57 million tonnes and US $ 109.3 billion respectively. International trade in fish and fishery products represented 10 percent of total agricultural exports and one percent of world merchandise exports in terms of value (FAO, 2012). The developing nations have emerged as the major net exporters of fish and fishery products since 1970s. Net exports of fish and fishery products from developing countries in terms of value increased from US $ 2.9 billion in 1978 to US $ 27.7 billion in 2010. About 75 percent of the fish and fishery product exports in terms of value from developing nations are directed to the developed countries (FAO, 2010). The major markets for the fish and fishery product exports of the developing
nations are the European Union (EU), the United States (US) and Japan. Hence developments in these markets have implications for fish and fishery product exports from developing nations.

Fish and fishery product exports comprise a significant part of the exports of India accounting for 10 percent of agricultural exports in 2010-11 earning a foreign exchange of US $ 2856.93 million (Government of India, 2012; MPEDA, 2012). Kerala possessing 10 percent of the coastline of India accounts for 16 percent of marine product exports of India in terms of value in 2010-11 (MPEDA, 2012). Historically, the major markets of exports of marine products of Kerala have been the EU, the US and Japan. At the start of the WTO period, about 87 percent of value of marine product exports from the state was directed to these markets reflecting a very high degree of market concentration.

1.2 Statement of the Problem

A significant development that influences the international trade in fish and fishery products is the establishment of the World Trade Organization (WTO) in 1995. The WTO has several agreements that are relevant for trade in fish and fishery products especially with reference to developing countries. These agreements are Technical Barriers to Trade Agreement (TBT Agreement), Sanitary and Phyto Sanitary Agreement (SPS Agreement), Agreement on Anti-dumping, Agreement on Subsidies and Countervailing Measures and Agreement on Rules of Origin. Trade in fisheries does not come under Agreement on Agriculture and is hence discussed under Non Agricultural Market Access (NAMA). The aforementioned agreements have been created with the intent to facilitate trade in commodities including fish and fishery products. With the establishment of the WTO, there has been a
lowering of tariff barriers on imports in line with the spirit of free trade principle. But the post WTO period witnessed a rise in non tariff measures (NTMs) imposed by the developed countries on the imported food products, especially fish and fishery products. The measures applied by the developed countries on the imports of fish and fishery products from developing countries are in the form of quality and safety standards, labeling, and packaging and other technical requirements, countervailing and anti-dumping duties etc.

Fish and fishery products being food products belong to the categories of credence goods (Bureau et al., 1998; Deodhar, 2005). This necessitates measures such as quality and safety standards and labeling and marking requirements to signal information to the consumers regarding the quality of the food product they consume. This, to an extent serves to eliminate asymmetric information and reduces transaction cost. The SPS Agreement in line with the spirit of the WTO Agreement advocates free trade without compromising on the safety and quality of the food product traded. The provisions of the SPS Agreement recognize the rights of every member nation of the WTO to apply sanitary and phyto sanitary measures to protect the life and health of plants, animals and human beings based on scientific evidence. The Agreement however emphasizes that these measures should not be used to arbitrarily or unjustifiably discriminate between the member nations when identical conditions prevail. It also calls for harmonization, equivalence, assessment of risk, transparency and the need for special and differential treatment for the developing nations. In the wake of the SPS Agreement, there has been a strengthening of food safety standards and quality regulations in the developed countries especially, the EU, the US and Japan probably due to greater levels of concerns and awareness about such quality related issues in
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these countries. This is reflected in a series of developments that have happened on this front in the EU, the US and Japan in the Post WTO Phase. To cite a few among them are the emphasis on net to fork principle, rising numbers of Rapid Alert System on Food and Feed (RASFF) notifications pertaining to fish and fishery products, stringency of Maximum Residue Limits (MRLs) set on various deleterious substances applicable to fish and fishery products (the EU); the need for mandatory registration of fish processing units with the United States Food and Drug Administration (USFDA) as per the provisions of the Bio Terrorism Act, 2002 and the imposition of the Country of Origin Labeling for fish products (the US); and stringency of MRLs on heavy metals and antibiotic residues especially for farmed fish (Japan). These developments have relevance for the marine product exports of Kerala that have been primarily targeting these markets. In the context of the excessive dependence of the marine product exports of Kerala on these markets in 1995-96, focus is on the implications of strengthening of food safety standards and quality regulations in its principal markets for the marine product exports of the state in the post WTO phase.

The present study examines the type of NTMs, especially the quality regulations and safety standards encountered by the marine product exports of Kerala in its major import markets of the EU, the US and Japan. An analysis of whether the safety and quality standards prescribed by these developed countries on the imported fish and fishery products are purely based on risk assessment and scientific evidence or are they erected as disguised barriers to trade is attempted.

1.3 Importance of the study

Fish and fishery products are regarded as healthy foods and there has been a significant increase in their global trade. Besides that, trade liberalization
policies, globalization of food systems and technological innovations have furthered the increase in international trade in fish and fishery products. According to FAO 2006, the total world trade of fish and fishery products reached a record value of US $71.5 billion representing a 23 percent growth relative to 2000 and a 51 percent increase since 1994. In 2010, the exports of fish and fishery products further rose and stood at a high of US $ 109.3 billion in value terms (FAO, 2012). The rise in global trade in fish and fishery products was accompanied by a significant change in the direction of flow of fish and fishery product exports. Since the mid 1970s, it is found that the developing countries have transformed from being the net importers to net exporters of fish and fishery products. Fish and fishery products have assumed growing importance in the export basket of developing countries. In 2008, developing countries accounted for 80 percent of world fishery production. The developing countries rely heavily on the developed countries as the markets for their fish and fishery product exports. In 2008, about 75 percent of fish and fishery product exports in terms of value were directed to the developed countries (FAO, 2010). Among the developed countries, the major import markets for the fish and fishery product exports of the developing countries are the EU, the US and Japan.

Fish and fishery product exports have a significant place in the export basket of India. Export earnings of India from fishery products increased from ` 4 crores in 1960-61 to ` 12901.47 crores in 2010-11 (MPEDA, 2012). The share of export earnings from fish and fishery products as a percentage of total agricultural exports of India increased from a low of 1.76 percent in 1960-61 to a high of 25.06 percent in 1994-95. But its share declined to 16.60 percent in the following year. Though its share in agricultural exports of the country has declined since then, in 2010-11, marine product exports accounted for 9.61
percent of total agricultural exports of India representing a significant share (Government of India, 2012).

Kerala is one of the coastal states in India accounting for a sizeable share in the fish and fishery product exports of India both in terms of quantity and value. Kerala has a coastal belt extending over 590 kms and an extensive inland water spread of around 4 lakh hectares. The Exclusive Economic Zone lying adjacent to Kerala coast is spread over 36000 sq.km. The inland water bodies consist of 44 rivers (with an area of 85000 ha), 53 reservoirs (44289 ha) and 53 backwater and extensive brackish water area (65213 ha) (Economic Review, 2011).

The fish production in the state consists of both marine capture fish production and inland fish production. Marine capture fisheries have always dominated the total fish production in the state. Marine fish production accounted for about 82 percent of the total fish production of the state during 2010-11. The exports of marine products from Kerala increased from ` 183.93 crores in 1987-88 to ` 2002.10 crores in 2010-11. The exports of marine products from the state in terms of quantity increased from about 35576 tonnes in 1987-88 to 124614 tonnes in 2010-11. Of the total marine product exports of India, the state accounts for about 15 percent in terms of quantity and 16 percent in terms of value (MPEDA, 2012). Historically, the major export markets of Kerala have been the EU, the US and Japan. But the post WTO period witnessed certain developments that could have some bearing on the fish and fishery product exports from the state. During this period, there has been a reduction in tariffs on the imports of traded products including fish and fishery products. But this period also witnessed strengthening of food safety standards and quality regulations in the import markets of developed countries.
especially the major fish and fish product importing markets. Since fish and fishery products fall in the category of credence goods, the imposition of such regulations are required to ensure the safety of the food products that the people consume. This necessitates an examination of whether these quality controls and food safety standards applied by the developed countries in line with the SPS Agreement under the WTO are meant to protect the life and health of the citizens or simply to restrict imports into their markets. In other words, whether such NTMs are based purely on risk assessment or arbitrarily used as disguised barriers to trade. In the light of these developments in the international trade scenario with the establishment of the WTO, it is necessary to examine the impact of these measures on the exports of marine products from Kerala.

1.4 Review of Literature

Trade in food products is always characterized by asymmetric information. There is a need to signal to the buyers, the quality attribute of the food products they consume. With the growing prominence of trade in food products, especially fish and fishery products, more focus has to be placed on ensuring the safety and quality of traded products. An attempt is made to trace out the evolution of quality regulations and safety standards on food products in general and fish and fishery products in particular. This further necessitates an examination of the impact of these measures on trade in fish and fishery products. With this view, a review of the existing theoretical literature that elaborates methods to measure the impact of the NTMs on trade in food products is made. Then it surveys literatures attempting to explain the specific issues faced by the developing nations in the food product trade in the recent times in the wake of application of NTMs, especially safety standards and
quality regulations. It also examines the response of the seafood export companies to the new developments in the international fish trade scenario.

The review of existing literature can be broadly classified into four: studies pertaining to the evolution of quality controls and safety standards on trade in food products in general and fish and fishery products in particular, studies pertaining to the measurement of the impact of these measures on trade, studies relating to the impact of the quality and safety standards on the food product trade of the developing nations and studies dealing with the response of the seafood export industry to the new developments.

1.4.1 Evolution of Quality and Safety Standards on Trade in Food Products

International trade in food products is affected by the quality and safety standards placed by countries on the imported food items. A number of studies focus on the evolution of the quality and safety standards in the field of international trade in food products.

John (2002) traces the development of national and international systems to assure the quality and safety of food supplies at domestic and international trade levels. National food legislation in food production, processing and marketing systems have evolved in most countries to ensure better quality and safer foods. For e.g., the US Food and Drugs Act of 1906 was enacted to curb undesirable hygienic practices. At the international level, a number of efforts were taken to ensure free and fair trade in safe foods. The thrust of the United Nations Conference on Food and Agriculture 1943 was to promote better food production for adequate supplies of good quality and safe foods. In 1940s, 1950s and 1960s, FAO in conjunction with the World Health Organization (WHO), the General Agreement on Tariffs and Trade (GATT) and Codex attempted to strengthen systems to promote better food supplies and improve
their quality and safety. The joint work of FAO and WHO led to the creation of review mechanisms for food additives and pesticides residues. Since 1995 WTO and other major Agreements such as the SPS and the TBT play a key role in facilitating free trade in safe and quality foods.

The trends in the evolution of international regulations on health, safety and environment are examined by Micklitz (2000). In the course of evolution of international regulations on health, safety and environment, there has occurred a shift of paradigm. It was the United Nations (UN) that performed a dominant role in the 1980s to ensure international regulations on health, safety and environment. The UN developed guidelines define basic minimum standards of health and safety. Both pre-market and post-market measures were used to protect consumers from threats to their health and safety. But the UN failed to develop a comprehensive food policy and modernize its guidelines on consumer protection. Currently, international safety regulation is closely linked to free trade perspectives. GATT/WTO plays a dominant role in framing of the standards. The provisions of the SPS and TBT agreements under the WTO try to ensure that regulatory standards do not disrupt international trade. There has occurred a shift of emphasis from regulations to protect health and safety of the consumers to regulations that ensure health and safety without disrupting free trade.

Deodhar (2005) examines the reasons for the need of a regulatory mechanism to ensure the quality of food products that are traded. Credence nature of food products is emphasised. This creates market imperfections thereby justifying the need for some regulatory mechanism to ensure the quality of the food product that is traded. The SPS and TBT agreements symbolise the efforts on the part of the international community to deal with quality issues in international trade in food products. Based on India’s
experiences in food trade with developed countries, it concludes that the SPS and the TBT restrictions applied by the developed countries on the food imports from the Less Developed Countries (LDCs) create a non tariff barrier to trade.

A few studies examine the major provisions of the SPS and the TBT Agreements that aim to promote food safety and quality, at the same time facilitating international trade in food products. It is through the illustration of several legal battles among the nations on the SPS and the TBT issues that these studies explore the evolution of quality and safety standards in the present trade scenario. The perceptions of different nations on the application of the SPS and the TBT measures are brought out through the respective stances taken by each nation at the dispute settlement body of the WTO. A perusal of these litigations on the SPS and the TBT issues makes it clear that in most cases, the developed nations such as the US, Japan and the EU countries are the initiators of the SPS measures. This gives strong evidence that the developed nations through the application of tighter regulatory requirements and stringent food safety and quality stipulations do interfere in the international trade in food products.

The SPS and the TBT Agreements are the two multilateral trading agreements under the WTO to ensure food safety and consumer protection. The SPS measures aim to ensure food safety and protect human, animal and plant life and health. The TBT Agreement aims to achieve national security and prevent deceptive practices. A comparative study of the two Agreements reveals that both share certain common elements such as obligations for non discrimination, setting up of notification authority and establishing enquiry points to ensure transparency. The major differences between the two agreements are; the SPS Agreement is based on scientific assessment to
protect human, animal and plant life and health, while the TBT Agreement is based on geographical and technological factors to achieve national security and prevent deceptive practices. SPS can be applied on a provisional basis but this provision does not exist in TBT Agreement (Garg, 2004).

There are provisions under the SPS Agreement that recognize the rights of countries to protect themselves from SPS risks. It contains number of instruments such as risk assessment, principles of harmonization, equivalence, regionalization, transparency, notification, SPS committee and special trade concerns to achieve its objectives without causing trade barriers (Burnquist et al., 2004).

One of the important provisions of the SPS Agreement relates to the use of the Precautionary Principle. In the light of the European Commission (EC) ban on hormone treated beef from the US, John (2002) questions this principle because it is used irrationally to negate the competent scientific data. Sandin (2006) gives an overview of the arguments for and against the precautionary principle of the SPS Agreement advanced in the area of food safety. In regulatory as well as general context, there are several versions of this principle that approve the use of precautionary measures against a potential threat, even though the existence of threat is not scientifically certain. Objections to precautionary principle emphasize that it is ill defined, unscientific and incoherent. Its application would lead to increased risk taking. The article however emphasizes that food safety is the area that requires the application of precautionary principle.

Charlier and Rainelli (2002) analyze the approach of the WTO to the notion of assessment of risk on the basis of the WTO dispute between the EC and the US on the EC ban on hormone treated beef from the US. The stances
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of the Dispute Settlement Panel (DSP) and the Appellate Body (AB) bring out the differences in their interpretation of the SPS agreement. The DSP interprets article 3.1 of the SPS agreement in such a manner that the recommendations and standards of international agencies are to be treated as binding norms for the member nations when they frame regulatory standards. The AB interprets the SPS Agreement in such a manner that harmonization of sanitary measures must not undermine the autonomy of members to establish their own sanitary measures. The AB emphasizes the significance of scientific assessment of risk while enforcing regulatory standards by a member country. Based on the judgment of the dispute over the hormone treated beef, it is concluded that a SPS measure can be treated as a protectionist practice if a member country maintains it without conducting a risk assessment.

Bureau et al., (1999) review several international trade disputes that involve food safety and quality issues. In this context, an analysis of some conceptual issues is made. The SPS agreement requires the members to base their SPS measures on the assessment of risk. But there are different conceptions of risk ranging from risk elimination to risk control. Besides there is disagreement among the nations of the world on ethical and cultural quality attributes. These factors are responsible for differences in the food safety standards across the nations. The study reviews the economic analyses to deal with the above problem to define an optimum quality. This leads to certain areas where further research is required in the context of liberalization of international trade. These are the questions of adequacy of international standards, the influence of social standards and consumer preferences on setting of standards and the role of private standards on trade.

Poli (2004) examines the role of Codex Alimentarius Commission and its standards to ensure food safety and quality within the framework of WTO
legal system. Since national measures based upon food standards adopted by the Codex Commission are presumed to comply with the WTO, it offers incentives to WTO members to comply with Codex standards leading to harmonization of national SPS measures. This is illustrated with the classic examples of the WTO sardine case and the hormone treated beef case. In both of the above cases, the Dispute Settlement Body of the WTO used the standards of the Codex as the benchmark and found that the national standards were not compatible with the Codex standards. The finding is that Codex offered a forum to harmonize the positions of different countries that have divergent views.

Victor (2002) attempts to explore whether the operation of the SPS agreement has led to harmonization of national SPS policies. It also examines whether there has been tightening or weakening of national SPS policies due to the implementation of the SPS agreement. It is based on the 3 WTO cases: the EC’s ban on imports of bovine meat, Australia’s ban on imports of fresh and frozen salmon, and Japan’s ban on numerous varieties of fruits and nuts. The AB based its decisions in all the 3 cases on the assessment of risk. In all the 3 cases, the AB struck down the SPS measures by pointing out that the countries failed to impose measures based on assessment of risk. This shows that the AB has interpreted the original agreement as allowing greater flexibility for nations to set their own SPS measures based on assessment of risk. This indicates that the SPS Agreement has failed to harmonize national SPS levels and measures, but it has produced harmonization of national SPS procedures such as the requirement for the assessment of risk. This also encourages the national governments to increasingly apply the precautionary principle.
Guzman (2005) analyses the impact of the existing WTO dispute settlement framework with respect to food safety standards and quality issues on the world trading system. The researcher illustrates the WTO cases on hormone treated beef and Genetically Modified (GM) foods. In the case of the dispute on hormone treated beef, the EC’s decision to impose restrictions on the imports of hormone treated beef was found to violate the rules of the WTO. In the case on GM foods too, the EC is the defendant as it has imposed restrictions on the imports of GM foods. In this context, Guzman identifies two issues: the first is acknowledging regulatory sovereignty of a nation and the second is restricting the scope of protectionism. He approves regulatory diversity if the policy adopted by the nation reflects the preferences and priorities of the citizens rather than protectionist motives even if the policies can have an effect on trade. In the SPS context, it is observed that a losing defendant may prefer the cost of withdrawal of concessions by the winning counterpart over exposing to products that it considers potentially harmful to health and safety. This is illustrated by the case of the EC, which refused to lift the ban on imports of hormone treated beef despite losing the case at the WTO. In the case of the SPS Agreement, the tradeoff between more accurate domestic decisions and unbiased WTO decisions tilt towards domestic decisions.

Bingen (2002) examines how standards define the quality of our agro food system. He provides empirical evidence for developing a conceptual framework of agro-food standards. The issues focused are identification of participants in food safety negotiations, exploration of standards that can encourage or discourage access to markets, and analysis of the positive and negative outcomes of different standards. Case studies reveal that dominant roles of national public and governmental agencies in standard setting and
implementation have waned and private agro food standards are set by agri-business and multinational retail firms. The new standards exclude small and medium producers who fail to upgrade the facilities to meet new standards. So he asks for a value based standards setting as economy is embedded in systems of social norms and institutions.

1.4.2 Evolution of Quality and Safety Standards in Fish and Fishery Products Trade.

Slack (1971) traces the historical development of quality controls applied in fish and fishery products. According to him, the concept of quality control was well established towards the end of the 14th Century when the Dutch Government recognized the economic importance of applying improved methods of handlings of herrings for the purpose of shipping it throughout the Europe without the fear of deterioration.

Anderson (1971) is of the view that as fishery resources are not unlimited, further gains from the ocean will depend on better utilization of the harvest. Quality control and inspection are thus very important. Quality control involves prevention of spoilage and protection from contaminants and other influences. Quality control is to be exercised between capture and delivery to the processor and also during the stages of storage, transportation and distribution of the finished product. The conditions peculiar to the fish products vis-a-vis other food products like meat and poultry are highlighted; hence demanding a stricter quality control programme. It is found that fish are free from bacteria of public health significance when taken from water and contamination occurs at the time of handling and processing. He emphasizes that an effective quality control programme must take into account the basic principles of good sanitation and food hygiene and provide vigilant inspection of all handling and processing operations.
Jackson (1971) examines the importance of exercising quality control in fish and fishery products to ensure fuller and rational utilization of world fishery resources. On the basis of the data on the world fishery resources that emerged from various studies conducted by the FAO, the researcher has estimated the optimum technical and financial effort necessary for exploiting fishery resources. The estimates about the future market demand for fish also suggests that there is a need for fuller and rational utilization of fish resources. The author also points out that with the increasing importance of fish products in international trade, the existing differences in quality requirements of fish products will be eliminated and will lead to general application of modern food processing technology, plant sanitation and food hygiene.

There are some fundamental differences in grading fresh fish and fresh meat. The characteristics of meat at the time of slaughtering determine its grade and quality and post mortem deterioration is not considered at the time of grading. But in the case of fresh fish, many of the systems of grading are based on the extent of post mortem deterioration, overlooking the influences of physiological and environmental factors on the quality of fish. The seasonal factors affect the quality of fish as bacterial break down takes place quickly in the summer caught fish. It is stated that quality of fish is to some extent determined by the physiological conditions at the time of catching and the significance of this quality is different for fresh and frozen fish (Castell, 1971).

Rajasenan (2005) states that the demand for stringent and hygienic standards in the production and processing facilities of fish and fish products greatly increased, after the stipulation of Hazard Analysis and Critical Control Point (HACCP) in 1993 by the USFDA. The safety standards and quality regulations framed by the EU also enhanced the need for implementation of
standards and hygiene at various stages of supply chain of fish and fishery products.

Huss et al., (2004) examine the approaches in place to ensure the safety and the quality of fish and fishery products. The traditional approach to food safety and quality is based on the application of codes of Good Hygienic Practices (GHP) and Good Manufacturing Practices (GMP). In contrast to the traditional approach, HACCP system identifies food safety problem and also where and how they can be controlled. HACCP system is a measure used to enhance food safety. The safety of the seafood products are based on factors such as the origin of fish, microbiological ecology of the product, handling and processing practices and preparation before consumption. Seafood products are categorized into different groups based on the above factors. HACCP plan is prescribed for different categories of fish like molluscan shell fish, fully cooked fresh or frozen fish and crustaceans, lightly preserved fish products, fermented fish, semi preserved fish, mildly heat processed, heat processed or sterilized and dried and heavily salted fish to deal with significant hazards.

Ababouch et al., (2004) explain the basics of microbiological and chemical risk assessment for sea foods. It outlines the basics of risk assessment, how to perform risk assessment (stepwise progression) and how to use risk assessments (risk management and HACCP). It can be used as a working tool that allows systematic ranking of the risks associated with different sea food product categories. Risk assessments can be qualitative and quantitative risk assessment. Qualitative risk assessment is based on factors such as likelihood of occurrence and severity of hazard. Every HACCP plan employs qualitative risk assessment in the HACCP worksheet. Quantitative risk assessments are done for specific purposes and provide numerical risk estimates to answer the questions that are posed by the risk managers.
The aforementioned literatures discuss the evolution of regulations and standards on traded food products including fish and fishery products, the need for such regulations, the issues of quality, the concept of risk and its assessment, the systems that are in place to ensure quality and safety standards based on risk assessment. As these food safety standards and quality regulations imposed on food products can have a bearing on the trade in food products, it is necessary to study the impact of such measures on trade. A review of existing literature is made to measure the impact of such NTMs on trade in food products.

1.4.3 Methodologies on Measurement of Effects of NTMs on Trade

A number of economic models have been developed to examine the impact of non tariff barriers (NTBs) on international trade in food products. Henson and Loader (2001) cite several studies that acknowledged that SPS measures can act to impede trade in agricultural and food products (Petrey and Johnson, 1993; Ndayisenga and Kinsey, 1994; Sykes, 1995; National Research Council, 1995; Hillman, 1997; Thilmany and Barrette, 1997; Unnevehr, 1997; Digges, Gordon and Marter, 1997; Jaffee, 1999). Henson and Loader (2001) classified the impacts of SPS measures on trade into 3 groups: 1) a measure that can prohibit trade by imposing ban or by increasing production and marketing costs, 2) measures that can divert trade from one trading partner to another due to discrimination across potential suppliers, and 3) measures that reduce overall trade by increasing costs and raising barriers.

There are several methodological approaches to evaluate the impact of the SPS Agreement on agricultural trade. All these approaches attempt to measure NTBs either by regarding residuals from the estimated regression as representing NTBs or by using various dummy variables. The models used are reduced form
models, comprehensive general equilibrium frameworks, price wedge analysis, gravity models, risk assessment approaches to cost benefit calculations, inventory approach etc. (Beghin and Bureau, 2001; Burnquist et al., 2004).

A fuller analysis of the effects of SPS restrictions on domestic industry and consumers is made by James and Anderson (1999). They employ partial equilibrium framework to explore the economics of quarantine policies. An empirical analysis of Australia’s ban on import of banana suggests that a move to free trade may cause a contraction of banana growing in Australia, but the economic welfare gains to consumers are certain to outweigh the losses to producers. A movement from autarky to either a free trade or a partially quarantine restricted trade, assuming zero disease entry is likely to produce net gains in economic welfare.

James (2000) uses an economic model to study the effects of hormone treated beef ban imposed by the EU and its removal under certain conditions. The partial equilibrium analysis reveals that the EU would be better off if the ban on hormone treated beef is lifted and a costless labeling scheme is introduced. It considers how the analysis changes if the market is segmented such that there are two separate demand curves for two types of beef; hormone free beef and hormone treated beef. If the ban is lifted, and hormone treated beef is available, hormone indifferent consumers would buy it, as it is cheaper. The quantity of the hormone free beef consumed falls, but the total quantity of beef sold in the EU increases resulting in net gain. It also examines the legitimate role of economics under the SPS Agreement. It outlines the weaknesses of using economic analysis to justify SPS measures. When advocating an economic analysis, it should be kept in mind that the economic efficiency test will not always yield trade liberalization recommendation and is not a legal basis for a SPS measure under the SPS Agreement. However using
economic analysis in risk management decisions will improve the efficiency of SPS policies and promote the balance between achieving gains from trade reform and protecting human, plant and animal health.

The phyto sanitary barriers imposed by Japan on the apple imported from the US are quantified by calculating the tariff rate equivalents. Trade as well as welfare impact of removing phyto sanitary barriers and tariffs are examined under two assumptions on transmission of the bacterial disease, fire blight. If welfare effects of removing the technical barrier to trade are examined under the assumption that fire blight cannot be transmitted, there arises net gains from trade. However if it is assumed that fire blight can be transmitted, the size of gains from trade depends on the extent of reduction in yield due to disease. Their major finding is that technical barriers in Japan on an average are more important than tariffs in deterring trade (Calvin and Krissoff, 1998).

An analytical framework is developed by Bureau et al., (1998) based on the EU-US trade dispute on beef treated with hormone in order to compare the welfare effects under the conditions of autarky, trade liberalization without labeling and trade liberalization with labeling in the case of credence goods. It is found that coexistence of imported and domestic product due to trade liberalization may enhance consumer’s imperfect information about quality. This leads to market inefficiencies linked to adverse selection, such as decrease in demand and potential exclusion of a higher quality from the market. It is suggested that the possible welfare losses caused by imperfect information must be measured against the welfare gains resulting from increased competition, international specialization according to comparative advantage and increase in product diversity. It emphasizes that cost benefit analysis should be the fundamental criterion to evaluate sanitary and phyto sanitary measures and technical barriers.
A model so widely applied to examine the trade effect of strengthening of food safety standards and regulations on food products is the gravity model. The quantum of trade between the nations depends on the explanatory variables such as the size of the per capita gross domestic products of the exporting and importing nations, distance between the nations, and other specific variables added in the equation to capture the effects on trade. The gravity analysis employed gives results that suggest that the strengthening of standards and regulations does produce adverse impact on the exports of food products from developing nations (Otsuki et al., 2001; Wilson et al., 2003; Babool et al., 2007; Yunus, 2009).

The review of the above literature shows that there are alternative methods to measure the impact of NTMs on trade. Both partial and general equilibrium analyses have been employed to analyse the impact of NTMs on trade. Methodologies such as Inventory Approach, Price Wedge Approach, Methods of Subsidy equivalents, Trade Restrictiveness Index, Gravity Models, etc. purely focus on the impact of these NTMs on trade. But the Cost Benefit method employed is capable of analyzing the impact of NTMs on trade as well as welfare. Literatures dealing with the specific issues faced by the developing nations in the wake of tightening of the safety standards and quality regulations in the import markets of developed nations are examined. Further it also analyses the response of the seafood exporting companies to meet the new requirements.

1.4.4 Effects of NTMs on Trade with reference to Developing Countries

A number of studies examine the concerns and challenges faced by the developing countries in the wake of the SPS measures adopted by the importing nations. These studies throw light on some of the problems
encountered by developing countries in enforcing and implementing quality standards. A number of studies have attempted to assess the impact of SPS measures on the exports of food products from the developing countries. SPS measures are claimed to be an impediment to exports of fish (ESCAP, 1996; Josupeit, 1997; Cato, 1998); spices (UNCTAD/Commonwealth Secretariat, 1996); oilseeds, oils and fats (FAO, 1998); livestock products (FAO, 1994; Petrey and Johnson, 1993; Colby, 1997; Johnson, 1997); and horticultural products (Giles, 1997; Kortbech-Olesen, 1997; Gilmour and Oxley, 1998; Sullivan, Sanchez, Weller and Edwards, 1999). Developing countries find it difficult to meet the quality standards prevalent in the developed countries due to differences in the quality and safety requirements maintained by them.

Mayeda (2004) evaluates the benefits of legal harmonization within the framework of international trade law with a particular focus on the effects on developing countries. Legal harmonization is justified on the basis of normative perspective. A concrete conception of procedural justice that ensures the involvement of all individuals and groups in deliberation oriented towards consensus building create benefits for marginalized interests. This protects the interests of the developing countries that are frequently marginalized. In the analysis of the SPS and the TBT Agreements, the institutional approach to legal harmonization enables to recognize the need to accommodate local differences. The article examines the tools available within the WTO system for accommodating the different institutional challenges confronted by the developed and developing countries. From the perspective of an institutional paradigm supported by a procedural conception of justice, both international and domestic institutions can be improved to make developing countries better informed and to rectify imbalances in decision making power between developed and developing nations in order to make
these countries more free to choose regulatory schemes that accord with their domestic policy goals.

Organisation for Economic Cooperation and Development (OECD, 2005) analyses the NTBs that are of concern to developing countries, especially by non OECD countries. It relies on data on notifications of NTBs by the non OECD countries to the WTO negotiating group on NAMA, trade disputes brought to the WTO and the tribunals of the Regional Trade Agreements (RTAs) and surveys of the private companies. Based on the above data, the NTBs that are of concern to the developing countries in the North-South trade and the South-South trade are identified. In the trade with developed countries, the NTBs that are primarily applied are customs and administrative procedures, technical barriers and SPS measures. The NTBs that are primarily found in the South-South trade are trade remedies, customs and administrative procedures and charges on imports. The NTBs applied are found to vary among product groups. The NTBs applied to live animals are SPS measures and customs related procedures. In the case of prepared food stuffs, the major NTB applied is technical regulations.

The impact of environmental standards and the SPS measures on the trade of the developing countries in the South Asian region is analyzed (Jha, 2002). The effects of TBT and SPS measures on trade from South Asian countries are examined on the basis of empirical evidence. The finding is that the general problems faced by the South Asian countries are the inability to participate in setting of standards, lack of technical expertise, financial constraints and the complexity of the SPS standards in the export markets. It also explores the impact of the SPS measures on specific products such as rice, mango pulp, peanuts, spices, tropical beverages and marine products. Analysis of the data obtained on the basis of interviews with the exporters, industry
associations, government officials etc. reveals that cost of compliance with the international standards is found to be high in all the selected South Asian countries. Certification cost, especially inspection and testing costs are beyond the reach of small and medium enterprises. Besides that, the compliance with the stipulated standards is not a sufficient condition to get higher prices in the export markets.

Burnquist et al., (2004) examine the trade effects of the SPS Agreement on developing countries. They bring out the problems that are prominent in the developing countries. Information, a critical factor in the implementation of the SPS Agreement is under-supplied in the LDCs. Other problems include high implementation costs, insufficient access to technical and scientific expertise, incompatibility of SPS requirement with domestic production and marketing methods.

The specific problems that developing countries face in meeting the SPS requirements are identified and spelt out by Henson and Loader (2001). Tariff liberalization in international trade is accompanied by a proliferation of technical measures such as food safety regulations and labeling requirements that can act as an impediment to trade. To understand the problems faced by the developing countries, a series of in depth case studies of 10 countries was undertaken. It revealed that the products for which SPS requirements created a significant problem were meat/meat products, fish/fish products and fruit and vegetable products. The case studies suggested that the major problems faced by the developing countries were insufficient access to scientific and technical resources and incompatibility of SPS requirements with domestic production and marketing methods.
Athukorala and Jayasuriya (2003) review the issues related to the trade effects of food safety standards on developing countries. The SPS standards are less transparent and are used as an instrument of protection by the developed countries. The specific problems encountered by the developing countries are resource, manpower and institutional constraints. Besides SPS standards diverge considerably across importing countries, making compliance more costly for exporters. Export value per detention (total dollar value of exports divided by number of detained shipments) is used as a relative measure of inter country differences in the ability to meet SPS standards. In a comparison among the countries, a higher numerical value of the ratio would suggest a better performance in meeting standards. The figure was $2.3 million, $1.16 million, $1.15 million for developed, upper middle income and low income countries respectively. Another finding is that large companies are better placed to undertake additional investments needed to meet international SPS standards.

In the light of tightening of food safety requirements in the EU, Doherty (2004) examines the problems faced by the food product exporters of Africa. The problems peculiar to African agricultural product exporters owing to the imposition of the SPS measures by the EU are identified. African countries are unable to meet the farm to fork approach insisted by the EU on the imports as they lack an effective overall food safety framework. Lack of coordination among the government departments entrusted with the responsibility of ensuring food safety, lack of credibility in local certification, absence of institutional capacity building, limited role of governmental and private agencies in the international standard setting and the lack of private sector initiatives in improving the quality of national products are issues encountered by the agricultural exports from Africa. The aforementioned problems have enhanced
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the cost of compliance and stood as NTBs to the export of agricultural products from Africa.

Dey et al., (2005) examine how the rising consumer concern about a range of food safety matters and increasingly stringent regulatory standards related to fish product pose challenges to the sustained international market access of many developing country suppliers. It reviews the implementation of various food safety measures by the major fish exporting countries in Asia. It also analyses the costs and benefits of implementation of these measures in these countries. Results show that at the factory level, implementation of the standards has significantly increased the cost of processing and the cost per unit of fish processed is higher for the smaller plants. These economies of scale could exclude small operators in developing countries. Continued competitiveness of small plants would seem to require government policies and support designed to minimize the cost of compliance with international standards.

The impact of quality and safety standards imposed by the OECD countries on the exports of fresh and perishable agricultural and fishery products from the developing countries is analysed by Willems et al., (2005). It makes a comparative analysis of supply chain for fish and fishery products and other food products such as fruits and vegetables. Data are obtained from the survey of producers and exporters in the developing countries and also from the survey of the buyers in the importing countries. Some of the major findings are the following. In response to several food scandals that shook Europe, the public and private sectors imposed tighter food safety requirements. A major problem faced by the producers or exporters of fruits and vegetables is the differences in standards and regulations imposed by the different member nations of the EU. But the food safety regulations for
imported fish are harmonized within the EU. It is also found that retailing sector is the major driving force behind the emergence of private sector food safety and quality standards in the case of fruits and vegetables. This is not true in the case of fish and fish products because the main market outlet for fish and fish products is the wholesale sector. But the number of food safety problems in the fish sector is significantly higher than the problems in the fruits and vegetables sector. The buyers’ priorities are found to be the volume, reliability of supply and price of the product. A major finding with regard to the cost of compliance is that producers and companies operating in the different types of supply chains face different costs of compliance due to different levels of organization and operation.

Greenhalgh et al., (2004) examine the impact of liberalization of trade in fish and related issues such as the application of SPS measures, eco labeling, subsidies and anti-dumping measures on different categories of stakeholders in the fisheries sector of the developing countries. Case studies have been conducted in Bangladesh, India, Uganda, Viet Nam and Guinea. Some of the major findings pertain to the impact on exports, employment and cost of compliance in fisheries sector of these developing countries. Analysis of exports of fish and fishery products from Bangladesh, India and Uganda reveals that the application of SPS measures on the exports of fish has adversely affected the industry. In Bangladesh and Uganda, the export ban and the required quality improvements led to the closure of several small plants leading to loss of jobs. Besides, the auxiliary industries such as packing, fish net manufacturers, the transport industry were also affected. In India, the EU’s requirements on the integration of processing and preprocessing operations led to the loss of job opportunities for the female workforce. The industry that was worst affected was the trawling industry of Kerala as their
operations were focused on the export species. In the case of Viet Nam, the value of fish exports in 2003 experienced a decline due to the impact of the anti-dumping tariff imposed by the US. In Viet Nam, the anti-dumping duty imposed by the US led to the loss of employment among the workers in small scale fish farm households, as well as processing plants, the majority being women. Another significant impact of application of SPS measures is on the cost of compliance. The cost of compliance to meet additional requirements was found to be high in all these developing countries.

Jaffee and Henson (2004) examine the changes that take place in the environment of standards and their impact on existing and potential exporters of high value agricultural and food products in developing countries. They however make a significant departure from ‘standards as a barrier’ perspective to ‘standards as a catalyst’ perspective in the context of developing countries. Developing countries face capacity constraints in meeting quality standards. They are administrative, technical, scientific and regulatory capacities. In discussing effects of standards on trade, the authors not only adopt traditional approach of using quantitative measures of changes in trade such as the data on agricultural and food product detentions by industrialized countries and the number of complaints that have been recorded in the SPS Committee, but also present some illustrative case studies. These case studies analyze the losses or gains from trade arising due to international food safety and regulatory standards within the context of wider supply chain challenges. These case studies on Kenyan exports of Nile Perch, Guatemalan exports of raspberries and exports of Peruvian asparagus reveal that the key question for developing countries is how to exploit their strengths and overcome their weaknesses such that they are gainers.
The food safety standard prescribed by the industrialized nations serving as a catalyst is supported by another study conducted by Fredriksson and Wendel (2005) with reference to seafood exports from Morocco. An evaluation of institutional framework in place in Morocco to ensure food safety and quality reveals that the government adopted a strategy of compliance. The impact of food safety standards on Moroccan seafood industry is analysed based on secondary data on volume and unit values of seafood exports of Morocco and a survey of the seafood export units of Morocco. An examination of volume, value and direction of exports of various forms of fish products reveals that exports of canned sardine, semi preserved products, and fresh fish exhibited a rising trend in terms of volume and unit value. The decline in the volumes of frozen fish is attributed to the exhaustion of cephalopod populations while the fluctuations in the unit values of different types of frozen products during the study period is an indication of variations in the forces of demand and supply rather than the evolution of quality standards. Analysis of the direction of exports shows that the EU still remains a major importer of the Moroccan seafood products especially in terms of value. Thus it can be concluded that despite the sharpening of food safety standards in the industrialized markets and Morocco being a relatively poorer developing country, its seafood exports sector has not been adversely affected. Thus Moroccan example can be cited as an evidence for standards as catalyst view rather than barrier view.

The potential impact of the food safety standards on the ability of the developing countries to gain and maintain access to markets of the industrialized countries are analyzed by Henson and Jaffee (2007). They outline how the proliferation and increased stringency of food safety creates a new landscape that can form a basis for the competitive repositioning and
enhanced export performance of developing countries. However institutional weaknesses such as lack of administrative, technical and scientific capacities and recurring compliance cost create problems for developing countries. The authors use the conceptual framework developed by Hirschman to characterize alternative strategic responses to food safety standards. It is apparent that the best strategic option for developing countries is to combine voice with proactivity. But a study of data on number and nature of complaints and counter notification made through SPS committee reveals that among the developing countries, only a small number of middle income countries adopted this approach. The paper presents the national compliance strategies for fish and fishery products for India and Kenya. In both countries the dominant strategic responses to emerging food safety standards in fish products were reactive and loyal by the government and private sector. The hygiene and antibiotic controls were upgraded in response to the regulatory standards enforced by the EU. In Kenya little action was taken until inspections by the EC, while in India the government had undertaken some reforms to its regulatory framework though insufficient. Across both India and Kenya there were examples of exporters that adopted enhanced food safety standards proactively but represented a small part of the total industry.

Gebrehiwet et al., (2007) attempt to quantify the impact of the SPS regulations imposed by the OECD countries on the exports of food products from South Africa. Their main objective is to estimate the amount of food exports from South Africa that is foregone due to aflatoxin standard set by 5 OECD countries. Gravity model is employed to analyse the effects of NTBs on trade. The regression variables specified in the gravity model are population as well as the GDP of both exporting and importing country, distance between the countries and the total aflatoxin standards set by the
importing country. The findings support the hypotheses that stringent SPS standards are limiting trade markedly. Moreover the simulation result based on the assumption that the OECD countries adopt the total aflatoxin level recommended by the Codex, shows that South Africa would have gained an estimated additional amount of US $ 69 million per year from food exports to these countries during the period of 1995 to 1999.

Donovan et al., (2001) present a case study that examines how the level of food safety in the domestic market is affected by the foreign regulatory standards imposed on the fish product processing industry in Brazil. This is done by analyzing national data and firm level data. This study shows that to date in Brazil, the adoption of HACCP systems has been concentrated in the export sector, with only small impact on domestic standards and food safety levels. To evaluate the relative importance of the export market in processors’ decisions to implement HACCP, they compared adoption rates between firms that were and were not on Brazil’s export roll. The HACCP adoption rates for plants that were on the export roll were 38.6 percent while it was just 9.3 percent for firms not on export roll.

In the late 1990s, the EU imposed repeated bans on fish imported from Uganda on the basis of food safety concerns. A case study of the Nile perch export industry of Uganda in the context of strict food safety standards is conducted. Information is collected from various quarters such as government officials, logistics, cold storage providers, locally based fish importers, trainers, certifiers, lab operators through interviews. The EU import bans had wide ranging effects on Uganda’s fish export industry. It led to lower fish exports and loss of export revenue. It also led to the closing down of 3 plants and less than full capacity utilization of the remaining plants. At the same time, compliance with the EU standards by the Ugandan fish industry in
reaction to import bans resulted in some positive effects. They are streamlined regulation with a strengthened competent authority under one roof, the formulation of a new fishery policy, improved monitoring and inspection systems, regional efforts for harmonization of handling procedures in 3 countries sharing Lake Victoria; Uganda, Tanzania and Kenya, upgradation of small number of landing sites and plans for upgrading a substantial number of others, upgrading of processing plants, procedures and design, increase in the number of processing plants compliant with HACCP, and improved export performance and access to the US market (Ponte, 2007).

Sawhney (2005) explains the Indian experiences in meeting the food safety challenges in the export sector in the context of structural and institutional changes taking place within the country. Government took steps to enhance the credibility of India’s pre-shipment inspection and certification agency. The economic impact of imposition of food safety standards on Indian sea food processing industry which comprises both large and small firms is analysed. This has been done in two ways: firstly by studying the cost of compliance with the new standards in large as well as in small fish processing units. The firms have identified that the best strategy to cope with technical lag and market access problems in export markets is to build up international technical partnership and joint venture agreements. Secondly by analyzing the trends in the destination pattern of India’s marine fish product exports during 1990-2001. Since the second half of the 1990s, markets such as China and Thailand have emerged as important importers of India’s marine product exports. The smaller seafood processing facilities that failed to obtain approval for the European markets are catering for the lower end South Asian markets.

Mehta and George (2003) study the processed food product industry of India and examine the impact of the application of SPS measures on a few
select product lines such as poultry products, marine products, mango pulp, peanuts and mushroom. The case studies conducted reveal that SPS measures affect the exports of all the above processed food products from India. The presence of NTBs is ascertained on the basis of the data on detentions of consignments of food product exports from India. Another implication of the implementation of the SPS measures is the need for introduction of capital intensive technologies by the processors imposing financial constraints. A contrasting picture in the exports of poultry products and marine products is made. In the former, the imposition of stricter food safety standards led to the close down of 3 egg powder units and reduction in capacity utilization of almost all units. In the case of marine product exports, it was observed that following the imposition of stricter SPS measures by the EU and the US, the exporters have explored alternative markets and the realized unit value of exports has declined.

The impact of the SPS measures and ecolabeling measures on the exports of shrimp from Bangladesh with focus on the stakeholders in the sector was studied by Khatun (2004). The methodology used is participatory as it employs field level survey accompanied by focus group discussions, individual case studies and personal observations. Analysis of the impact of implementation of the SPS measures on the shrimp industry has brought out that it has adversely affected the economic conditions of farmers, transporters and processing workers. However, the impact of the SPS measures on the processing factories was short term and they could recover the initial losses. Implementation of the SPS measures has also increased the foreign exchange earnings of Bangladesh from the exports of shrimp. In the absence of actual information on the impact of ecolabeling, the study undertakes a tentative estimation of cost and benefit associated with its implementation. It concludes
that SPS measures and eco labeling measures serve as NTBs on shrimp exports from Bangladesh affecting the livelihoods of various stakeholders in the supply chain.

Deb (2006) examines the types of NTBs imposed by the developed and developing countries on agricultural imports from LDCs such as Bangladesh and Cambodia. The product specific incidence of NTBs for all major commodities of export interest to Bangladesh and Cambodia are analyzed using the procedure of frequency index followed by the UNCTAD. A major finding of the study is that the exports facing NTMs as a percent of total exports to the EU, the US and Japan were 91, 94 and 68 percentages respectively. Non-traditional NTMs such as the SPS and the TBT and related measures were the most prevalent accounting for a sizeable share in the EU (96 percent), the US (95 percent) and in Japan (64 percent). The impact of the SPS and the TBT measures are categorized into short term, medium term and long term. The short term negative effect due to the ban on fish product exports from Bangladesh resulted in net losses. But the medium to long term losses arose from market diversion and erosion in prices offered to the exporters. Besides the upgradation of facilities and equipments to meet the stipulated standards enhanced the cost of compliance.

Henson et al., (2005) analyse the impact of SPS measures on the fish and fishery product industry of Kerala. On the basis of the secondary data on the exports of fish products from India, they observe a decline in the value of exports to the EU from Kerala and India in the wake of the export ban imposed by the EU. A survey of the processing plants based on the their recurring and non recurring costs of compliance, size of operation, capacity utilization, and prevailing hygiene standards give the following results. The upgrading of hygiene standards has imposed considerable non- recurring and
recurring costs on the fish processing sector. The investment imposed hardship on processors especially those operating at low levels of capacity leading to the exit of a number of processors from the industry. The imposition of stricter safety standards by the EU and the consequent controls implemented by the Government of India had the greatest impact on the preprocessing sector leading to the closure of a number of independent preprocessing operations.

Kulkarni (2005) examines the impact of regulatory standards imposed by the EU and the US on the Indian seafood export industry. He examines in detail the seafood supply chain in India that consists of fishermen, commission agents, supplier and exporter and also their functions. It relies on the information obtained from the exporters and the regulatory agencies. The finding is that the EU and the US product regulations have a negative effect on seafood exports compared to process regulations since the severity of import regulations are based more on precautionary principles rather than actual foods safety concerns. Besides Indian seafood export industry requires a bottom up approach starting from the lowest actor of the supply chain to ensure better quality and safety. Infrastructural constraints pose problems in the implementation of HACCP and GMPs. It identifies critical concerns at the bottom of the chain by studying the four landing sites in Mumbai and Cochin. This brings to light the infrastructural problems at the natural beach ports and constructed ports.

Oyejide et al., (2000) attempt to analyze the effects of the SPS measures on trade in agricultural and food products with reference to Africa. A comparative study of the NTBs faced by the exports of food products from African countries in the major export markets of the US, the EU and Japan reveal that, the US has the least number of NTBs, the EU has high number of
NTBs and Japan has the highest concentration of NTBs. Another major finding is that the incidence of SPS measures was higher for processed and semi processed agricultural products than for those in the raw form. To quantify the effects of the SPS measures on trade in food products with reference to Africa, it is necessary to consider the cost of complying with the standards. But in the context of Africa, the costs of meeting the standards not only include compliance cost at the firm level, but also the macro costs of services provided by the public agencies. In fact the macro cost associated with compliance with the SPS measures in African countries are significant. They suggest that in order to fully capture the impact of the SPS measures on African export of processed agricultural and food products, it is necessary to design a data gathering methodology that covers both the firm level and macro cost elements.

Loc (2003) cites the study conducted by Than Thu (2001) on the problems faced by the seafood companies of Viet Nam in the main export markets. The SWOT analysis is used to judge the state of Viet Nams’ seafood exports to the foreign markets such as the US, the EU and Japan. The major threats faced by the Viet Namese seafood companies in the 3 export markets are high competition from other fish product exporting countries such as Thailand, India, and Bangladesh as well as very strict quality control requirements in the US, the EU and Japan. However the strengths of the seafood companies of Viet Nam are the improvement in the quality of seafood products and product and market diversification.

The quality issues involved in the seafood supply chain in Mekong Delta, Viet Nam are analysed by Loc (2003). A survey of the heads of quality control in the seafood companies in the region brings out the following results. About 96.9 percent of the seafood companies surveyed have implemented the
HACCP system. But the HACCP has not been implemented in all the stages of supply chain such as hatchery production, farm production/capture fisheries, collectors or wholesale buyers and the distribution stage. There are some deficiencies in the supply chain of shrimp products in Viet Nam. The first deficiency is the inability of seafood company management to exercise quality control in the primary stage of production. Thus it cannot control the quality of shrimp materials delivered from the farmers to the company via the collector and wholesale buyers. The other deficiency is that the seafood companies have only knowledge of customer information and quality requirements from the import companies or other common communication sources and have no access to information specific indicators on TBT and sanitation performance standards. This necessitates the intervention of the government to correct the deficiencies in the supply chain.

1.4.5 Factors Affecting the Adoption of Quality Control Programme in Firm/Industry

Jayasinghe et al., (2006) assess quantitatively the economic incentives for the firms to adopt food safety controls. They focus on the red meat and poultry processing sector in Canada. A two stage research program was conducted. The stage one helped to identify 10 specific incentives for firms to implement enhanced food safety controls. Stage two was designed to quantify the extent to which the identified specific incentives influenced the propensity of firms to implement enhanced food safety controls. The major finding is that anticipated sales and the reputation of the firm are the predominant drivers behind the food safety responsiveness of plants in the Canadian meat and poultry processing industry. Another strong motivating factor is good practices. The results indicate that government regulations and liability laws have a negative impact on food safety responsiveness. This creates challenges
for regulators in defining policy instruments that promote greater levels of food safety control in the food processing sector.

The correlation between the characteristics of the firm and the adoption of food safety and quality assurance practices are examined by Herath et al., (2007). This study is done on the food processing sector of Canada. The results from binomial logistic regressions indicate that characteristics of firms are closely associated with the adoption of enhanced food safety and quality assurance practices. The firm size and industry subsector have a much more pronounced effect on the probability of adopting HACCP alone or in combination with other food safety and quality assurance practices than the other firm characteristics. The other characteristics that influence the adoption of standards are level of innovativeness and the level of export orientation of the firm.

Suwanrangsi (2002) examines the implementation of HACCP based programme in seafood processing industry of Thailand. Data on exports of seafood products from Thailand to various markets are used for analysis. The major markets for Thai seafood products are Japan, the US, the EU, Canada, Australia and new markets such as China, Korea, the Middle East, South Africa, Argentina and Brazil. The major factors that hinder the implementation of HACCP are high financial costs, especially for small scale and traditional product producers, lack of technical and trained personnel, differences in the stipulation of standards in various export markets, insufficient audits due to lack of familiarity about the procedures and resource constraints. The research also throws light on some unresolved issues such as the extension of the quality control programmes to primary production, small scale firms and the firms focusing on the domestic market.
Survey of the existing literature has brought out some of the issues affecting the international trade in fish and fishery products. It is evident from the review of existing literature that since the latter half of the 1990s, there has been an increase in the application of NTMs especially, safety and quality standards and other technical requirements on the imports of food products in general and fish and fishery products in particular. It can also be found that most of the NTMs imposed on the imports of fish and fishery products are by the EU, the US and Japan; the 3 major import markets for fish and fishery products. The quality and safety standards and other regulatory and technical requirements placed on the imported fish and fishery products in these markets are very stringent. These requirements had profound implications on fish and fishery product trade of developing countries. The existing literature evaluates the impact of the food safety standards, quality regulations and other NTMs on the exports of fish and fishery products from several developing countries of Asia, Africa and Latin America. The studies also discuss on the methodologies used to measure and quantify the effects of NTMs especially SPS measures on trade in food products.

Since fish and fishery products comprise an important place in the export basket of India and Kerala, it is necessary to analyze the impact of such aforementioned developments on our marine product exports. This is especially relevant because traditionally, the major markets for the marine fish and fishery products of India and Kerala had been the EU, the US and Japan. As has been stated earlier, these markets had been strengthening the quality standards and regulatory requirements on the imports of fish and fishery products coming into their markets. In this context, it is essential to examine the impact of these measures imposed by the EU, the US and Japan on the marine product exports of India and Kerala. This is also an attempt to explore whether the food safety standards and quality regulations applied on fish and
fishery product imports are meant to ensure quality or are they erected as NTBs to limit trade. Following are the objectives of the study.

1.5 Objectives

1) To identify the non tariff measures, especially the quality and safety standards and other regulatory requirements encountered by the marine product exports from Kerala in the major markets of the EU, the US and Japan.

2) To analyze the market wise exports of marine products from India and Kerala in terms of quantity and value in the pre and the post WTO periods.

3) To study the measures adopted by the government and seafood export industry to comply with the new requirements in the import markets.

4) To examine the costs and benefits of the implementation of standards for the marine product export industry of the state.

1.6 Hypotheses

Following hypotheses have been developed.

1) Country wise safety standards affect the marine product exports from India.

2) The institutional set up in force helps in overcoming the SPS stipulations.

1.7 Theoretical Framework

The theory of international trade advocates that free trade is the most benign as it enhances the welfare of the world. Economists belonging to
various schools of thought beginning from the English Classical school proved the significance of free trade in the promotion of the welfare of the world. A number of theories can be traced that attempted to explain the reasons for international trade and its consequent gains. These include Smith’s Absolute Advantage model (1776), Ricardian Comparative Advantage model (1817), Haberler’s Opportunity Cost Theory based on Ricardian analysis (1933), Hecksher-Ohlin Factor Endowment theorem (Hecksher, 1919; Ohlin, 1933), Samuelson’s Factor Price Equalization theorem (1948), etc. The more recent developments in the arena of international trade are the theory of intra-industry trade that focuses on trade in imperfect markets.

However, policy interventions in trade in the form of tariffs and NTMs have been pursued by nations to achieve certain objectives such as protection of infant industry, strategic industry, other socio-political reasons etc. A framework for assessing the impact of both tariffs and NTMs on the imports of commodities has been developed in the arena of international trade.

1.7.1 Definition of NTMs

Commercial trade policies can be classified into tariffs and NTMs. NTMs have been defined variously by several economists. Francois and Reinert, 1997 observe that the most theoretically satisfying definition on NTM is the one given by Baldwin (1970a). Baldwin defines non tariff distortion as any measure (public or private) that causes internationally traded goods and services or resources devoted to the production of these goods and services, to be allocated in such a way as to reduce potential real world income.

Laird and Vossenaar (1991) have classified NTMs according to intent or immediate impact of the measures. They identify 5 categories such as
measures to control the volume of imports (quantitative restrictions, Export Restraint Agreements), measures to control the price of imported goods (variable levies, anti-dumping duties, countervailing duties etc.), monitoring measures including price and volume investigations and surveillance (licenses), production and export measures either directly applied to output or indirectly applied to inputs in the production process (subsidies) and technical barriers (standards for health, safety reasons etc.).

The effects of trade measures can be classified into price and quantity effects on trade and production, employment effects and welfare effects. Among the aforementioned NTMs, anti-dumping duties, countervailing duties etc. have an impact on the prices of imports, while quotas and Voluntary Export Restraints (VERs) affect the quantity of imports. However, technical barriers, standards and regulations imposed on imports operate either way and produce effects on both quantity and price.

1.7.2 Measurement of NTBs.

A number of measures have been developed to measure the impact of NTMs on international trade. Following approaches to measure NTMs have been outlined in the works of Baldwin (1989); Francois and Reinert (1997); Beghin and Bureau (2001); and Deb (2006).

Inventory Approach to NTMs has been developed to estimate the extent of trade covered by NTMs or their frequency of application in specific sectors or against individual countries or groups of countries. The percentage of trade subject to NTMs for an exporting country is given by the trade coverage ratio while the percentage of import transactions covered by a selected group of NTMs for an exporting country is the frequency index.
Modeling Approach is a more comprehensive approach to quantifying the effects of trade barriers. Models are designed to capture the quantity effects of trade measures and derive a price effect. Cross country or cross commodity regression techniques are used within the model designed to explain trade (Leamer, Stern 1970). Feenstra (1988); Laird and Yeats (1990); and Hufbauer and Schott (1992) designed models to examine the effects of NTMs.

Tariff equivalent or the price wedge approach is widely employed by the economists such as Baldwin (1975); Bhagwati and Srinivasan (1975); and Roningen and Yeats (1976). Price wedge is the difference between the free world price of a product and the domestic price which is protected by NTMs.

The method of subsidy equivalents is used to measure the transfers that are a result of government policies to producers. It is measured by the direct and indirect government expenditures to producers or by imputing the effects of policies by calculating the difference between actual domestic prices and what they would have been in the absence of trade interventions.

The Trade Restrictiveness Index (TRI) developed by Anderson and Neary (1991) is defined as the uniform tariff equivalent of the consumption and production distortions. TRI is used to measure the change in the restrictiveness of trade policy overtime for a single economy or sector of an economy, i.e., comparing two distorted situations rather than comparing against the free trade benchmark.

Stylized macroeconomic approaches estimate the effects of NTMs by observing the displacement of the market equilibrium induced by a regulation. It helps in assessing how much trade is foregone due to regulations and what the effect of harmonization of regulations is for a particular nation.
Gravity model originating from Newton’s Gravity Law is used to examine the trade flow between nations. This model captures the trade effect of the NTMs. Tinbergen (1962) has been the first to apply the gravity equation to explain international trade flows. The quantum of trade between the nations depends on the explanatory variables such as the size of the per capita gross domestic products of the exporting and importing nations, distance between the nations, and other specific variables added in the equation to capture the effects on trade. The gravity model fits into the framework of classical, neoclassical and new trade theories. International trade flows resulting from specialization can be attributed to difference in technology as in the Ricardian model (Eaton and Kortum, 2002); differences in factor endowments subject to constant returns to scale and perfect market as in neoclassical model (Deardroff, 1998); and due to product differentiation, economies of scale and imperfect competition as in the new trade theory (Anderson 1979; Helpman and Krugman 1985; Bergstand 1985; 1989). All these generate a force of gravity leading to international trade flows between the centers of economic activity. The gravity model is used to the study the effect of various factors including standards and requirements on trade between countries.

The cost benefit analysis helps to capture the welfare effects of the imposition of standards. The theoretical foundations of the cost benefit analysis are rooted in the welfare economics. The welfare effect is analyzed on the basis of producers’ surplus and consumers’ surplus. Producers’ surplus is analyzed using the variations in the profits of the producers. The consumers’ surplus depends on the effect of the NTMs on the price of the product sold in the import markets and the quantity of the output sold in those markets. It is possible to capture the welfare effect on the basis of the variation in the willingness to pay of the foreign buyers and the consequent change in the damage caused by the low
Marine Product Export Trade of Kerala – An Exploration of Issues in the Background

quality food. The cost benefit analysis studies not only the trade effect of NTMs but also the welfare effects of their implementation.

The present study basically employs gravity model to capture the effects of standards, regulations and other NTMs on the exports of marine products from India. Responses of the marine product export industry of Kerala to the emerging requirements in the import markets are analyzed within the cost benefit framework though not in its authentic form and hence failing to bring out the welfare effects of the standards and regulations. The computation of specific costs, both non recurring and recurring borne by the marine product exports sector of the state in the post standards era along with the appropriation of probable gains resulting from compliance with the requirements throw light on the variations in the producers’ surplus. This exposes the impact of the rising standards and regulations in the import markets on the cost structure of the marine product export industry of Kerala and the consequent benefits they receive.

1.8 Research Design

Research Design used is exploratory and descriptive. The study seeks to examine whether the food safety standards and quality regulations applied by the developed countries are NTMs meant to limit the imports of fish and fishery products. The proliferation of the standards and quality regulations occurred since the mid 1990s especially in the markets of the EU, the US and Japan. The food safety standards and quality and hygiene requirements prevalent in the EU, the US and Japan are outlined. A gravity model is employed to find out whether the standards implemented in the major markets of the EU, the US and Japan have emerged as barriers to the exports of marine products from India. Based on the findings of this model, the hypothesis can
be tested and used to prove whether these standards are indeed NTMs meant to restrict trade. It also analyses the market wise flow of marine product exports from India and Kerala. The markets are categorized into traditional markets and the non-traditional markets; the former consisting of the EU, the US and Japan and the latter consisting of the South East Asia (SEA), the Middle East Asia (MEA) and ‘Others’ comprising rest of the importing nations; the prominent being China, Turkey, etc. A comparative study of the exports of marine products from India and Kerala in the pre WTO period (1987-88 to 1994-95) and the post WTO period (1995-96 to 2009-10) to these markets serves to bring out whether significant changes have taken place in the direction of marine fish and fishery product exports from India and Kerala between these two phases. Time series analysis has been employed to explain the underlying structure of the data on quantity and value of marine product exports from Kerala to the aforementioned markets in the pre and post WTO periods. Time series modeler is used to identify the model of best fit and based on that forecast of quantity and value of marine product exports to various markets is made. This helps to assess whether significant changes have taken place in the direction of marine product exports from Kerala in the light of tightening of standards and regulations in the traditional markets of the EU, the US and Japan.

The response of the government to meet the challenges that have arisen in this sector in the wake of the rigorous stipulations in the major import markets is examined. This helps to bring out whether the institutional support has enabled the marine product sector to overcome the challenges that have arisen in the major import markets. An analysis of the impact of the new requirements on the marine product export sector of Kerala is also done. It identifies and computes specific costs incurred by the firm to meet the new requirements. The costs include both
the fixed costs of upgrading the infrastructure and other facilities as well as the recurring cost of compliance. The benefits of implementation of standards for the marine product export units too are examined.

1.9 Methodology

The study uses secondary and primary sources of data. The secondary data pertaining to the quarter wise quantity and value of marine product exports from India and Kerala to various markets of the EU, the US, Japan, the SEA, the MEA and ‘Others’ are obtained from the published and unpublished export statistics of the Marine Products Exports Development Authority, Kochi. The secondary data used also include the stipulations based on sanitary measures in the import markets and the data on alert and information notifications issued by the EU on fish and fishery products as well as data on detentions and rejections of consignments of marine product exports from the state at the import markets. Bulks of these data are obtained from the Exports Inspection Agency, Kochi and from the websites of Exports Inspection Council, Europa, RASFF, USFDA and FAO. Details of financial and institutional support provided to the marine product export sector of India and Kerala are collected from the MPEDA, Kochi. The other main sources of the secondary data are the websites of the Department of Fisheries, Government of India and Government of Kerala and of Ministry of Commerce, Government of India and various books and journals.

Primary data are collected by conducting a survey of seafood export units of the state. For the purpose of the survey, 24 seafood export units from Ernakulam, Alappuzha and Kollam, 3 major coastal districts of the state that possess largest number of seafood export units are selected. The surveyed units can be categorized into the EU approved units and the non EU approved units. Due to the preponderance of the EU approved units in the state, the
sample consists of 18 EU units and 6 non EU units. The sampling method adopted was purposive to bring out the specific issues faced by the marine product exporters in the new environment.

![Sampling Frame](image)

**Figure 1.1. Sampling Frame**

1.9.1 Statistical Tools

The models of best fit are identified to explain the underlying structure of the quantity and value of marine product exports from Kerala to various markets. The models of best fit obtained are ARIMA, simple seasonal, simple, winters’ additive and winters’ multiplicative Model. The estimates of the model parameters generated are used to make short term forecast for bringing out the relative importance of various markets for the marine product exports of Kerala.

The study also employs various parametric (t test, ANOVA) and non parametric tests (Mann Whitney U test) to study the cost structure of the marine product export units of the state classified on the basis of status of approval and production capacities measured in terms of tonnes per day. These tests are also used to study the benefits appropriated by the marine product export units of the state in the post standards regime.
1.10 Chapterisation


Chapter I

Global Trade in Fish and Fishery Products-An Overview, The SPS Agreement of the WTO and its Provisions relevant for international Trade in Fish and Fishery Products, The SPS measures adopted and implemented by the major importers of the EU, the US and Japan that have ramifications for the marine product exports of India and Kerala.

Chapter II

Market wise Exports of Marine Product from India – A Comparative Analysis of the Pre and the Post WTO Periods, Impact of the Standards in the EU, the US and Japan on the Marine Product Exports from India – A Gravity Model Analysis, Market wise Exports of Marine Product from Kerala in the Pre and Post WTO Periods – A Time Series Analysis, Market wise Forecasts of Marine Product Exports From Kerala

Chapter III


Chapter IV

Responses of the Marine Product Export Industry- Kerala, Profile of the Surveyed Units, Costs and Benefits of Implementation of the Standards.

Chapter V

Conclusion and Policy Options

Chapter VI
1.11 Limitations

The major limitation is the inability to apply the cost benefit framework of analysis in its authentic form. The inability to conceptualize cost and benefit so as to capture the welfare implications of implementation of standards is indeed a limitation. With a view to facilitate collection of data, only costs and benefits that are measurable and observable were brought within the framework of the study. Further the cost and benefit analysis is studied purely from the perspective of the producers. The cost and benefit dimensions relevant for the buyers do not figure and hence fail to capture the effects on consumers’ surplus. The effects of standards on welfare could be captured only partially through the analysis of impact on suppliers. But it can be assumed that in the event of strengthening of standards and regulations, better compliances and improvement in the levels of hygiene and quality of the products, buyers definitely benefit. The costs they bear could be in the form of rising prices in their respective domestic markets owing to limitations in the free entry of products from markets with a comparative advantage leading to a squeeze in their consumers’ surplus. The question to be addressed here is whether the consumers in the foreign markets are indeed willing to pay a premium price for better quality product which is linked to the demand elasticities of the quality sensitive and quality indifferent buyers. This is an area which can be taken up by researchers to make an assessment of the impact of standards on marine product export trade.

End notes:

The official definitions of certain concepts used such as standards, regulations and technical regulations are given below.
Standards: According to the International Organization for Standardization (ISO), standard is a document, established by consensus and approved by a recognized body that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results aimed at the achievement of the optimum degree of order in a given context. Standards should be based on the consolidated results of science, technology and experience and should be aimed at the promotion of optimum community benefits. International standard is the standard that is adopted by an international standardizing organization and made available to the public.

Regulation: regulation is a document providing binding legislative rules that is adopted by an authority.

Technical Regulation: technical regulation is regulation that provides technical requirements, either directly or by referring to or incorporating the content of standard, technical specification or code of practice.